

Office of Chemical Safety and Pollution Prevention

Final Risk Evaluation for Cyclic Aliphatic Bromides Cluster (HBCD)

Supplemental Information File:

Data Quality Evaluation for Environmental Release and Occupational Exposure Data

> CASRN: 25637-99-4 CASRN: 3194-55-6 CASRN: 3194-57-8



September 2020

This document is a compilation of tables for the data extraction and evaluation for Cyclic Aliphatic Bromides Cluster (HBCD). Each table shows the data point or set or information element that was extracted and evaluated from a data source in accordance with Appendix D of the Application of Systematic Review in TSCA Risk Evaluations. If the source contains more than one data set or information element, the review provides an overall confidence score for each data set or information element that is found in the source. Therefore, it is possible that a source may have more than one overall quality/confidence score.

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Explanatory Notes

These explanatory notes provide context to understand the short comments in the data evaluation tables.

Domain	Metric	Description of Comments Field
Reliability	Methodology	Indicates the sampling/analytical methodology, estimation method, or type of publication
Representativeness	Geographic Scope	Indicates the country of the study, publication, or underlying data
	Applicability	Indicates whether the data are for a condition of use within scope of the Risk Evaluation
	Temporal Representativeness	Provides the year of study, publication, or underlying data
	Sample Size	Describes the distribution of the sample or underlying data
Accessibility / Clarity	Metadata Completeness	Describes the completeness of the metadata
Variability and Uncertainty	Metadata Completeness	Indicates if study or publication addresses variability and uncertainty of the data or information

Releases to the Environment

Source Citation: Ke	Kemmlein, S.,Hahn, O.,Jann, O 2003. Emissions of organophosphate and brominated flame retardants from selected consumer products and building materials. Atmospheric Environment							
Type of Data SourceReHero ID13	Releases to the Environment; Environmental Release Data; 131377							
EXTRACTION								
Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source:		Commerc Insulation Emission measured	Commercial Use Insulation products in buildings Emission from EPS and XPS insulation samples from manufacturers, measured in chamber tests					
Environmental Media	ı:		Air					
Release or Emission I	Factor:		See table	5. Emiss	ion is ng	g of HBCD per m2 of insulation per hour. EPS		
Release Estimation Method:			= 4 ng/m Measured	2-h and	1 ng/m	2-h. XPS = 29 ng/m2-h and 0.1 ng/m2-h.		
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliability Me	etric 1:	Methodology	Medium	$\times 1$	2	Represents release in a chamber and may not be fully repre- sentative of the circumstances during actual use		
Domain 2: Represent	ative			1	0	~		
	etric 2:	Geographic Scope	Medium	$\times 1$	2	Germany		
IVIO M	$\frac{1}{2}$	Tomporal Boprosontativonoss	Modium	$\times 2$ $\times 2$	2 1	Occupational scenario (use of insulation in offices).		
Me	etric 5:	Sample Size	Medium	$ \times 1 $	2	There are two insulation samples with four test results - is cahracterized but may not be representative		
Domain 3: Accessibili	ity/Clari	Notadata Completenega	II: mb	× 1	1			
	etric o:	Metadata Completeness	підп	X 1	1	Release circumstances are fully characterized		
Domain 4. Variability	v and Ur	ocertainty						
Metric 7: Metadata Completeness High $\times 1$ 1 Discusses how sample type, chamber temperature, and c ber size may affect results						Discusses how sample type, chamber temperature, and chamber size may affect results		
	Continued on next page							

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Source Citation:	Kemmlein, S.,Hahn, O.,Jann, O 2003. Emissions of organophosphate and brominated flame retardants from selected consumer products and building materials. Atmospheric Environment.							
Type of Data Source	Releases to the Environment; Environmental Release Data;							
Hero ID	131377							
EVALUATION								
Domain	Metric	Rating MWF	* Score	Comments				
Overall Quality D	$\operatorname{Petermination}^\dagger$	High	1.6					

Source Citation: Type of Data Source Hero ID	ToxNet Hazardous Substances Data, Bank. 2017. HSDB: Hexabromocyclododecane. Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3970277					
EXTRACTION Parameter			Data			
Life Cycle Stage: Release Source: Disposal /Treatment Method: Environmental Media: Release Estimation Method: Annual Release Quantity (kg/yr): Waste Treatment Method:			All HBCD in sewage sludge from EPA's 2001 National Sewage Sludge Survey Sewage sludge to Biosolids, land applications, incineration, landfill Water, Land Measured 101-127 kg/yr to biosolids; 49.9-75.9 to land application; 20.8-26 to in- cineration; 17.7-20.9 kg/yr to landfill Sewage sludge to Biosolids, land applications, incineration, landfill			
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources
Domain 2: Repres	sentative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	High Medium Medium Low	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	$\begin{array}{c} 1 \\ 4 \\ 3 \end{array}$	US Captures releases from all possible stages, some of which are not in scope 2001 Sample size not listed, just cites the National Sewage Sludge Survey
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Information is all clearly cited
Domain 4: Variab	ility and Ur Metric 7:	ncertainty Metadata Completeness	Low	× 1	3	The report does not address variability or uncertainty with respect to this data element.
Overall Quality Determination [†]			Medium		1.9	
	Continued on next page					

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Source Citation:ToxNet Hazardous Substances Data, Bank. 2017. HSDB: Hexabromocyclododecane.Type of Data SourceReleases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3970277							
EVALUATION							
Domain	Metric	Rating	MWF^{\star}	Score	Comments		

Source Citation:Nicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34.Type of Data SourceReleases to the Environment; Completed Exposure or Risk Assessments;Hero ID3978355						
EXTRACTION Parameter		Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Environmental Media: Release or Emission Factor: Release Estimation Method: Release Days per Year: Number of Sites:			Processing EPS /XPS Compounding and converting Water, Land, Air, Incineration Loss fractions cited from the 2004 Plastics Compounding and Converting ESD Estimated 2004 Plastics Compounding and Converting ESD 2004 Plastics Compounding and Converting ESD			
EVALUATION Domain	Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliability Metric 1:	Methodology	High	$\times 1$	1	Information is from 2004 Plastics Compounding and Convert- ing ESD	
Domain 2: Representative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium Medium Medium Low	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 4 4 3	OECD EPS compounding not in scope, but other scenarios are 2004 Unknown	
Domain 3: Accessibility/Clan Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Information is all clearly cited	
Domain 4: Variability and U: Metric 7:	ncertainty Metadata Completeness	Medium	× 1	2	Limited discussion on uncertainty and variability	
Overall Quality Determination	\mathbf{n}^{\dagger}	Medium		1.9		

Source Citation: Type of Data Source Hero ID	Nicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34. Releases to the Environment; Completed Exposure or Risk Assessments; 3978355					
EXTRACTION						
Parameter			Data			
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Environmental Media: Release Estimation Method: Annual Release Quantity (kg/yr):		Commercial Use Insulation products in buildings Life of EPS /XPS insulation Air and water Estimated 1.4 (Air) and 1.4 (Water)				
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources
Domain 2: Repres	Sentative Metric 2:	Geographic Scope	Medium	× 1	2	Australia
	Metric 3:	Applicability	High	$\times 2$	2	Occupational scenario (use of insulation in offices).
	Metric 4: Motric 5:	Sample Size	High	$\times 2$ $\times 1$	2	2012 University
Domain 3: Access Domain 4: Variab	Metric 5: sibility/Clari Metric 6: sility and Ur Metric 7:	ty Metadata Completeness ncertainty Metadata Completeness	Low High High	× 1 × 1 × 1	3 1 1	Unknown Information is all clearly cited Discusses variability and uncertainty
Overall Quality D	eterminatio	n†	High		1.3	

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	2014. The 2012 annual effluent guidelines review report. Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3860559						
EXTRACTION Parameter			Data				
Life Cycle Stage: Release Source:			All Data from the United Kingdom indicate that the primary sources of HBCD release are fugitive emissions during its manufacture and subse- quent use in products, leaching from landfills, and incinerator emissions				
Environmental Media: Release Estimation Method: Annual Release Quantity (kg/yr):		quent use in products, leacning from landnins, and incinerator emissions 50 percent to WWT, 29 percent surface water, 21 percent air Measured 3100					
EVALUATION			D (:		q		
Domain		Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
Domain 2: Repres	entative	~			_		
	Metric 2:	Geographic Scope	Medium	× 1	2	EU	
	Metric 3:	Applicability	Medium	$\times 2$	4	Captures releases from all possible stages, some of which are not in scope	
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008	
	Metric 5:	Sample Size	Low	$\times 1$	3	Information stated from Europe, unknown sample size	
Domain 3: Access	ibility/Clar	ity					
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Information is all clearly cited	
Danain 4. Vaniah	:1:41 TT						
Domain 4: variab	Metric 7:	Metadata Completeness	High	$\times 1$	1	Discusses variability and uncertainty with regards to limita- tions on how European data can be applied to US	
Overall Quality D	eterminatio	n [†]	High		1.6		

Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Releases to the Environment; Completed Exposure or Risk Assessments; 3970747						
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Release or Emission Factor:		Disposal Insulation products in buildings Building and construction waste Information from industry shows that, in 1992, out of the total construction- and demolition (C&D) waste, plastic waste was 0.4 per- cent of the weight. EPS and XPS were representing about 3 percent of the plastic waste and therefore 0.01 percent of the total building waste.					
EVALUATION		Matria	Dation	MM7177+	C	()	
Domain		Metric	Rating	MWF^	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
Domain 2. Donno	ontativo						
Domain 2. Repres	Metric 2.	Geographic Scope	Medium	× 1	2	Europe	
	Metric 3:	Applicability	High	$\times 2$	2	In scope	
	Metric 4:	Temporal Representativeness	Low	$\times 2$	6	1992	
	Metric 5:	Sample Size	Low	$\times 1$	3	Distribution characterized by no statistics.	
Domain 3: Access	ibility/Clari Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality Determination [†]		Medium		1.8			

Source Citation:Echa., 20Type of Data SourceReleasesHero ID3970747	08. Risk assessment: hexabromo to the Environment; Completed 1	cyclododeca Exposure or	nne. Risk As	sessmer	its;		
EXTRACTION Parameter		Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Environmental Media: Release Estimation Method: Annual Release Quantity (kg/yr):			Processing Formulation of EPS and HIPS WW, surface water, air Measured Table 3-5 = 0.3 to 113.4 (surface water); 0.14 to 20 (WW); 0.029 to 2.2 (air)				
Release Days per Year: Number of Sites:		1 to 340 13					
EVALUATION							
Domain	Metric	Rating	MWF^*	Score	Comments		
Domain 1: Reliability Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Representative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium Medium High High	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 4 2 1	Europe HIPS similar but not in scope 2008 Statistical distribution of samples is fully characterized. Sam- ple size is sufficiently representative		
Domain 3: Accessibility/Cla Metric 6:	rity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability and U Metric 7:	Incertainty Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality Determinati	on [†]	High		1.3			
	Cor	ntinued on r	next page	;			

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Source Citation: Type of Data Source Hero ID	Echa,. 2008. Risk assessment: hexabromocyclododecane. Releases to the Environment; Completed Exposure or Risk Assessments; 3970747					
EVALUATION						
Domain	Metric	Rating	MWF* Score	Comments		

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* MWF = Metric Weighting Factor

Jource Citation:Echa., 2008. Risk assessment: hexabromocyclododecane.Type of Data SourceReleases to the Environment; Completed Exposure or Risk Assessments; 3970747Hero ID3970747							
EXTRACTION Parameter		Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Environmental Media: Release Estimation Method: Annual Release Quantity (kg/yr): Release Days per Year: Number of Sites:			Processing Formulation of EPS and HIPS WW, surface water, air Estimated for sites that did not provide data using the 90th percentile of measured values from sites that did provide data Table 3-6 = 22.8 (surface water), 2.2 (air) 300 6				
EVALUATION	Nf. to be	Dating	MAX 717+	C	Quantum		
Domain	Metric	Rating	M W F ^	Score	Comments		
Domain 1: Reliability Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Representative							
Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
Metric 3:	Applicability	Medium	$\times 2$	4	HIPS similar but not in scope		
Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008		
Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative		
Domain 3: Accessibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4. Variability and II	neentaintu						
Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality Determination	\mathbf{n}^{\dagger}	High		1.3			
	Cor	ntinued on r	next page				

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Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Releases to the Environment; Completed Exposure or Risk Assessments; 3970747								
EVALUATION									
Domain	Metric	Rating	MWF* Score	Comments					

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* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Echa,. 200 Releases to 3970747	8. Risk assessment: hexabromodo the Environment; Completed I	cyclododeca Exposure or	ane. : Risk As	sessmer	ats;	
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Environmental Media: Release Estimation Method: Annual Release Quantity (kg/yr): Release Days per Year: Number of Sites:			Processing XPS Compounding /Masterbatch surface water, air Measured Table 3-9 = 0.12 to 37 (WW) and 1.2 to 3.3 (air) 300 3				
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources	
Domain 2: Repres	Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High High	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 1	Europe Use is in scope 2008 Statistical distribution of samples is fully characterized. Sam-	
Domain 3: Access	ibility/Clari Metric 6:	ity Metadata Completeness	High	× 1	1	ple size is sufficiently representative Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variab	ility and Ur Metric 7:	ncertainty Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality D	eterminatio	n [†]	High		1.1		

* MWF = Metric Weighting Factor
† If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:EchType of Data SourceReiHero ID397	na,. 200 leases to 70747	8. Risk assessment: hexabromodo the Environment; Completed H	cyclododeca Exposure or	ane. [.] Risk As	sessmer	ats;	
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Environmental Media: Release Estimation Method: Annual Release Quantity (kg/yr): Release Days per Year: Number of Sites:			Processing XPS Compounding /Masterbatch surface water, air Estimated for sites that did not provide data using the 90th percentile of measured values from sites that did provide data Table $3-10 = 26$ (WW), 2.6 (air) 300 11				
EVALUATION					~	~	
Domain		Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliability Me	tric 1:	Methodology	High	× 1	1	Information is from trusted sources	
Domain 2: Representa Me Me Me Me	tric 2: tric 3: tric 4: tric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High High	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 1	Europe Use is in scope 2008 Statistical distribution of samples is fully characterized. Sam- ple size is sufficiently representative	
Domain 3: Accessibilit Me	ty/Clar tric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variability Me	and Uı tric 7:	ncertainty Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality Deter	minatio	\mathbf{n}^{\dagger}	High		1.1		
		Cor	tinued on r	next page			

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Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Releases to the Environment; Completed Exposure or Risk Assessments; 3970747								
EVALUATION									
Domain	Metric	Rating	MWF* Score	Comments					

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* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Releases to the Environment; Completed Exposure or Risk Assessments; 3970747							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Environmental Media: Release Estimation Method: Annual Release Quantity (kg/yr): Release Days per Year: Number of Sites:			Processing EPS Converting WW, surface water, air Estimated Table 3-16 = 20.4 (surface water), 82 (WW), 102 (Air) Table 3-5 hundreds					
EVALUATION		Metric	Bating	MWF*	Score	Comments		
		Weblic	Itating	101 00 1	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Benres	entative							
Domain 2. Repres	Metric 2:	Geographic Scope	Medium	× 1	2	Europe		
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008		
	Metric 5:	Sample Size	Low	$\times 1$	3	Distribution of samples characterized by no statistics.		
Domain 3: Access	ibility/Clari	ty Matadata Completeness	II: ah	× 1	1			
	Metric 6:	Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variab	Metric 7:	certainty Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality D	etermination	n [†]	High		1.3			

Source Citation:Echa,. 200Type of Data SourceReleases tHero ID3970747	 Risk assessment: hexabromodo the Environment; Completed I 	cyclododeca Exposure or	ane. [.] Risk As	sessmer	ats;		
EXTRACTION Parameter		Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Environmental Media: Release Estimation Method: Annual Release Quantity (kg/yr): Release Days per Year: Number of Sites:			Processing XPS converting WW, air Measured Table $3-19 = 0$ to 4.2 (WW), 0.31 to 18 (air) 15 to 3004				
EVALUATION Domain	Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliability Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Representative Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
Metric 3: Metric 4:	Applicability Temporal Representativeness	High High	$\times 2 \times 2$	2 2	Use is in scope 2008		
Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative		
Domain 3: Accessibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability and U: Metric 7:	ncertainty Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality Determination	\mathbf{n}^{\dagger}	High		1.1			

* MWF = Metric Weighting Factor
[†] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation: Echa, 2008. Risk assessment: hexabromocyclododecane.							
Hero ID 3970747	to the Environment, Completed	Exposure of	I IUSK AS	sessinei	105,		
EXTRACTION							
Parameter		Data					
Life Cycle Stage:		Processin	ıg				
Life Cycle Description (Sul	ocategory of Use):	XPS conv	verting				
Environmental Media:		WW, air					
Release Estimation Method	1:	Estimate	d for site	s that o	did not provide data using the 90th percentile		
		of measur	red value	s from s	sites that did provide data		
Annual Release Quantity (kg/yr):	Table 3-2	20 = 7.9 (WW),	17.4 (air)		
Number of Sites:		13					
EVALUATION							
Domain	Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Roliability							
Metric 2	: Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Representative							
Metric 2	2: Geographic Scope	Medium	$\times 1$	2	Europe		
Metric 3	3: Applicability	High	$\times 2$	2	Use is in scope		
Metric 4	1: Temporal Representativeness	High	$\times 2$	2	2008		
Metric :	b: Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative		
Domain 3: Accessibility/C	arity						
Metric (6: Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4. Variability 1	Uncontainty						
Metric ?	7: Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality Determination [†] High 1.1							

* MWF = Metric Weighting Factor
[†] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Releases to the Environment; Completed Exposure or Risk Assessments; 3970747						
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Environmental Media: Release Estimation Method: Annual Release Quantity (kg/yr): Number of Sites:		Processing XPS from HBCD powder WW, air Measured Table 3-22 = 0.00004 to 15 (WW), 0.15 to 3.8 (air) 18					
EVALUATION Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources	
Domain 2: Repres	Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High High	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 1	Europe Use is in scope 2008 Statistical distribution of samples is fully characterized. Sam- ple size is sufficiently representative	
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variab	ility and Un Metric 7:	ncertainty Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.1		

Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Releases to the Environment; Completed Exposure or Risk Assessments; 3970747							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Environmental Media: Release or Emission Factor: Release Estimation Method: Annual Release Quantity (kg/yr):		Commercial Use Insulation products in buildings emission from boads during service life surface water, WW, air release factor = 8.4E-06 ; 5 ug/m2 insulation/yr estimates taken from sources Table $3-33 = 54$ (air), 0 (surface water and WW)						
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments		
			8					
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Repre	sentative							
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
	Metric 3:	Applicability	High	$\times 2$	2	Occupational scenario (use of insulation in offices).		
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	sources date back to 2002		
	Metric 5:	Sample Size	Low	$\times 1$	3	Distribution characterized by no statistics.		
Domain 3: Access	sibility/Clari	ity						
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4. Variat	vility and Ur	certainty						
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality D	Oeterminatio	\mathbf{n}^{\dagger}	High		1.6			

Source Citation:Echa, 2008. Risk assessment: hexabromocyclododecane.Type of Data SourceReleases to the Environment; Completed Exposure or Risk Assessments; 3970747Hero ID3970747							
EXTRACTION Parameter		Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Disposal /Treatment Method:		Disposal Insulation demolotic 30 percen structures these buil	Disposal Insulation products in buildings demolotion of buildings 30 percent of boards recycled, requiring manual deconstruction of the structures. The remaining 70 percent of material was disposed of, and these buildings were assumed not to be manually deconstructed.				
Environmental Media:incinerationRelease or Emission Factor:5E-06 release factor from incineration to WW or airRelease Estimation Method:estimated				incineration to WW or air			
EVALUATION							
Domain	Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliability Metric	: 1: Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Representativ Metric Metric Metric Metric	e 22: Geographic Scope 23: Applicability 24: Temporal Representativeness 25: Sample Size	Medium High High Low	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 3	Europe Use is in scope 2008 Distribution characterized by no statistics.		
Domain 3: Accessibility/ Metric	Clarity e 6: Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability an Metric	d Uncertainty 27: Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality Determin	Overall Quality Determination [†] High 1.3						
Continued on next page							

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Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Releases to the Environment; Completed Exposure or Risk Assessments; 3970747							
EVALUATION								
Domain	Metric	Rating	MWF* Score	Comments				

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* MWF = Metric Weighting Factor

Source Citation: Type of Data Source	Echa, 2008. Risk assessment: hexabromocyclododecane. Releases to the Environment; Completed Exposure or Risk Assessments;								
Hero ID	3970747								
EXTRACTION									
Parameter			Data						
Life Cycle Stage			Recycling	,					
Life Cycle Descrit	otion (Subca	ategory of Use):	Insulation	, product	s in bui	ildings			
Release Source:	(demolotic	on of buil	dings -	breaking boards for recycling			
Release or Emissi	on Factor:		$90 \mathrm{g} \mathrm{EPS}$	-particles	/tonne	EPS; 0 g XPS particles/tonne XPS			
Release Estimatio	on Method:		Measured						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility								
Domain 1. Itenab	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources			
		5.	0						
Domain 2: Repres	sentative								
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe			
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008			
	Metric 5:	Sample Size	Low	$\times 1$	3	Distribution characterized by no statistics.			
Domain 3. Access	vibility/Clar	ity							
Domain 5. Access	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as-			
						sessment memous, results, and assumptions.			
Domain 4: Variab	ility and U	ncertainty							
	Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
Overall Quality Determination [†]					1.3				

Source Citation: Type of Data Source Hero ID	Echa,. 200 Releases to 3970747	Echa, 2008. Risk assessment: hexabromocyclododecane. Releases to the Environment; Completed Exposure or Risk Assessments; 3970747								
EXTRACTION Parameter		Data								
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Release or Emission Factor: Release Estimation Method:		Disposal Insulation products in buildings demolotion of buildings - breaking boards for disposal release factor of 0.1 percent estimated								
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments				
Domain 1: Reliab	oility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources				
Domain 2: Repre	sentative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High Low	$\begin{array}{c} \times 1 \\ \times 2 \\ \times 2 \\ \times 1 \end{array}$	2 2 2 3	Europe Use is in scope 2008 Distribution characterized by no statistics				
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Unacceptable	× 1	4	Assessment list source as Anonymous and is not included in the list of references				
Domain 4: Variał	Dility and Un Metric 7:	ncertainty Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.				
Overall Quality I	Determinatio	n [†]	Unacceptable		4	Metric Mean Score: 1.7.				
		(Continued on nex	t page						

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Source Citation: Type of Data Source Hero ID	Echa,. 2008. Risk assessment: hexabromocyclododecane. Releases to the Environment; Completed Exposure or Risk Assessments; 3970747								
EVALUATION									
Domain	Metric Rating MWF* Score Comments								

** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation:EchaType of Data SourceReleaHero ID3970	Echa, 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified. Furce Releases to the Environment; Completed Exposure or Risk Assessments; 3970748									
EXTRACTION Parameter		Data								
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Environmental Media: Release or Emission Factor: Release Estimation Method: Release Days per Year: Number of Sites:			Processing EPS /XPS Converting Water, Land, Air, Incineration Loss fractions cited from the 2004 Plastics Converting ESD Estimated 2004 Plastics Converting ESD 2004 Plastics Converting ESD							
EVALUATION Domain	Metric	Rating	MWF*	Score	Comments					
Domain 1: Reliability Metr	ric 1: Methodology	High	× 1	1	Information is from 2004 Plastics Converting ESD					
Domain 2: Representative Metric 2: Geographic Scope Metric 3: Applicability Metric 4: Temporal Representativene Metric 5: Sample Size		Medium High Medium Low	$\begin{array}{c} \times 1 \\ \times 2 \\ \times 2 \\ \times 1 \end{array}$	2 2 4 3	OECD In scope 2004 Unknown					
Domain 3: Accessibility Metr	v/Clarity ric 6: Metadata Completeness	High	$\times 1$	1	Information is all clearly cited					
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness		Medium	$\times 1$	2	Limited discussion on uncertainty and variability					
Overall Quality Determination [†]		Medium		1.7						

Source Citation:Echa,. 201Type of Data SourceReleases tHero ID3970748	17. Chemical safety report: Hexa o the Environment; Completed I	abromocycle Exposure or	ododecan · Risk As	ne and a ssessmen	ll major diastereoisomers identified. .ts;			
EXTRACTION Parameter		Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source:			Processing Cutting of EPS boards cutting of foam; emission factors implicitly account for the following assumptions: 10 percent of boards at a construction site are sawed or cut; boards are 6 cm x 60 cm x 125 or 104 cm; and the boards are cut					
Environmental Media: Release or Emission Factor: Release Estimation Method: Annual Release Quantity (kg/yr): Release Days per Year:			 along the short side. 50 percent to surface water and 50 percent to air or landfill 100 g/tonnes HBCDD from cutting of boards Estimated 95 percent of the particles generated during cutting operations are assumed to end up in waste. ?230 days/yr 					
EVALUATION Domain	Metric	Rating	MWF*	Score	Comments			
Domain 1: Reliability Metric 1:	Methodology	High	× 1	1	Information is from trusted sources			
Domain 2: Representative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High Medium Low	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	$2 \\ 2 \\ 4 \\ 3$	Europe Use is in scope 2003 Unknown			
Domain 3: Accessibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Information is all clearly cited			
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness			× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
	Cor	ntinued on 1	next page	9				

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Source Citation: Type of Data Source Hero ID	Echa, 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified. Releases to the Environment; Completed Exposure or Risk Assessments; 3970748								
EVALUATION									
Domain	Metri	Metric Rating MWF [*] Score Comments							
Overall Quality Determination [†] High 1.6									

Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Releases to the Environment; Completed Exposure or Risk Assessments; 3970747							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source:		Processing Sawing and cutting of EPS and XPS boards cutting and sawing of foam; emission factors implicitly account for the following assumptions: 10 percent of boards at a construction site are sawed or cut; boards are 6 cm x 60 cm x 125 or 104 cm; and the boards are cut along the short side						
Environmental Media: Release or Emission Factor: Release Estimation Method: Annual Release Quantity (kg/yr):			50 percent 445 g pa boards; 5 Measured 95 percent sumed to	are cut along the short side. 50 percent to surface water and 50 percent to air or landfill 445 g particles per tonne EPS being released during sawing of EPS boards; 5 g XPS/tonne XPS sawed; 100 g EPS/tonne cut with hot wire Measured 95 percent of the particles generated during cutting operations are as- sumed to end up in waste.				
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Representative Metric 2: Geographic Scope Metric 3: Applicability Metric 4: Temporal Representativeness Metric 5: Sample Size		Medium High Medium Low	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 4 3	Europe Use is in scope 2003 Unknown			
Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness		High	$\times 1$	1	Information is all clearly cited			
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness		High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
Continued on next page								

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Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Releases to the Environment; Completed Exposure or Risk Assessments; 3970747								
EVALUATION	UATION								
Domain	Metri	Metric Rating MWF* Score Comments							
Overall Quality Determination [†] High 1.6									

* MWF = Metric Weighting Factor
[†] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation: Type of Data Source Hero ID	Echa, 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified. Releases to the Environment; Completed Exposure or Risk Assessments; 3970748								
EXTRACTION Parameter	Data								
Life Cycle Stage:			Use						
Life Cycle Descript	ion (Subca	tegory of Use):	cutting of	f EPS bo	ards at	construction sites			
Release Source:			cutting of foam; emission factors implicitly account for the following assumptions: 10 percent of boards at a construction site are sawed or cut; boards are 6 cm x 60 cm x 125 or 104 cm; and the boards are cut along the short side						
Environmental Med	lia:		50 percen	t to surf	ace wate	er and 50 percent to air			
Release or Emission	n Factor:		10 g part	iculates/	tonnes I	EPS			
Release Estimation	Method:		Estimated	d - Durin	ng profes	ssional use (i.e. at construction sites) it is esti-			
			mated the	at only 1	0 percer	nt of boards are cut			
Release Days per Y	ear:		250						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliabili	itv								
]	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources			
Domain 2: Represe	ntative								
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe			
]	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope			
]	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2003			
]	Metric 5:	Sample Size	Low	$\times 1$	3	Unknown			
Domain 3: Accessit	oility/Clari	ity							
]	Metric 6:	Metadata Completeness	High	$\times 1$	1	Information is all clearly cited			
Domain 4: Variabil	ity and Ur	ocertainty							
	Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
		Con	tinued on r	next page	9				

		indea nom p		Page			
Source Citation: Type of Data Source Hero ID	Echa,. 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified. Releases to the Environment; Completed Exposure or Risk Assessments; 3970748						
EVALUATION							
Domain	Metric	Rating	$\rm MWF^{\star}$	Score	Comments		
Overall Quality I	$\operatorname{Determination}^{\dagger}$	High		1.6			

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* MWF = Metric Weighting Factor

Source Citation:Echa, 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified.Type of Data SourceReleases to the Environment; Completed Exposure or Risk Assessments;Hero ID3970748							
EXTRACTION		Data					
		Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source:		Use cutting of XPS boards at construction sites cutting of foam; emission factors implicitly account for the following assumptions: 10 percent of boards at a construction site are sawed or cut; boards are 6 cm x 60 cm x 125 or 104 cm; and the boards are cut					
Environmental Media		along the 50 percen	snort sid t to surfs	le. Ne wati	er and 50 percent to air		
Release or Emission Factor:		5 g XPS	particles	er tonr	ne XPS		
Release Estimation Method:			i i				
EVALUATION							
Domain	Metric	Rating	MWF^*	Score	Comments		
Domain 1: Reliability Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Representative		N.C. 11	1	0	-		
Metric 2: Motric 3:	Geographic Scope	Medium High	$\times 1$ $\times 2$	2	Europe		
Metric 3.	Temporal Representativeness	Medium	$\times 2$ $\times 2$	2 1	Use is in scope		
Metric 5:	Sample Size	Low	$\times 1^{2}$	3	Unknown		
Domain 3: Accessibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Information is all clearly cited		
		0			· · · · · · · · · · · · · · · · · · ·		
Domain 4: Variability and Un	ncertainty						
Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality Determination ^{\dagger}				1.6			
Continued on next page							

Source Citation: Type of Data Source Hero ID	Echa, 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified. Releases to the Environment; Completed Exposure or Risk Assessments; 3970748								
EVALUATION									
Domain	Metric	Rating	MWF* Score	Comments					

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* MWF = Metric Weighting Factor
| Source Citation:
Type of Data Source | Echa,. 201
Releases to | 7. Chemical safety report: Hexa
o the Environment; Completed I | bromocyclo
Exposure or | dodecan
Risk As | e and a
sessmen | ll major diastereoisomers identified.
nts; | | |
|--|---------------------------|---|----------------------------|--------------------|--------------------|---|--|--|
| Hero ID | Hero ID 3970748 | | | | | | | |
| EXTRACTION | | | | | | | | |
| Parameter | | | Data | | | | | |
| | | | | | | | | |
| Life Cycle Stage: | | | Commerc | ial Use | | | | |
| Life Cycle Descript | ion (Subca | tegory of Use): | Insulation | n product | s in bui | ildings | | |
| Release Source: | | | service life | e of EPS | boards | at construction sites | | |
| Environmental Med | lia: | | water, lan | id, incine | ration | | | |
| Release or Emission | n Factor: | | No loss of | f HBCD | is expe | ected to occur in the foam during service life, | | |
| | | | even when | n exposed | l to nat | cural light. | | |
| Release Estimation | Method: | | The service | ce life of | the boa | ards is estimated as 30 to 100 years. | | |
| Release Days per Y | ear: | | 365 | | | | | |
| | | | | | | | | |
| EVALUATION | | | | | | | | |
| Domain | | Metric | Rating MWF* Score Comments | | | | | |
| | | | | | | | | |
| Domain 1: Reliabil | ity | | | | | | | |
| | Metric 1: | Methodology | High | $\times 1$ | 1 | Information is from trusted sources | | |
| | | | | | | | | |
| Domain 2: Represe | ntative | | | - | 0 | _ | | |
| | Metric 2: | Geographic Scope | Medium | × 1 | 2 | Europe | | |
| - | Metric 3: | Applicability | High
Madiana | × 2 | 2 | Occupational scenario (use of insulation in offices). | | |
| | Metric 4: | Comple Size | Low | × 2 | 4 | 2003 | | |
| | Metric 5: | Sample Size | LOW | × 1 | 3 | Unknown | | |
| Domain 3: Accessit | oility/Clari | it v | | | | | | |
| Domain J. Accessio | Metric 6: | Metadata Completeness | High | × 1 | 1 | Information is all clearly cited | | |
| | | notadata completeness | 111811 | × 1 | - | information is an elearly effect | | |
| Domain 4: Variability and Uncertainty | | | | | | | | |
| | Metric 7: | Metadata Completeness | High | $\times 1$ | 1 | The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. | | |
| Overall Quality Determination [†] | | | High | | 1.6 | | | |
| | | | | | | | | |
| | | | | | | | | |

 * MWF = Metric Weighting Factor

EXTRACTION Parameter Data Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Environmental Media: Release Source: Environmental Media: Release or Emission Factor: Release Estimation Method: Daily Release Quantity (kg/day): Annual Release Quantity (kg/day): Annual Release Quantity (kg/yr): Release Days per Year: 365 Commercial Use Insulation products in buildings service life Output only ear service life Comparison over a 100 year service life Daily Release Quantity (kg/yr): Release Days per Year: 365 EVALUATION Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Metric 3: Medium × 1 2 Europe Metric 4: Temporal Representativeness Medium × 1 2 Europe Metric 5: Sample Size Low × 1 3 Unknown Domain 3: Accessibility/Clarity Metric 6: High × 1 1 Information is all clearly cited Domain 4: Variability and Uncertainty Metric 7: High × 1 1 The assessment addresses variability and uncertain results. Uncertainty is well characterized.	Source Citation:Echa,. 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified.Type of Data SourceReleases to the Environment; Completed Exposure or Risk Assessments; 3970748							
I drameer Data Life Cycle Stage: Life Cycle Description (Subcategory of Use): Insulation products in buildings service life of EPS boards at construction sites air Release Source: Environmental Media: air Release or Emission Factor: release factor = 8.4E-06 Release Quantity (kg/day): 1.8E-05 kg/day Annual Release Quantity (kg/yr): 6.7E-03 kg/yr Release Days per Year: 365 Comments Comments Domain 1: Reliability Metric 1: Methodology Metric 2: Geographic Scope Metric 3: Applicability Medium x 1 1 Metric 3: Applicability Metric 5: Sample Size Medium x 2 4 Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High x 1 1 Information is all clearly cited Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High x 1 1 Information is all clearly cited	EXTRACTION Parameter Data							
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Farameter			Data				
Life Cycle Description (Subcategory of Use):Insulation products in buildings service life of EPS boards at construction sites air release factor = 8.4E-06 Over a 100 year service life Daily Release Quantity (kg/ay):Insulation products in buildings service life 0 ver a 100 year service life 0 ver at 100 year service life 0 ver a 100 year service life 0 ver a 100 year serv	Life Cycle Stage:			Commerc	ial Use			
Release Source:service life of EPS boards at construction sitesEnvironmental Media:airRelease or Emission Factor:release factor = 8.4E-06Release Estimation Method:over a 100 year service lifeDaily Release Quantity (kg/day):1.8E-05 kg/dayAnnual Release Quantity (kg/day):6.7E-03 kg/yrRelease Days per Year:365EVALUATIONDomain 1: ReliabilityMetric 1:MetricRatingMWF*ScoreCommentsDomain 2: RepresentativeMetric 2:Geographic ScopeMedium× 11Information is from trusted sourcesMetric 3:ApplicabilityHigh× 22Occupational scenario (use of insulation in offices).Metric 4:Temporal RepresentativeessMedium× 242003Metric 5:Sample SizeLow× 13UnknownDomain 3: Accessibility/ClarityHigh× 11Information is all clearly citedDomain 4: Variability and UncertaintyMetric 6:Metadata CompletenessHigh× 11Domain 4: Variability and UncertaintyMetric 7:Metadata CompletenessHigh× 11Domain 4: Variability and UncertaintyHigh× 11The assessment addresses variability and uncertaint results. Uncertainty is well characterized.	Life Cycle Descriptio	on (Subca	tegory of Use):	Insulation	product	s in bui	ildings	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Release Source:	,	,	service life	e of EPS	boards	at construction sites	
Release or Emission Factor:release factor = $8.4E-06$ over a 100 year service life Daily Release Quantity (kg/day):release factor = $8.4E-06$ over a 100 year service life $1.8E-05$ kg/dayDaily Release Quantity (kg/yr): $6.7E-03$ kg/yr 8.26 Release Days per Year: 365 EVALUATIONEVALUATIONDomainMetricReliabilityRating MWF^* ScoreDomain 1: ReliabilityFigh $\times 1$ 1Metric 1:MethodologyHigh $\times 1$ 2Domain 2: RepresentativeKetric 3:ApplicabilityMetric 3:ApplicabilityHigh $\times 2$ 2Metric 4:Temporal RepresentativenessMedium $\times 2$ 4Metric 5:Sample SizeLow $\times 1$ 3Domain 3: Accessibility/ClarityHigh $\times 1$ 1Information is all clearly citedDomain 4: Variability and Uncertainty Metric 7:Metadata CompletenessHigh $\times 1$ 1Domain 4: Variability and Uncertainty Metric 7:Metadata CompletenessHigh $\times 1$ 1	Environmental Medi	a:		air				
Release Estimation Method: over a 100 year service life Daily Release Quantity (kg/day): 1.8E-05 kg/day Annual Release Quantity (kg/day): 6.7E-03 kg/yr Release Days per Year: 6.7E-03 kg/yr Bomain Metric Release Days per Year: 6.7E-03 kg/yr Bomain Metric Release Days per Year: 6.7E-03 kg/yr Bomain Metric Domain Metric Metric 1: Metric Metric 2: Geographic Scope Metric 3: Applicability High × 1 1 Metric 4: Temporal Representative Metric 5: Sample Size Low × 1 3 Domain 3: Accessibility/Clarity Ketadata Completeness Metric 6: Metric Ge Metric 7: Metadata Completeness High × 1 1 Information is all clearly cited	Release or Emission	Factor:		release fac	$\operatorname{ctor} = 8.$	4E-06		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Release Estimation M	Method:		over a 100) year set	vice life	e	
Annual Release Quantity (kg/yr): 6.7E-03 kg/yr Release Days per Year: 365 EVALUATION Domain Domain Metric Rating MWF* Score Comments Domain 1: Reliability High × 1 1 Metric 1: Methodology High × 1 1 Domain 2: Representative Metric 3: Applicability High × 2 2 Metric 3: Applicability High × 2 4 2003 Metric 4: Temporal Representativeness Medium × 2 4 2003 Domain 3: Accessibility/Clarity Low × 1 3 Unknown Domain 4: Variability and Uncertainty Metric 7: Metric 7: Metric 7: Metric 7: Metric 7: High × 1 1 The assessment addresses variability and uncertaint results. Uncertainty is well characterized.	Daily Release Quant	ity (kg/d	ay):	1.8E-05 k	g/day			
Release Days per Year: 365 EVALUATION Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Europe Metric 3: Applicability High × 2 2 Occupational scenario (use of insulation in offices). Metric 4: Temporal Representativeness Medium × 2 4 2003 Metric 5: Sample Size Low × 1 3 Unknown Domain 3: Accessibility/Clarity- Metric 6: Metadata Completeness High × 1 1 Information is all clearly cited Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertaint results. Uncertainty is well characterized.	Annual Release Quar	ntity (kg/	/yr):	6.7E-03 k	g/yr			
EVALUATION Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Europe Metric 3: Applicability High × 2 2 Occupational scenario (use of insulation in offices). Metric 4: Temporal Representativeness Medium × 2 4 2003 Metric 5: Sample Size Low × 1 3 Unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Information is all clearly cited Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty results. Uncertainty is well characterized.	Release Days per Year:			365				
Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Europe Metric 3: Applicability High × 2 2 Occupational scenario (use of insulation in offices). Metric 4: Temporal Representativeness Medium × 2 4 2003 Metric 5: Sample Size Low × 1 3 Unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Information is all clearly cited Domain 4: Variability and Uncertainty Metric 7: Metric 3 High × 1 1 The assessment addresses variability and uncertainty results. Uncertainty is well characterized.	EVALUATION							
Domain 1: Reliability Metric 1: Methodology High $\times 1$ 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Medium $\times 1$ 2 Europe Metric 3: Applicability High $\times 2$ 2 Occupational scenario (use of insulation in offices). Metric 4: Temporal Representativeness Medium $\times 2$ 4 2003 Metric 5: Sample Size Low $\times 1$ 3 Unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High $\times 1$ 1 Information is all clearly cited Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High $\times 1$ 1 The assessment addresses variability and uncertaint results. Uncertainty is well characterized.	Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative	Domain 1: Reliabilit	v						
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	M	letric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
Metric 2: Geographic Scope Medium × 1 2 Europe Metric 3: Applicability High × 2 2 Occupational scenario (use of insulation in offices). Metric 4: Temporal Representativeness Medium × 2 4 2003 Metric 5: Sample Size Low × 1 3 Unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Information is all clearly cited Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty results. Uncertainty is well characterized.	Domain 2: Represent	tative						
Metric 3: Applicability High × 2 2 Occupational scenario (use of insulation in offices). Metric 4: Temporal Representativeness Medium × 2 4 2003 Metric 5: Sample Size Low × 1 3 Unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Information is all clearly cited Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty results. Uncertainty is well characterized.	M	letric 2:	Geographic Scope	Medium	$\times 1$	2	Europe	
Metric 4: Temporal Representativeness Medium × 2 4 2003 Metric 5: Sample Size Low × 1 3 Unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Information is all clearly cited Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty results. Uncertainty is well characterized.	Ν	letric 3:	Applicability	High	$\times 2$	2	Occupational scenario (use of insulation in offices).	
Metric 5: Sample Size Low × 1 3 Unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Information is all clearly cited Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty results. Uncertainty is well characterized.	Μ	letric 4:	Temporal Representativeness	Medium	$\times 2$	4	2003	
Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Information is all clearly cited Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty results. Uncertainty is well characterized.	M	letric 5:	Sample Size	Low	$\times 1$	3	Unknown	
Metric 6: Metadata Completeness High × 1 1 Information is all clearly cited Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty results. Uncertainty is well characterized.	Domain 3: Accessibi	lity/Clari	ty					
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High $\times 1$ 1 The assessment addresses variability and uncertainty results. Uncertainty is well characterized.	N	letric 6:	Metadata Completeness	High	$\times 1$	1	Information is all clearly cited	
Metric 7: Metadata Completeness High $\times 1$ 1 The assessment addresses variability and uncertainty results. Uncertainty is well characterized.	Domain 4: Variabilit	v and Ur	certainty					
	M	letric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality Determination [†] High 1.6	Overall Quality Dete	Overall Quality Determination ^{\dagger}		High		1.6		
Continued on next page								

			1 1 8					
Source Citation: Type of Data Source Hero ID	Echa, 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified. Releases to the Environment; Completed Exposure or Risk Assessments; 3970748							
EVALUATION		D						
Domain	Metric	Rating	MWF* Score	Comments				

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* MWF = Metric Weighting Factor

Source Citation: E Type of Data Source R	7. Chemical safety report: Hexa the Environment; Completed I	abromocyclo Exposure or	ododecan Risk As	e and a sessmer	ll major diastereoisomers identified. hts;			
Hero ID 39	3970748							
EXTRACTION Parameter								
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Environmental Media: Release or Emission Factor: Release Estimation Method: Release Days per Year:			Disposal Insulation products in buildings demolition - breaking boards 50 percent is assumed to go to waste water and 50 percent to air. 90 g EPS-particles/tonne EPS taken from EU RAR 365					
EVALUATION								
Domain		Metric	Rating MWF* Score Comments					
Domain 1: Reliabilit N	y Ietric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Represen	tative							
N	fetric 2:	Geographic Scope	Medium	× 1	2	Europe		
N	Ietric 3:	Applicability	High	$\times 2$	2	Use is in scope		
N	letric 4:	Temporal Representativeness	High	$\times 2$	2	2008		
N	letric 5:	Sample Size	Low	$\times 1$	3	Distribution characterized by no statistics.		
Domain 3: Accessibility/Clarity		TT: 1	-	-				
N	letric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability and Uncertainty								
N	fetric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality Determination [†]			High		1.3			

EXTRACTION		Data				
Parameter		Data				
Life Cycle Stage:		Disposal				
Life Cycle Description (Subcate	gory of Use):	Insulation	n product	s in bui	ildings	
Release Source:		demolition	n - dispos	sal of b	oards	
Disposal /Treatment Method:		30 percent of boards recycled, requiring manual deconstruction of the structures. The remaining 70 percent of material was disposed of, and there building group accurate does not be supported by the structure of the structure o				
Environmental Media:		incinerati	on	le assui	not not to be manuary deconstructed.	
Release or Emission Factor:		5E-06 rele	ease facto	or from	incineration to WW or air	
Release Estimation Method:		taken from	n EU RA	R		
Release Days per Year:	330					
EVALUATION						
Domain	Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1. Poliability						
Metric 1: N	Methodology	High	$\times 1$	1	Information is from trusted sources	
Domain 2: Representative						
Metric 2: 0	Geographic Scope	Medium	$\times 1$	2	Europe	
Metric 3: A	Applicability	High	$\times 2$	2	Use is in scope	
Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008	
Metric 5: S	Sample Size	Low	$\times 1$	3	Distribution characterized by no statistics.	
Domain 3: Accessibility/Clarity						
Metric 6: M	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as sessment methods, results, and assumptions.	
Domain 4: Variability and Unce	ertainty					
$\begin{array}{cccc} \text{Metric 7: Metadata Completeness} & \text{High} & \times 1 & 1 & \text{The assessment addresses variability and uncertainty i} \\ \text{results. Uncertainty is well characterized.} \end{array}$						

		omaoa nom p	ronodo	page					
Source Citation: Type of Data Source Hero ID	Echa, 2017. Chemical safety report: I Releases to the Environment; Complet 3970748	Echa, 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified. Releases to the Environment; Completed Exposure or Risk Assessments; 3970748							
EVALUATION									
Domain	Metric	Rating	MWF^{\star}	Score	Comments				
Overall Quality I	$\operatorname{Determination}^\dagger$	High		1.3					

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* MWF = Metric Weighting Factor

Source Citation:Echa,. 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified, Part 2.Type of Data SourceReleases to the Environment; Completed Exposure or Risk Assessments; 3970753Hero ID3970753							
EXTRACTION Parameter	Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Environmental Media: Release or Emission Factor: Release Estimation Method: Release Days per Year:			Processing formulation of EPS beads Waste-water from the reaction process wastewater 2 g per tonne of HBCDD used informtation from industry ?330 days				
EVALUATION	Bating	MME*	Scoro	Comments			
	WICHIC	Itating	TAT AA T,	Store	Comments		
Domain 1: Reliability Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Representative							
Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
Metric 3:	Applicability	Medium	$\times 2$	4	EPS compounding not in scope but may provide insight into XPS compounding		
Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012		
Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness		High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality Determinatio	High		1.6				

Source Citation: Type of Data Source Hero ID	Echa, 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified, Part 2. Releases to the Environment; Completed Exposure or Risk Assessments; 3970753							
EXTRACTION Parameter	EXTRACTION Parameter							
Life Cycle Stage: Life Cycle Descrip	tion (Subca	utegory of Use):	Processin formulation	g on of EP:	S beads			
Release Source:	X		waste pac off-spec p	kaging co roduct	ontamin	ated with the substance, filters, filter dust and		
Disposal /Treatme	ent Method:	:	release of incinerato	less tha	n 0.001	percent of the flame retardant put into the		
Environmental Me Release or Emissio	dia: n Factor:		incinerati	on cont of th	₀ HBCI	DD used to incincration		
Release Estimation	n Method:		informtat	ion from	industr	y		
Release Days per Year:			?330 days	5				
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliabi	lity Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Bepres	entative							
Bollian 2. Repres	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
	Metric 3:	Applicability	Medium	$\times 2$	4	EPS compounding not in scope but may provide insight into XPS compounding		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Accessi	bility/Clari	ity						
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variabi	lity and Ur	ncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
		Con	tinued on r	next page	:			

- continued from previous page									
Source Citation: Type of Data Source Hero ID	Echa,. 2017. Chemical saf Releases to the Environme 3970753	Echa, 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified, Part 2. Releases to the Environment; Completed Exposure or Risk Assessments; 3970753							
EVALUATION									
Domain	Me	tric Ratin	g MWF*	Score	Comments				
Overall Quality Determination [†] High 1.6									

Source Citation: Type of Data Source Hero ID	Source Citation:Echa, 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified, Part 2.Type of Data SourceReleases to the Environment; Completed Exposure or Risk Assessments;Hero ID3970753							
EXTRACTION Parameter	EXTRACTION Parameter							
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Environmental Media: Release or Emission Factor: Release Estimation Method: Release Days per Year:		Processing formulation of EPS beads landfill 1 g per tonne of HBCDD used informtation from industry ?330 days						
EVALUATION								
Domain		Metric	Rating	M W F**	Score	Comments		
Domain 1: Reliabi	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Bonros	ontativo							
Domain 2. Repres	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
	Metric 3:	Applicability	Medium	$\times 2$	4	EPS compounding not in scope but may provide insight into XPS compounding		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variab	Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality Determination [†]			High		1.6			

Source Citation: Type of Data Source Hero ID	Echa, 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified. Releases to the Environment; Completed Exposure or Risk Assessments; 3970750							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Estimation Method: Annual Release Quantity (kg/yr): Number of Sites:			manufacturing manufacturing Estimated - see table 3 2 kg/yr (air); <1 kg/y (WW) 1					
EVALUATION								
Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Repres	sentative				_			
	Metric 2: Metric 3:	Geographic Scope Applicability	Medium Medium	$\begin{array}{c} \times 1 \\ \times 2 \end{array}$	$\frac{2}{4}$	Europe Manufacturing not in scope but maybe can be applied to im- portation		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variab	oility and Un Metric 7:	ncertainty Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality D	eterminatio	n^\dagger	High		1.6			

Source Citation:Echa, 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified.Type of Data SourceReleases to the Environment; Completed Exposure or Risk Assessments; 3970750							
Data	Data						
Processin Cutting o cutting o assumptio cut; board along the	Processing Cutting of EPS boards cutting of foam; emission factors implicitly account for the following assumptions: 10 percent of boards at a construction site are sawed or cut; boards are 6 cm x 60 cm x 125 or 104 cm; and the boards are cut along the short side.						
air 100 g/ton taken fron	nes HBC m EU RA	CDD fro AR	m cutting of boards				
EVALUATION							
Rating	MWF*	Score	Comments				
High	$\times 1$	1	Information is from trusted sources				
Medium	$\times 1$	2	Europe				
High	$\times 2$	2	Use is in scope				
ness High	$\times 2$	2	2008				
Low	$\times 1$	3	characterized by no statistics.				
High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.				
Domain 4: Variability and Uncertainty							
Medium	× 1	2	limited discussion				
High		1.4					
Continued on next page							
	intervention Data Data Processin Cutting of cutting of cutting of cutting of cutting of cutting of assumption cut; board along the air 100 g/ton taken from t	for hexabromocyclododeca eted Exposure or Risk As Data Processing Cutting of EPS bo cutting of foam; of assumptions: 10 p cut; boards are 6 along the short sid air 100 g/tonnes HBC taken from EU R/ Rating MWF* High $\times 1$ Medium $\times 1$ High $\times 2$ Low $\times 1$ High $\times 2$ Low $\times 1$ High $\times 1$ Medium $\times 1$ High $\times 1$	Data Data Processing Cutting of EPS boards cutting of foam; emission assumptions: 10 percent cut; boards are 6 cm x 60 along the short side. air 100 g/tonnes HBCDD fro taken from EU RAR Rating MWF* Score High × 1 1 Medium × 1 2 High × 2 2 Low × 1 3 High × 1 1 Medium × 1 2 High × 2 2 Low × 1 3 High × 1 2 High × 1 1 Medium × 1 2 High × 1 1 Medium × 1 2 High 1.4 2				

		1	10	
Source Citation: Type of Data Source Hero ID	Echa,. 2009. Background document for hexa Releases to the Environment; Completed Exp 3970750	abromocyclododeca posure or Risk As	ane and all major diastereoiso sessments;	mers identified.
EVALUATION				
Domain	Metric	Rating MWF*	Score	Comments

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* MWF = Metric Weighting Factor

Source Citation:Echa,. 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified.Type of Data SourceReleases to the Environment; Completed Exposure or Risk Assessments;Hero ID3970750							
EXTRACTION Parameter		Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source:			Use cutting of XPS boards at construction sites cutting of foam; emission factors implicitly account for the following assumptions: 10 percent of boards at a construction site are sawed or cut; boards are 6 cm x 60 cm x 125 or 104 cm; and the boards are cut along the short side.				
Environmental Media:airRelease or Emission Factor:5 g XPS particlesper tonne XPSRelease Estimation Method:taken from EU RAR				e XPS			
EVALUATION							
Domain	Metric	Rating	MWF^*	Score	Comments		
Domain 1: Reliability Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Representative				_			
Metric 2: Matria 2:	Geographic Scope	Medium	$\times 1$	2			
Metric 3: Metric 4:	Applicability Temporal Representativeness	пі <u>g</u> іі High	$\times 2$ $\times 2$	2	Use is in scope		
Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Accessibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability and U	ncertainty						
Metric 7:	Metadata Completeness	Medium	$\times 1$	2	limited discussion		
Overall Quality Determination	\mathbf{n}^{\dagger}	High		1.4			
Continued on next page							

		1	10	
Source Citation: Type of Data Source Hero ID	Echa,. 2009. Background document for hexa Releases to the Environment; Completed Exp 3970750	abromocyclododeca posure or Risk As	ane and all major diastereoiso sessments;	mers identified.
EVALUATION				
Domain	Metric	Rating MWF*	Score	Comments

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* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Echa,. 200 Releases to 3970750	99. Background document for here by the Environment; Completed H	xabromocy Exposure or	clododeca Risk As	ane and sessmen	all major diastereoisomers identified. nts;	
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Environmental Media: Release Estimation Method: Annual Release Quantity (kg/yr):			Commercial Use Insulation products in buildings service life of EPS and XPS boards at construction sites air measured 70 kg/year				
EVALUATION Domain		Metric	Rating	MWF^*	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
Domain 2: Repres	sentative Metric 2:	Geographic Scope	Medium	× 1	2	Europe	
	Metric 3: Metric 4: Metric 5:	Applicability Temporal Representativeness Sample Size	High High Low	$\times 2$ $\times 2$ $\times 1$	$2 \\ 2 \\ 3$	Occupational scenario (use of insulation in offices). 2008 characterized by no statistics	
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as-	
Domain 4: Variab	ility and Uı Metric 7:	ncertainty Metadata Completeness	Medium	× 1	2	limited discussion	
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.4		

Source Citation:IType of Data SourceIHero IDI	Echa,. 200 Releases to 3970750	9. Background document for he o the Environment; Completed F	xabromocy Exposure or	clododeca Risk As	ane and sessmer	all major diastereoisomers identified. ats;
EXTRACTION						
Parameter			Data			
Life Cycle Stage:			Processin	g		
Life Cycle Descript	ion (Subca	ategory of Use):	XPS Con	pounding	g /Mast	terbatch
Environmental Med	lia:	/	air, waste	water, su	irface w	rater
Release Estimation	Method:		Estimated	i - see ta	ble 3	
Annual Release Qu	antity (kg	/yr):	14 kg/y (air), 84 k	g/y (W	W), 10 kg/y (surface water)
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliabili	itv					
]	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources
Domain 2: Represe	ntative					
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe
]	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope
]	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008
]	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.
	···· / (0)	•,				
Domain 3: Accessit	oility/Clar	ity	TT' 1	1	1	
	Metric 6:	Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4. Variabil	ity and Ur	ncertainty				
]	Metric 7:	Metadata Completeness	Medium	$\times 1$	2	limited discussion
		I ····				
Overall Quality Det	terminatio	\mathbf{n}^{\dagger}	High		1.4	
- 0			2			

Source Citation: Type of Data Source	ource Citation:Echa,. 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified.Cype of Data SourceReleases to the Environment; Completed Exposure or Risk Assessments;					
Hero ID	3970750					
EXTRACTION Parameter			Data			
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Environmental Media: Release Estimation Method: Annual Release Quantity (kg/yr):			Processing EPS and HIPSformulation air, wastewater, surface water Estimated - see table 3 30 kg/y (air), 75 kg/y (WW), 330 kg/y (surface water)			
EVALUATION						
Domain		Metric	Rating	MWF^*	Score	Comments
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources
Domain 2: Repres	sentative					
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe
	Metric 3:	Applicability	Medium	$\times 2$	4	EPS and HIPS compounding not in scope but may provide insight into XPS compounding
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4: Variab	ility and Ur Metric 7:	ncertainty Metadata Completeness	Medium	× 1	2	limited discussion
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Medium		1.7	

Source Citation: Type of Data Source Hero ID	Echa,. 200 Releases to 3970750	9. Background document for he o the Environment; Completed F	xabromocy Exposure or	clododeca Risk As	ane and sessmer	all major diastereoisomers identified. hts;
EXTRACTION			Data			
Parameter			Data			
Life Cycle Stage:			Processin	g		
Life Cycle Descrip	tion (Subca	ategory of Use):	EPS conv	erting fro	om bead	ds to foam
Environmental Me	edia:		air, waste	water, su	urface w	rater
Release Estimatio	n Method:		Estimated	l - see ta	ble 3	
Annual Release Q	uantity (kg	/yr):	$159~{\rm kg/y}$	(air), 128	8 kg/y ((WW), 31 kg/y (surface water)
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliab	ility					
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources
Domain 2: Repres	entative					
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.
Domain 3. Access	ibility/Clar	ity				
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4: Variab	ility and Ur	ncertainty				
	Metric 7:	Metadata Completeness	Medium	$\times 1$	2	limited discussion
Overall Quality D	eterminatio	n^\dagger	High		1.4	

Source Citation:Echa., 200Type of Data SourceReleases tHero ID3970750	99. Background document for he o the Environment; Completed I	xabromocy Exposure or	clododeca Risk As	ane and sessmer	all major diastereoisomers identified. ats;
EXTRACTION		Data			
Parameter		Data			
Life Cycle Stage:		Processin	g		
Life Cycle Description (Subc	ategory of Use):	XPS conv	verting fro	om bea	ds to foam
Environmental Media:		air, waste	water, su	urface w	rater
Release Estimation Method:		Estimated	l - see ta	ble 3	
Annual Release Quantity (kg	/yr):	146 kg/y	(air), 63	kg/y (V	WW), 16 kg/y (surface water)
EVALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources
Domain 2: Representative					
Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe
Metric 3:	Applicability	High	$\times 2$	2	Use is in scope
Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008
Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.
Domain 3: Accessibility/Clar	ity				
Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4: Variability and U	ncertainty				
Metric 7:	Metadata Completeness	Medium	$\times 1$	2	limited discussion
Overall Quality Determination	n^\dagger	High		1.4	

Source Citation: Type of Data Source Hero ID	Echa,. 201 Releases to 3970755	5. RAC and SEAC Opinion on the Environment; Reports for a	an applicat Data or Infe	ion for a ormation	uthorisa Other	ation for hexabromocyclododecane. than Exposure or Release Data;
EXTRACTION Parameter			Data			
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Environmental Media: Release or Emission Factor: Release Estimation Method: Annual Release Quantity (kg/yr):			Disposal Insulation products in buildings demolition - disposal of EPS boards incineration 90 g HBCD/tonne EPS boards proposed by industry 3.20 tonnes/yr (if 32,000 tonnes HBCDD are used)			
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments
Domain 1: Reliab	ility Metric 1:	Methodology	Medium	$\times 1$	2	Not from trusted sources; however, Associated information does not indicate flaws or quality issues
Domain 2: Repres	Sentative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High Low	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 3	Europe Use is in scope 2014 characterized by no statistics.
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	$\times 1$	3	report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variab	ility and Un Metric 7:	ncertainty Metadata Completeness	High	× 1	1	Fully addresses variability and uncertainty
Overall Quality D	eterminatio	n^\dagger	Medium		1.7	

Source Citation: Type of Data Source Hero ID	Echa, 201 Releases to 3970755	5. RAC and SEAC Opinion on the Environment; Reports for a	an applicat Data or Inf	ion for au ormation	uthorisa Other	ation for hexabromocyclododecane. than Exposure or Release Data;	
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Environmental Media: Release or Emission Factor: Release Estimation Method: Annual Release Quantity (kg/yr):			Use construction /installation of EPS boards at construction sites unknown 10 g HBCD/tonne EPS boards proposed by industry 1.97 tonnes/yr (if 32,000 tonnes HBCDD are used)				
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	Medium	$\times 1$	2	Not from trusted sources; however, Associated information does not indicate flaws or quality issues	
Domain 2: Repres	sentative						
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe	
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope	
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2014	
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.	
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	Low	$\times 1$	3	report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.	
Domain 4: Variab	ility and Ur Metric 7:	ncertainty Metadata Completeness	High	× 1	1	Fully addresses variability and uncertainty	
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Medium		1.7		

Source Citation: Type of Data Source Hero ID	European Releases to 3981170	Flame Retardants, Association. b the Environment; Reports for	2016. Firea Data or Inf	away! the ormation	e EFRA Other	newsletter. than Exposure or Release Data;
EXTRACTION Parameter			Data			
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Environmental Media: Belease or Emission Factor:		Disposal /Recycle HIPS Household waste In Belgium, 71 percent of household waste is reused, recycled or com- posted; 27 percent is incinerated; <1 percent is landfilled 4 percent of all plastics (not just household) are recycled				
			1 percent	or an pic		
EVALUATION Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliab	ility Metric 1:	Methodology	Low	× 1	3	The data, data sources, and/or techniques used in the assess- ment or report are not specified.
Domain 2: Repres	sentative					
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Belgium
	Metric 3:	Applicability	High	$\times 2$	2	Disposal of HIPs materials, including packging, is in scope
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2016
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.
Domain 3: Access	ibility/Clar	ity				
	Metric 6:	Metadata Completeness	Low	$\times 1$	3	report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variab	ility and Ur	ncertainty				
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	does not address variability or uncertainty
Overall Quality D	eterminatio	n [†]	Medium		2.0	

Source Citation:Duan, H.,Yu, D.,Zuo, J.,Yang, B.,Zha and demolition waste components: HiType of Data Source Hero IDReleases to the Environment; Reports 3575294	Duan, H.,Yu, D.,Zuo, J.,Yang, B.,Zhang, Y.,Niu, Y 2016. Characterization of brominated flame retardants in construction and demolition waste components: HBCD and PBDEs. Science of the Total Environment. Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3575294							
EXTRACTION Parameter	Data							
Life Cycle Stage:DisposalLife Cycle Description (Subcategory of Use):Insulation products in buildingsRelease Source:sorting and crushingEnvironmental Media:airRelease or Emission Factor:Original HBCD constituent in C&D waste is released into the atmosphere during these sorting and crushing operations, and is assumed to contribute 10 percent of the atmospheric emissions in the demolition process.								
EVALUATION Domain Metric	Metric Rating MWF [*] Score Comments							
Domain 1: Reliability Metric 1: Methodology	High	× 1	1	Journal article				
Domain 2: Representative Metric 2: Geographic Scope Metric 3: Applicability Metric 4: Temporal Representative Metric 5: Sample Size	Low High ness High High	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	3 2 2 1	China disposal in scope 2016 Statistical distribution of samples is fully characterized. Sam- ple size is sufficiently representative				
Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, a sessment methods, results, and assumptions.								
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness	High	$\times 1$	1	Fully addresses variability and uncertainty				
Overall Quality Determination †	High Continued on	next pa	1.2					

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Source Citation:	Duan, H., Yu, D., Zuo, J., Yang, B., Zhang, Y and demolition waste components: HBCD	.,Niu, Y and PBE	2016. DEs. Scie:	Characte ace of th	erization of brominated flame retardants in construction e Total Environment.	
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;					
Hero ID	3575294					
EVALUATION						
Domain	Metric	Rating	MWF^{\star}	Score	Comments	

Source Citation:	Duan, H.,Yu, D.,Zuo, J.,Yang, B.,Zhang, Y.,Niu, Y 2016. Characterization of brominated flame retardants in construction and demolition waste components: HBCD and PBDEs. Science of the Total Environment.								
Type of Data Source Hero ID	Releases to 3575294	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3575294							
EXTRACTION Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Environmental Media: Release or Emission Factor:				Disposal Insulation products in buildings landfilling of foam insulation landfill 7039.00 ?g/kg of HBCD found in foam in landfills					
EVALUATION Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Journal article			
Domain 2: Repres	sentative								
	Metric 2:	Geographic Scope	Low	$\times 1$	3	China			
	Metric 3:	Applicability	High	$\times 2$	2	disposal in scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2016			
	Metric 5:	Sample Size	High	$\times 1$	1	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative			
Domain 3: Access	sibility/Clar	ity							
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Variability and Uncertainty									
	Metric 7:	Metadata Completeness	High	$\times 1$	1	Fully addresses variability and uncertainty			
Overall Quality Determination [†]			High		1.2				

Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.								
Type of Data Source Hero ID	Releases to 3809277	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277							
EXTRACTION									
Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source:		Processing EPS comp This is th on the 90 from the o	Processing EPS compounding This is the emission factor for a generic site and was determined based on the 90th percentile of measurements of concentration in the effluent from the on-site sewer treatment plants of 9 of the total of 13 sites.						
Environmental Me	edia:		water						
Release or Emissio	on Factor:		7.60E-06						
Release Estimation	n Method:		taken from	n 2008 E	U asses	sment (HERO 3970747)			
Release Days per	Year:		300						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Previous risk assessments			
Domain 2: Repres	Motria 2:	Coographic Scope	Modium	~ 1	9	Europe			
	Metric 2:	Applicability	Medium	$\times 1$ $\times 2$	2 4	EPS and HIPS compounding not in scope but may provide			
		Tippicasing	mount	·· -	-	insight into XPS compounding			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008			
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.			
Domain 2. Accord	ibility /Clar	i+							
Domain 5: Access	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Variab	Metric 7:	ncertainty Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
		Con	tinued on r	next page)				

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Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.							
Type of Data Source Hero ID	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277							
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score	Comments			
Overall Quality D	$\operatorname{Petermination}^\dagger$	High		1.6				

Source Citation:	U.S, E. P. A 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.								
Type of Data Source Hero ID	Releases to 3809277	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277							
EXTRACTION									
Parameter			Data						
Life Cycle Stare:			Processin	a					
Life Cycle Descrir	tion (Subca	ategory of Use):	EPS com	s pounding	r				
Release Source:	vion (Subor	legory of obe).	This is th	e emissio	n factor	for a generic site and is equal to the maximum			
			emission	factor ca	lculated	from site-specific data that pertain to three			
			processing	g steps ir	ncluding	g formulation of EPS and XPS compounds.			
Environmental Me	edia:		air						
Release or Emission	on Factor:		7.60E-06	2000 F					
Release Estimatio	n Method: Versus		taken from	m 2008 E	EU asses	ssment (HERO 3970747)			
Number of Sites:	rear:		300 13						
Number of Sites.			10						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility								
	Metric 1:	Methodology	High	$\times 1$	1	Previous risk assessments			
Domain 2: Repres	Matria 2	Caamankia Saana	Madium	v 1	0	D			
	Metric 2: Motrie 3:	Applicability	Medium	$\times 1$	2 4	Europe			
	metric 5.	Applicability	meurum	~ 2	4	insight into XPS compounding			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008			
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.			
Domain 2. Access	ibility/Class								
Domain 5: Access	Metric 6:	Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as-			
			0			sessment methods, results, and assumptions.			
Domain 4. Variah	ility and U	acertainty							
		Cor	tinued on i	next page	e				

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Source Citation:	U.S, E. P. flame retar	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.							
Type of Data Source Hero ID	Releases to 3809277	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277							
EVALUATION									
Domain		Metric	Rating	$\rm MWF^{\star}$	Score	Comments			
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
Overall Quality I	High		1.6						

Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.							
Type of Data Source Hero ID	Releases to 3809277	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277						
EXTRACTION								
Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source:		Processing EPS compounding These values are reasonable worst case values that are the sums of emis- sion factors for handling and compounding solid flame retardants with particle sizes <40 ?m that are also of relatively high volatility as reported in OECD (2004b).						
Environmental Me	edia:		water	()				
Release or Emissio	on Factor:		6.80E-03					
Release Estimation	n Method:		taken from	m 2012 A	Australia	an assessment (HERO 3978355)		
Release Days per	Year:		150					
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility							
	Metric 1:	Methodology	High	$\times 1$	1	Previous risk assessments		
Domain 2: Benres	entative							
Domain 2. Repres	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Australia		
	Metric 3:	Applicability	Medium	$\times 2$	4	EPS and HIPS compounding not in scope but may provide insight into XPS compounding		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
	'I 'I'' /CI	•,						
Domain 3: Access	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variab	ility and U	ncertainty						
		Con	tinued on r	next pag	Э			

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Source Citation:	U.S, E. P. flame retar	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.							
Type of Data Source Hero ID	Releases to 3809277	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277							
EVALUATION									
Domain		Metric	Rating	$\rm MWF^{\star}$	Score	Comments			
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
Overall Quality I	High		1.6						

Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.							
Type of Data Source Hero ID	Releases to 3809277	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277						
EXTRACTION								
Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source:		Processing EPS compounding These values are reasonable worst case values that are the sums of emis- sion factors for handling and compounding solid flame retardants with particle sizes <40 ?m that are also of relatively high volatility as reported in OECD (2004b)						
Environmental Me	edia:		air	(20010)	•			
Release or Emissio	on Factor:		2.50E-04					
Release Estimation	n Method:		taken from	m 2012 A	Australia	an assessment (HERO 3978355)		
Release Days per	Year:		150					
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility							
	Metric 1:	Methodology	High	$\times 1$	1	Previous risk assessments		
Domain 2: Benres	entative							
Domain 2. Repres	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Australia		
	Metric 3:	Applicability	Medium	$\times 2$	4	EPS and HIPS compounding not in scope but may provide insight into XPS compounding		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domoin 2. Accord	:la:ll:ter /Clam	:						
Domain 5: Access	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variab	ility and U	ncertainty						
		Con	tinued on r	next page	e			

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Source Citation:	U.S, E. P. flame retar	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.							
Type of Data Source Hero ID	Releases to 3809277	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277							
EVALUATION									
Domain		Metric	Rating	$\rm MWF^{\star}$	Score	Comments			
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
Overall Quality I	High		1.6						

Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants							
Type of Data Source Hero ID	Releases to 3809277	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277						
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source:		Processing EPS Converting These are the emission factors for the generic site and are reported in OECD (2004b) as the emission factors for organic flame-retardants of relatively low volatility in partially open plastics conversion processes						
Environmental Media:waterRelease or Emission Factor:3.00E-05Release Estimation Method:taken from 2008 EU assessment (HERO 3970747)Release Days per Year:300				ssment (HERO 3970747)				
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Previous risk assessments		
Domain 2: Repres	sentative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High Low	$\begin{array}{c} \times 1 \\ \times 2 \\ \times 2 \\ \times 1 \end{array}$	2 2 2 3	Europe in scope 2008 characterized by no statistics.		
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variab	ility and Un Metric 7:	ncertainty Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Continued on next page								

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Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.							
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;							
Hero ID	3809277							
EVALUATION								
Domain	Metric	Rating MV	VF^* Score	Comments				
Overall Quality D	$\operatorname{Petermination}^\dagger$	High	1.3					
Source Citation:	U.S, E. P. flame retai	A 2015. TSCA Work Plan che rdants	mical probl	lem form	ulation	and initial assessment. Cyclic aliphatic bromide cluster		
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Type of Data Source Hero ID	Releases to 3809277	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277						
EXTRACTION			Data					
- I arameter			Data					
Life Cycle Stage:			Processin	g				
Life Cycle Descrip	otion (Subca	ategory of Use):	EPS Con	verting				
Release Source:	× ×		These are	e the emi	ssion fa	actors for the generic site and are reported in		
			OECD (2	2004b) as	the en	nission factors for organic flame-retardants of		
			relatively	low vola	tility in	partially open plastics conversion processes.		
Environmental M	edia:		air					
Release or Emissie	on Factor:		3.00E-05	2000 5				
Release Estimatio	n Method:		taken froi	m 2008 E	U asses	ssment (HERO 3970747)		
Release Days per	Year:		300					
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility							
	Metric 1:	Methodology	High	$\times 1$	1	Previous risk assessments		
Domain 2: Repres	sentative							
·	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
	Metric 3:	Applicability	High	$\times 2$	2	in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Access	sibility/Clar	itv						
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 1. Variah	ility and U	acertainty						
	Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Continued on next page								

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Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.							
Type of Data Source	Releases to the Environment; Report	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;						
Hero ID	3809277							
EVALUATION								
Domain	Metric	Rating MV	VF^* Score	Comments				
Overall Quality D	$\operatorname{Petermination}^\dagger$	High	1.3					

Type of Data Sourc or Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; EXTRACTION Parameter Data EXTRACTION Parameter Data Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Processing EPS Converting Release Source: Processing Processing EPS Converting Release of relatively high volatility in closed plastics conversion pro- cesses that are reported in OECD (2004b). The emission factors for or- ganic flame of relatively high volatility in closed plastics conversion pro- cesses that are reported in OECD (2004b). The emission factors that were averaged include values for high process temperature and low plas- tics production volume. Water Environmental Media: Release Days per Year: water Environmental Media: Release Days per Year: NWF* Score Comments EVALUATION Domain 1: Reliability Metric 1: Methodology High × 1 1 Previous risk assessments Domain 2: Representative Metric 3: Applicability Metric 4: Temporal Representativeness Metric 5: Sample Size Medium × 1 2 Australia Australia Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, as- assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty High × 1 1 Assessment or report	Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.						
Data Parameter Data Life Cycle Stage: Freesesing Life Cycle Description (Subcatery of Use): Processing Release Source: EPS Converting Release Source: These emission factors are weighted averages of emission factors for organic flame of relatively high volatility in closed plastics conversion processes that are reported in OECD (2004b). The emission factors that were averaged include values for high process temperature and low plastics production volume. Environmental Media: water Release Temission Factor: 1.60E-03 Release Estimation Method: taken from 012 Australia Release Estimation Method: Rating MWF* Score Domain 1: Reliability Metric 1: Methodogy High × 1 1 Previous risk assessments Domain 2: Representative Metric 3: Geographic Scope Medium × 1 2 Australia Metric 4: Temporal Representativeeness High × 1 2 Australia Metric 5: Sample Size Low × 1 3 inscope Metric 5: Sample Size Low × 1 3 inscope	Type of Data Source Hero ID	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277						
Parameter Data Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Processing EPS Converting These emission factors are weighted averages of emission factors for or- ganic flame of relatively high volatility in closed plastics conversion pro- cesses that are reported in OECD (2004b). The emission factors that were averaged include values for high process temperature and low plas- tics production volume. Environmental Media: Release or Emission Factor: Release of Emission Method: Release Estimation Method: Release Days per Year: Nate EVALUATION Domain 1: Reliability Metric 1: Methodology High × 1 1 Previous risk assessments Comments Domain 2: Representative Metric 2: Geographic Scope Metric 3: Applicability Metric 4: Temporal Representativeness Metric 5: Sample Size Medium × 1 2 Australia Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, as sessment methods, results, and assumptions. Domain 4: Variability and Uncertainty High × 1 1 Assessment or report clearly documents its data sources, as sessment methods, results, and assumptions.	EXTRACTION							
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: EPS Converting These emission factors are weighted averages of emission factors for or- ganic flame of relatively high volatility in closed plastics conversion pro- cesses that are reported in OECD (2004b). The emission factors that were averaged include values for high process temperature and low plas- tics production volume- Environmental Media: Environmental Media: Release or Emission Factor: Release or Emission Factor: Release Days per Year: 200 EVALUATION Domain 1: Reliability Metric 1: Methodology Metric 2: Geographic Scope Medium × 1 2 Metric 3: Applicability Metric 4: Temporal Representativeness High × 2 2 Metric 5: Sample Size Low × 1 3 characterized by no statistics. Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Domain 4: Variability and Uncertainty Continued on next page	Parameter			Data				
Release or Emission Factor: 1.60E-03 Release Estimation Method: taken from 2012 Australian assessment (HERO 3978355) 200 200 EVALUATION 200 Domain Metric Release Days per Year: Metric Domain Metric Release Days per Year: Metric Domain Metric Release Days per Year: Metric Domain Metric Metric 1: Methodology High × 1 1 Previous risk assessments Previous risk assessments Domain 2: Representative Important Scope Metric 3: Applicability High × 2 2 Metric 5: Sample Size Low × 1 3 Domain 3: Accessibility/Clarity Sample Size Low × 1 1 Domain 4: Variability and Urertainty Ketric 6: Metric 6: <td colspan="2">Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Environmental Media:</td> <td colspan="5">Processing EPS Converting These emission factors are weighted averages of emission factors for or- ganic flame of relatively high volatility in closed plastics conversion pro- cesses that are reported in OECD (2004b). The emission factors that were averaged include values for high process temperature and low plas- tics production volume.</td>	Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Environmental Media:		Processing EPS Converting These emission factors are weighted averages of emission factors for or- ganic flame of relatively high volatility in closed plastics conversion pro- cesses that are reported in OECD (2004b). The emission factors that were averaged include values for high process temperature and low plas- tics production volume.					
Release Estimation Method: Release Days per Year: taken from 2012 Australian assessment (HERO 3978355) EVALUATION Netric Metric Rating MWF* Score Comments Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Previous risk assessments Domain 2: Representative Metric 3: Applicability Applicability High × 1 2 Australia in scope Metric 4: Temporal Representativeness Metric 5: Sample Size Low × 1 3 characterized by no statistics. Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions. Domain 4: Variability and U	Release or Emission	on Factor:		1.60E-03				
Release Days per Year: 200 EVALUATION Metric Rating MWF* Score Comments Domain Metric 1: Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Previous risk assessments Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Australia Metric 3: Applicability High × 2 2 in scope Metric 4: Temporal Representativeness High × 2 2 2012 Metric 5: Sample Size Low × 1 3 characterized by no statistics. Domain 3: Accessibility/Clarrity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Continued on next page Fightick in the store in	Release Estimatio	n Method:		taken from	m 2012 A	ustralia	an assessment (HERO 3978355)	
EVALUATION Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Previous risk assessments Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Australia Metric 3: Applicability High × 2 2 in scope Metric 4: Temporal Representativeness High × 2 2 2012 Metric 5: Sample Size Low × 1 3 characterized by no statistics. Domain 3: Accessibility/Clarity Metric 6: Metadaa Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty France Intervertainty Intervertainty Assessment methods, results, and assumptions.	Release Days per	Year:		200				
EVALUATION Metric Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Previous risk assessments Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Australia Metric 3: Applicability High × 2 2 in scope Metric 4: Temporal Representativeness High × 2 2 2012 Metric 5: Sample Size Low × 1 3 characterized by no statistics. Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Continued on next page E Sament methods, results, and assumptions.								
Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Previous risk assessments Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Australia Metric 3: Applicability High × 2 2 in scope Metric 4: Temporal Representativeness High × 2 2 2012 Metric 5: Sample Size Low × 1 3 characterized by no statistics. Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Continued on next page Continued on next page Continued on next page	EVALUATION		Martania.	Deting	MANUE+	C	Commenter .	
Domain 1: Reliability Metric 1: Methodology High × 1 1 Previous risk assessments Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Australia Metric 3: Applicability High × 2 2 in scope Metric 4: Temporal Representativeness High × 2 2 2012 Metric 5: Sample Size Low × 1 3 characterized by no statistics. Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Continued on next page E E E	Domain		Metric	Rating	IVI VV F ^	Score	Comments	
Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Australia Metric 3: Applicability High × 2 2 in scope Metric 4: Temporal Representativeness High × 2 2 2012 Metric 5: Sample Size Low × 1 3 characterized by no statistics. Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Continued on next page Figh × 1 1 Assessment methods, results, and assumptions.	Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Previous risk assessments	
Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Australia Metric 3: Applicability High × 2 2 in scope Metric 4: Temporal Representativeness High × 2 2 2012 Metric 5: Sample Size Low × 1 3 characterized by no statistics. Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Continued on next page Image: Continued on next page								
Metric 2: Geographic Scope Medulin × 1 2 Australia Metric 3: Applicability High × 2 2 in scope Metric 4: Temporal Representativeness High × 2 2 2012 Metric 5: Sample Size Low × 1 3 characterized by no statistics. Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Continued on next page For the second seco	Domain 2: Repres	Sentative Matria 2.	Coorrentie Coorre	Madium	× 1	0	A ()	
Metric 6: Mppletonity Ingli × 2 2 In scope Metric 4: Temporal Representativeness High × 2 2 2012 Metric 5: Sample Size Low × 1 3 characterized by no statistics. Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Continued on next page Image: Continued on next page		Metric 2: Metric 3:	Applicability	High	$\times 1$ $\times 2$	2	Australia	
Metric 5: Sample Size Low × 1 3 characterized by no statistics. Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Continued on next page		Metric 4:	Temporal Representativeness	High	$\times 2 \times 2$	2	2012	
Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Continued on next page		Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.	
Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Continued on next page		/						
Domain 4: Variability and Uncertainty Continued on next page	Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Continued on next page	Domain 4: Variab	ility and Ur	ncertainty					
			Con	tinued on r	next page	è		

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Source Citation:	U.S, E. P. flame retar	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.								
Type of Data Source Hero ID	Releases to 3809277	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277								
EVALUATION										
Domain		Metric	Rating	$\rm MWF^{\star}$	Score	Comments				
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.				
Overall Quality I	Determination	\mathbf{n}^{\dagger}	High		1.3					

Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.						
Type of Data Source Hero ID	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277						
EXTRACTION							
Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Environmental Media:		Processing EPS Converting These emission factors are weighted averages of emission factors for or- ganic flame of relatively high volatility in closed plastics conversion pro- cesses that are reported in OECD (2004b). The emission factors that were averaged include values for high process temperature and low plas- tics production volume.					
Release or Emissi	on Factor:		1.60E-03				
Release Estimatic	on Method:		taken from	m 2012 A	ustralia	an assessment (HERO 3978355)	
Release Days per	Year:		200				
EVALUATION							
Domain		Metric	Rating	MWF^*	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Previous risk assessments	
Domain 2: Repres	Sentative Motrie 2:	Coorrenhia Saona	Modium	× 1	2	A control 11	
	Metric 2. Metric 3.	Applicability	High	$\times 1$ $\times 2$	2	Australia	
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012	
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.	
Domain 3: Access	Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variab	oility and Ur	ncertainty					
		Con	tinued on r	next page)		

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Source Citation:	U.S, E. P. flame retar	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.								
Type of Data Source Hero ID	Releases to 3809277	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277								
EVALUATION										
Domain		Metric	Rating	$\rm MWF^{\star}$	Score	Comments				
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.				
Overall Quality I	Determination	\mathbf{n}^{\dagger}	High		1.3					

Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster						
Type of Data Source Hero ID	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277						
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Environmental Media:		Processing Compounding of Polystyrene Resin to Produce XPS Masterbatch This is the emission factor for a generic site and is equal to the maximum of emission factors calculated from sitespecific data for three sites. water					
Release or Emission Release Estimation	n Factor: Method:		7.40E-06 taken from	n 2008 E	U asses	ssment (HERO 3970747)	
Release Days per Y	lear:		300				
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliabil	lity Metric 1:	Methodology	High	$\times 1$	1	Previous risk assessments	
Domain 2: Represe	entative						
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe	
	Metric 3:	Applicability	High	$\times 2$	2	in scope	
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008	
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.	
Domain 2. Accordi	hility /Clari						
Domain 5: Accessi	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variabil	lity and Ur	ocertainty					
	Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality De	eterminatio	\mathbf{n}^{\dagger}	High		1.3		
Continued on next page							

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Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.					
Type of Data Source Hero ID	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277					
EVALUATION						
Domain	Metric Rating MWF^{\star} Score Comments					

Source Citation:	U.S, E. P. A 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster								
Type of Data Source Hero ID	Releases to 3809277	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277							
EXTRACTION Parameter			Data						
Life Cycle Stage: Life Cycle Descrip Release Source:	otion (Subca	ategory of Use):	Processin Compoun This is the emission processing	g ding of F e emissio factor ca g steps in	Polystyr n factor lculated icluding	ene Resin to Produce XPS Masterbatch for a generic site and is equal to the maximum I from site-specific data that pertain to three formulation of EPS and XPS compounds.			
Environmental Media: Release or Emission Factor: Release Estimation Method: Release Days per Year:			air 7.30E-06 taken froi 300	m 2008 E	U asses	ssment (HERO 3970747)			
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Previous risk assessments			
Domain 2: Repres	Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High Low	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 3	Europe in scope 2008 characterized by no statistics.			
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Variab	ility and Un Metric 7:	ncertainty Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
Continued on next page									

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Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.							
Type of Data Source	Releases to the Environment; Reports	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;						
Hero ID	3809277							
EVALUATION								
Domain	Metric	Rating M	MWF [*] Score	Comments				
Overall Quality D	$\operatorname{Petermination}^\dagger$	High	1.3					

Source Citation: U.S, E. P. flame reta	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants						
Type of Data SourceReleases tHero ID3809277	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277						
EXTRACTION		Data					
		Data					
Life Cycle Stage: Life Cycle Description (Subc	ategory of Use):	Processin Compour	g Iding of I	Polvstvr	ene Resin to Produce XPS Masterbatch		
Release Source:		This is th	e emissio	on facto	r for a generic site and is the sum of emission		
		factors fo with part	r handli icle sizes	ng and $< 40^{-2}$	compounding organic solid flame retardants m that are of relatively medium volatility as		
		reported	in OECI	(2004k))).		
Environmental Media: Balazza ar Emission Factor:		water 6 60E 03					
Release Estimation Method:		taken from	m 2011 (Canadiaı	n assessment		
Release Days per Year:		60 or 200					
EVALUATION				_	_		
Domain	Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliability							
Metric 1:	Methodology	High	$\times 1$	1	Previous risk assessments		
Domain 2: Representative							
Metric 2:	Geographic Scope	Medium	$\times 1$	2	Canada		
Metric 3:	Applicability	High	$\times 2$	2	in scope		
Metric 4:	Temporal Representativeness	High	$\times 2$	2	2011		
Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Accessibility/Clar	ity						
Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4. Variability and U	ncortainty						
Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
	Continued on next page						

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Source Citation:	U.S, E. P. A 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.							
Type of Data Source Hero ID	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277							
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score	Comments			
Overall Quality D	$\operatorname{Petermination}^{\dagger}$	High		1.3				

Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.								
Type of Data Source Hero ID	Releases to 3809277	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277							
EXTRACTION									
Parameter	r Data								
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Environmental Media: Release or Emission Factor: Release Days per Year:			Processing XPS converting These are the emission factors for the generic site and are equal to the maxima of the emission factors that were derived from site-specific data but were not explicitly reported. EPA calculated these factors, each of which is equal to the ratio of total annual releases from 13 sites for which site-specific data was not reported and the total annual processing rate for these sites. water 2.60E-05						
Release Days per Year:			1						
EVALUATION			D. (*	N (11717)+	a	C			
Domain		Metric	Rating	M W F^	Score	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Previous risk assessments			
Domain 2: Repres	Motria 2	Coorrenhia Saona	Modium	× 1	0	Prove and			
	Metric 2.	Applicability	High	$\times 1$ $\times 2$	2	Europe			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008			
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.			
Domain 3: Access	ibility/Clar Motrie 6:	ity Metadata Completeness	High	× 1	1	Assessment on non-out should desuments its data sources of			
	Methe 0.	Metadata Completeness	Ingn	~ 1	1	Assessment of report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Variab	ility and U	ncertainty							
		Con	tinued on 1	next page	è				

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Source Citation:	U.S, E. P. flame retar	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.							
Type of Data Source Hero ID	Releases to 3809277	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277							
EVALUATION									
Domain		Metric	Rating	$\rm MWF^{\star}$	Score	Comments			
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
Overall Quality I	Determination	\mathbf{n}^{\dagger}	High		1.3				

Type of Data Source Hero ID Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277 EXTRACTION Parameter Data Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Processing XPS converting These are the emission factors for the generic site and are equal to the maxima of the emission factors that were derived from site-specific data but were not explicitly reported. EPA calculated these factors, each of which is equal to the ratio of total annual releases from 13 sites for which site-specific data was not reported and the total annual processing rate for these sites. Environmental Media: Release Days per Year: air 5.80E-05 300 EVALUATION Metric Domain 1: Reliability Metric 1: Methodology Metric 1: Methodology High × 1 1 Previous risk assessments	Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.							
EXTRACTION Data Parameter Data Life Cycle Stage: Processing Life Cycle Description (Subcategory of Use): XPS converting Release Source: These are the emission factors for the generic site and are equal to the maxima of the emission factors that were derived from site-specific data but were not explicitly reported. EPA calculated these factors, each of which is equal to the ratio of total annual releases form 13 sites for which site-specific data was not reported and the total annual processing rate for these sites. Environmental Media: air Release or Emission Factor: 5.80E-05 Release Days per Year: 300 EVALUATION Metric 1: Methodology Metric 1: Methodology High × 1 1 Previous risk assessments	Type of Data Source I Hero ID 3	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277							
Parameter Data Life Cycle Stage: Processing Life Cycle Description (Subcategory of Use): XPS converting Release Source: These are the emission factors for the generic site and are equal to the maxima of the emission factors that were derived from site-specific data but were not explicitly reported. EPA calculated these factors, each of which is equal to the ratio of total annual releases from 13 sites for which site-specific data was not reported and the total annual processing rate for these sites. Environmental Media: air Release or Emission Factor: 5.80E-05 Release Days per Year: 300 EVALUATION Metric Rating MWF* Score Comments Metric 1: Methodology High × 1 1 Previous risk assessments	EXTRACTION								
Life Cycle Stage: Processing Life Cycle Description (Subcategory of Use): XPS converting Release Source: These are the emission factors for the generic site and are equal to the maxima of the emission factors that were derived from site-specific data but were not explicitly reported. EPA calculated these factors, each of which is equal to the ratio of total annual releases from 13 sites for which site-specific data was not reported and the total annual processing rate for these sites. Environmental Media: air Release or Emission Factor: 5.80E-05 Release Days per Year: 300 EVALUATION Metric Domain 1: Reliability Metric 1: Methodology	Parameter			Data					
EVALUATION Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Previous risk assessments	Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Environmental Media: Release or Emission Factor: Release Days per Year:			Processing XPS converting These are the emission factors for the generic site and are equal to the maxima of the emission factors that were derived from site-specific data but were not explicitly reported. EPA calculated these factors, each of which is equal to the ratio of total annual releases from 13 sites for which site-specific data was not reported and the total annual processing rate for these sites. air 5.80E-05 300					
EVALUATION Domain Metric Rating MWF* Score Comments Domain 1: Reliability Image: Comments of the second s									
Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Previous risk assessments	EVALUATION								
Domain 1: Reliability Metric 1: Methodology High $\times 1$ 1 Previous risk assessments	Domain		Metric	Rating	MWF^{\star}	Score	Comments		
	Domain 1: Reliabili	ity Metric 1:	Methodology	High	$\times 1$	1	Previous risk assessments		
Domain 2: Representative Matria 2: Coorraphia Scope Medium X 1 2 Empres	Domain 2: Represen	ntative Motria 2:	Coographie Seene	Modium	× 1	0	P		
Metric 2: Geographic Scope Medium $\times 1$ 2 Europe Metric 3: Applicability High $\times 2$ 2 in scope	ו	Metric 2:	Applicability	High	$\times 1$ $\times 2$	2	Europe		
Metric 4: Temporal Representativeness High $\times 2$ 2 2008	1	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008		
Metric 5: Sample Size $Low \times 1$ 3 characterized by no statistics.	I	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Accessibility/Clarity Metric 6: Metadata CompletenessHigh $\times 1$ 1Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	Domain 3: Accessib I	oility/Clari Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability and Uncertainty	Domain 4: Variabil	ity and Ur	ncertainty						
Continued on next page			Con	tinued on r	next page)			

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Source Citation:	U.S, E. P. flame retar	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.							
Type of Data Source Hero ID	Releases to 3809277	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809277							
EVALUATION									
Domain		Metric	Rating	$\rm MWF^{\star}$	Score	Comments			
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
Overall Quality I	Determination	\mathbf{n}^{\dagger}	High		1.3				

Source Citation:2008. SurType of Data SourceReleases tHero ID3970756	2008. Summary risk assessment report: Hexabromocyclododecane. rce Releases to the Environment; Completed Exposure or Risk Assessments; 3970756							
EXTRACTION Parameter		Data						
Life Cycle Stage: Release Source:			All Total EU 15 emissions of HBCDD. Most emissions (81 percent) are estimated to come from the industrial of use of HBCDD in textile back- coating.					
Environmental Media:		72 percen	t WW, 2	2 perce	nt SW, 6 percent air			
Release or Emission Factor:		0.1 percer	nt of PV	T T				
Release Estimation Method:			n 2008 E	U asses	sment (HERO 3970747)			
Timutai Release Quantity (RS/y1).								
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Beliability								
Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources			
Domain 2: Roprosontativa								
Metric 2:	Geographic Scope	Medium	× 1	2	Ешторе			
Metric 3:	Applicability	Medium	$\times 2$	4	Captures releases from all possible stages, some of which are not in scope			
Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008			
Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.			
Domain 3: Accessibility/Clar	rity							
Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Variability and U	ncertainty							
Metric 7:	Metadata Completeness	Medium	$\times 1$	2	limited discussion			
Overall Quality Determination	on^{\dagger}	Medium		1.7				
Continued on next page								

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Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment report Releases to the Environment; Complet 3970756	t: Hexabromocyclododecane. ted Exposure or Risk Assessments;	
EVALUATION			
Domain	Metric	Rating MWF* Score	Comments

continued from previous page

Source Citation:	Echa, 201	Echa, 2011. Proposal for identification of a substance as a CMR Cat 1 or 2, PBT, vPvB, or a substance of an equivalent lavel of concerns: Proposal for identification of herebromographeded concerns as a SVHC							
Type of Data Source Hero ID	Releases to 3970757	Releases to the Environment; Completed Exposure or Risk Assessments; 3970757							
EXTRACTION									
Parameter		Data							
Life Cycle Stage:	All								
Release Source:			Total EU 15 emissions of HBCDD. Most emissions (81 percent) are estimated to come from the industrial of use of HBCDD in textile back- coating						
Environmental M	edia:		72 percen	t WW, 2	2 perce	ent SW, 6 percent air			
Release or Emissi	on Factor:		0.1 percer	nt of PV					
Release Estimation Method:			taken from	n 2008 E	U asses	ssment (HERO 3970747)			
Annual Release Quantity (kg/yr):			8.7 tonnes	s/yr					
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility								
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources			
Domain 2: Ropros	contativo								
Domain 2. Repres	Metric 2:	Geographic Scope	Medium	× 1	2	Europe			
	Metric 3:	Applicability	Medium	$\times 2$	4	Captures releases from all possible stages, some of which are not in scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008			
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.			
Domain 3. Accord	ubility/Clar	:+							
Domain 5. Access	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4. Variah	ility and U	acortainty							
Domain 4. Vallat	Metric 7:	Metadata Completeness	Medium	$\times 1$	2	limited discussion			
					-				
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Medium		1.7				
	Continued on next page								

	– continue	d from I	previous	page		
Source Citation:	Echa, 2011. Proposal for identification of a level of concern: Proposal for identification of	a substan of hexabre	.ce as a C omocyclo	MR Cat 1 dodecane a	or 2, PBT, vPvB, or a substance of an equivalent s a SVHC.	
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;					
Hero ID	3970757					
EVALUATION						
Domain	Metric	Rating	MWF^{\star}	Score	Comments	

Source Citation: Type of Data Source Hero ID	Echa,. 200 Releases to 3970759	09. Prioritisation and Annex XIV o the Environment; Reports for	V backgrour Data or Inf	nd inform ormation	Other	hexbromocyclododecane. than Exposure or Release Data;
EXTRACTION			Data			
			Data			
Life Cycle Stage:			manufact	uring		
Life Cycle Descrip	otion (Subca	ategory of Use):	manufact	uring		
Environmental M	edia:		air and w	astewate	r	
Release Estimatio	n Method:		same as E	IERO ID	397075	
Annual Release Q	uantity (kg	/yr):	2 kg/yr (a	air); 0.73	kg/y (w w)
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1. Beliah	ility					
	Metric 1:	Methodology	High	$\times 1$	1	Previous risk assessments
Domain 2: Ropros	ontotivo					
Domain 2. Repres	Metric 2.	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	Medium	$\times 2$	4	Manufacturing not in scope but maybe can be applied to im-
			*** 1			portation
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.
Domain 3: Accoss	ibility/Clar	ity				
Domain 5. Access	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Demain 4. V. 11	:1:41 TT					
Domain 4: Variab	Motrie 7:	Motodoto Completeness	Modium	~ 1	9	limited discussion
	metric 7:	Metadata Completeness	meanum	× 1	2	limited discussion
Overall Quality D	eterminatio	n^\dagger	Medium		1.7	

Source Citation: Type of Data Source Hero ID	Echa, 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane. Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3970759							
EXTRACTION			Data					
			Data					
Life Cycle Stage:			Commerc	ial Use				
Life Cycle Descrip	otion (Subca	ategory of Use):	Insulation	n product	s in bu	ildings		
Release Source:			service life	e of EPS	and XI	PS boards at construction sites		
Environmental M	edia:		air					
Release Estimatio	n Method:		same as H	IERO ID	397075	51		
Annual Release Q	uantity (kg	/yr):	70 kg/yea	ır				
EVALUATION					_	_		
Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1, Paliah	:1:+							
Domain 1. Kenab	Motrie 1.	Mathadalagy	High	~ 1	1	Dustique rich accomments		
	Meetiic 1.	Methodology	IIIgii	~ 1	1	r levious fisk assessments		
Domain 2: Repres	sentative							
1	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
	Metric 3:	Applicability	High	$\times 2$	2	Occupational scenario (use of insulation in offices).		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Access	ibility/Clar	ity						
	Metric 6:	Metadata Completeness	Hìgh	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4. Variah	ility and U	acentainte						
Domain 4: Varian	Motrie 7	Metadata Completeness	Modium	× 1	0	limite 1 discussion		
	metric 7:	Metadata Completeness	meanum	X 1	2	limited discussion		
Overall Quality D	eterminatio	n^\dagger	High		1.4			

Source Citation:EchType of Data SourceRelationHero ID397	ia,. 200 eases to 0759	99. Prioritisation and Annex XIV to the Environment; Reports for	V backgrou Data or Inf	nd inform ormation	ation: Other	hexbromocyclododecane. than Exposure or Release Data;
EXTRACTION			Data			
			Data			
Life Cycle Stage:			Processin	g		
Life Cycle Description	(Subca	ategory of Use):	XPS Con	poundin	g /Mas	terbatch
Environmental Media:			air, waste	water, su	urface w	rater
Release Estimation Me	ethod:	/ X	same as I	IERO ID	397075	52
Annual Release Quantity (kg/yr):		14 kg/y (air), 84 k	ag∕y (W	/W), 10 kg/y (surface water)	
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliability						
Met	tric 1:	Methodology	High	$\times 1$	1	Previous risk assessments
Domain 2: Representa	tive					
Met	tric 2:	Geographic Scope	Medium	$\times 1$	2	Europe
Met	tric 3:	Applicability	High	$\times 2$	2	Use is in scope
Met	tric 4:	Temporal Representativeness	High	$\times 2$	2	2008
Met	tric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.
Domain 3: Accessibilit	v/Clar	ity				
Met	tric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4: Variability	and U	acertainty				
Met	tric 7:	Metadata Completeness	Medium	$\times 1$	2	limited discussion
Overall Quality Deterr	ninatio	n^\dagger	High		1.4	

Source Citation: Type of Data Source Hero ID	Echa, 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane. Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3970759							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Environmental Media: Release Estimation Method: Annual Release Quantity (kg/yr):			Processing EPS and HIPSformulation air, wastewater, surface water same as HERO ID 3970753 30 kg/y (air), 75 kg/y (WW), 330 kg/y (surface water)					
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Previous risk assessments		
Domain 2: Repres	sentative Metric 2: Metric 3:	Geographic Scope	Medium	$\times 1$ $\times 2$	2	Europe		
	Metric 4: Metric 5:	Temporal Representativeness Sample Size	High	$^{\land 2}$ $\times 2$ $\times 1$	4 2 3	2008 characterized by no statistics		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as-		
Domain 4: Variab	ility and Ur Metric 7:	ncertainty Metadata Completeness	Medium	× 1	2	limited discussion		
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Medium		1.7			

Source Citation:HType of Data SourceHHero IDS	Echa,. 200 Releases to 3970759	9. Prioritisation and Annex XIV o the Environment; Reports for 1	/ backgrour Data or Infe	nd inform ormation	other	hexbromocyclododecane. than Exposure or Release Data;
EXTRACTION Parameter			Data			
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Environmental Media: Release Estimation Method: Annual Release Quantity (kg/yr):			Processing EPS converting from beads to foam air, wastewater, surface water same as HERO ID 3970754 159 kg/y (air), 128 kg/y (WW), 31 kg/y (surface water)			
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliabili	ty Metric 1:	Methodology	High	× 1	1	Previous risk assessments
Domain 2: Represer	ntative Metric 2: Metric 3:	Geographic Scope Applicability	Medium High	$\begin{array}{c} \times \ 1 \\ \times \ 2 \end{array}$	2 2	Europe Use is in scope
ת ת	Metric 4: Metric 5:	Temporal Representativeness Sample Size	High Low	$\times 2 \times 1$	$\frac{2}{3}$	2008 characterized by no statistics.
Domain 3: Accessib	oility/Clari Metric 6:	ty Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4: Variabili	ity and Un Metric 7:	certainty Metadata Completeness	Medium	× 1	2	limited discussion
Overall Quality Det	ermination	n†	High		1.4	

Source Citation:Echa,. 200Type of Data SourceReleases tHero ID3970759	09. Prioritisation and Annex XIV o the Environment; Reports for	V backgroui Data or Inf	nd inform ormation	nation: Other	hexbromocyclododecane. than Exposure or Release Data;
EXTRACTION Parameter		Data			
		Data			
Life Cycle Stage:		Processin	g		
Life Cycle Description (Subc	ategory of Use):	XPS conv	verting fro	om bea	ds to foam
Environmental Media:		air, waste	water, su	urface w	rater
Release Estimation Method:		same as I	IERO ID	397075	55
Annual Release Quantity (kg	/yr):	146 kg/y	(air), 63	kg/y (V	WW), 16 kg/y (surface water)
EVALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	$\times 1$	1	Previous risk assessments
Domain 2: Representative					
Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe
Metric 3:	Applicability	High	$\times 2$	2	Use is in scope
Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008
Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.
Domain 2. Accessibility/Clar	:4				
Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4: Variability and U	ncertainty				
Metric 7:	Metadata Completeness	Medium	$\times 1$	2	limited discussion
Overall Quality Determination	n^\dagger	High		1.4	

Source Citation: Type of Data Source Hero ID	European Releases to 3981171	Flame Retardants, Association. o the Environment; Reports for	2013. Firea Data or Inf	away! the ormation	e EFRA Other	newsletter, Part 2. than Exposure or Release Data;
EXTRACTION						
Parameter			Data			
Life Cycle Stage:			Disposal			
Life Cycle Descrip	otion (Subca	ategory of Use):	Disposal	of packag	ging	
Release Source:	,		Waste pa	ckaging	, 0	
Environmental M	edia:		97 percen	t was inc	cinerated	d while 3 percent went to controlled landfill
EVALUATION						
EVALUATION		Martania.	Deting	MAND+	C	Commente
Domain		Metric	Rating	MWF^	Score	Comments
Domain 1: Reliab	ility					
	Metric 1:	Methodology	Low	$\times 1$	3	The data, data sources, and/or techniques used in the assessment or report are not specified.
Domain 2: Ropros	contativo					
Domain 2. Repres	Metric 2:	Geographic Scope	Medium	× 1	2	Belgium
	Metric 3:	Applicability	High	$\times 2$	2	Disposal of HIPs materials, including packging, is in scope
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2010-2014
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.
		•.				
Domain 3: Access	sibility/Clar	ity	Ŧ	1	0	
	Metric 6:	Metadata Completeness	Low	× 1	3	provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variah	ility and U	ncortainty				
Domain 4. Variau	Metric 7.	Metadata Completeness	Low	× 1	3	doos not address variability or uncertainty
		metadata Completeness	LOW	~ 1	0	does not address variability of uncertainty
Overall Quality D	eterminatio	n^\dagger	Medium		2.0	
•						

Source Citation:European Flame Retardants, Association. 2013. Fireaway! the EFRA newsletter, Part 2.Type of Data SourceReleases to the Environment; Reports for Data or Information Other than Exposure or Release Data;Hero ID3981171						
EXTRACTION Parameter			Data			
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Disposal /Treatment Method: Annual Release Quantity (kg/yr):			Disposal /Recycle Waste of Electric and Electronic Equipment (WEEE) Disposal /Recycling of WEEE is difficult due to difficulty in identifying the type of polymer when dissassembling electronics. 12wt percent of collected WEEE plastics and and almost no FR plastics are currently recycled in Europe 700,000 tons/yr of annual waste WEEE is expected to contain FRs (in Europe)			
EVALUATION Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliability M	, etric 1:	Methodology	Low	$\times 1$	3	The data, data sources, and/or techniques used in the assess- ment or report are not specified.
Domain 2: Represent M M M M M	ative etric 2: etric 3: etric 4: etric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High Low	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 3	Belgium Eelectronics recycling plants are in scope 2010-2014 characterized by no statistics.
Domain 3: Accessibil M	ity/Clari etric 6:	ity Metadata Completeness	Low	× 1	3	provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness		Low	× 1	3	does not address variability or uncertainty	
Overall Quality Determination ^{\dagger}			Medium		2.0	
Continued on next page						

		-		
Source Citation: Type of Data Source Hero ID	European Flame Retardants, Association Releases to the Environment; Reports f 3981171	on. 2013. Firea or Data or Info	away! the EFRA ne ormation Other tha	wsletter, Part 2. n Exposure or Release Data;
EVALUATION				
Domain	Metric	Rating	MWF^* Score	Comments

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Source Citation:	Gorga, M., Martinez, E., Ginebreda, A., Eljarrat, E., Barceló, D 2013. Determination of PBDEs, HBB, PBEB, DBDPE, HBCD, TBBPA, and related compounds in sewage sludge from Catalonia (Spain). Science of the Total Environment						
Type of Data Source Hero ID	Releases to the Environment; Environmental Release Data; 1676764						
EXTRACTION							
Parameter	Data						
I : fo Cruelo Stame.			A 11				
Life Cycle Stage:	tion (Subc	terory of Use).	All Wastowat	tor troatn	nent slu	dae	
Belease Source:		tegory of ese).	HBCD m	easured i	n anaer	robic digestion and activated sludge	
Disposal /Treatme	ent Method		Sewage sl	udge to s	oil appli	ication, compost, dump, thermal drving, agrar-	
I I I I I I I I I I I I I I I I I I I			ian, or de	hydratio	n.		
Environmental Me	edia:		water, lar	nd, incine	eration		
Release or Emissie	on Factor:		5.17 - 97.	5 ng/g d	ry weigh	ht (dw) (mean - 19.3 ng/g dw)	
Release Estimatio	n Method:		Measured	l			
Annual Release Q	uantity (kg	/yr):	0.757 kg/	yr			
Number of Sites:			17				
EVALUATION			5.1		a	a	
Domain		Metric	Rating	MWF'*	Score	Comments	
Domain 1. Beliab	ility						
Domain 1. Ronab	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
Domain 2: Repres	sentative						
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Spain	
	Metric 3:	Applicability	Medium	$\times 2$	4	Captures releases from all possible stages, some of which are not in scope	
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2013	
	Metric 5:	Sample Size	Medium	$\times 1$	2	Sample size provided with some statitistical information such as recovery percent and relative standard deviation	
Domain 3: Access	ibility/Clar	ity					
Domain 9. Treeess	Metric 6:	Metadata Completeness	High	$\times 1$	1	Information is all clearly cited	
Domain 4: Variab	ility and Ur	ncertainty					
		Con	tinued on a	next nage	2		
		001		Lone page	-		

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Source Citation:	ource Citation: Gorga, M.,Martinez, E.,Ginebreda, A.,Eljarrat, E.,Barceló, D 2013. Determination of PBDEs, HBB, PBEB, DBDPE, HBCD, TBBPA and related compounds in sewage sludge from Catalonia (Spain). Science of the Total Environment.								
Type of Data Source	Releases to	Releases to the Environment; Environmental Release Data;							
Hero ID	1676764	1676764							
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	\mathbf{Score}	Comments			
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	The report does not address variability or uncertainty with respect to this data element.			
Overall Quality Determination [†] Medium 1.7									

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* MWF = Metric Weighting Factor

Source Citation:	Tomko, G.,McDonald, K. M. 2013. Environmental fate of hexabromocyclododecane from a new Canadian electronic recycling facility. Journal of Environmental Management.							
Type of Data Source Hero ID	Releases to the Environment; Published Models for Exposures or Releases; 1927574							
EXTRACTION								
Parameter			Data					
Life Cycle Stage			Disposal	/Recycle				
Life Cycle Descrip	otion (Subca	ategory of Use):	Disposal of	of Waste	of Elec	tric and Electronic Equipment (WEEE)		
Release Source:			Releases f	from cana	adian re	ecycling facility and associated landfill. Article		
			largely ta	lks about	enviro	nmental fate.		
Disposal /Treatm	ent Method	:	Recycling	and land	lfill			
Annual Release Q	uantity (kg	/yr):	Annual q	uantities	of HB	CD partitioned to each media is in Table 2		
			(based on	releases	at recy	ling /landfill site and fate modeling)		
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1. Beliah	ility							
	Metric 1:	Methodology	High	$\times 1$	1	scientifically sound; no errors found		
Domain 2: Repres	sontativo							
Domain 2. Repres	Metric 2:	Geographic Scope	Medium	× 1	2	Canada		
	Metric 3:	Applicability	High	$\times 2$	2	Eelectronics recycling plants are in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2013		
	Metric 5:	Sample Size	N/A		N/A	Parameter is not applicable to models		
Domain 3: Access	vibility/Clar	ity						
Domain 5. Access	Metric 6:	Metadata Completeness	High	$\times 1$	1	Model approach, equations, and choice of parameter values are transparent and clear		
Domain 4: Variat	Metric 7.	Metadata Completeness	Medium	× 1	2	limited discussion		
	metric 7.	metadata Completeness	meunin	^ 1	4	minted discussion		
Overall Quality D	Oeterminatio	\mathbf{n}^{\dagger}	High		1.3			
2 · · · · · · · · · · · · · · · · · · ·			0					

Source Citation: Type of Data Source Hero ID	Bsef, 2009. HBCD hexabromocyclododecane fact sheet. Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3981179						
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Descrip Number of Sites: Waste Treatment	manufacturing manufacturing 1 Wastewater from the production process is treated at the plant by an advanced wastewater treatment facility including filtration, active car- bon treatment and bio membrane reactor, resulting in effluents that can be safely discharged.						
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	Medium	× 1	2	Sources arent necessarily trusted but do not seem flawed	
Domain 2: Repres	sentative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	High Unacceptable High N/A	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \end{array}$	1 8 2 N/A	US Out of scope and not applicable to in scope 2009 This metric is not applicable to this data type	
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	Medium	× 1	2	Data sources are generally described but not fully transparent.	
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	The report does not address variability or uncertainty	
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.2.	
		(Continued on nex	t page			

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Source Citation: Type of Data Source Hero ID	Bsef, 2009. HBCD hexabromocyclododecane fact sheet. Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3981179						
EVALUATION							
Domain	Metric	Rating	MWF^{\star} Score	Comments			

** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation:	Zhang, H.,Kuo, Y. Y.,Gerecke, A. C.,Wang, J 2012. Co-release of hexabromocyclododecane (HBCD) and Nano- and microparticles from thermal cutting of polystyrene foams. Environmental Science and Technology.						
Type of Data Source Hero ID	Releases to 1927576	o the Environment; Completed F	Exposure or	Risk As	sessmer	its;	
EXTRACTION							
Parameter			Data				
			р :				
Life Cycle Stage:	tion (Cubo	tomore of Use).	VDC The	g maal Cut	ting		
Bolosso Source:	Stion (Subca	ategory of Use).	Thormal	cutting o	noratio	n modeled in a closed sampling system	
Disposal /Treatm	ent Method		Particulat	te (dust)	peration	n modeled in a closed sampling system	
Environmental M	edia:	•	Release ra	ate per h	our dur	ing the thermal cutting operation	
Release or Emissi	on Factor:		4.0E12 pa	rticles p	er hour	released or 160.4 ug HBCD per hour released	
Release Estimatic	on Method:		Measured			0 1	
Daily Release Qu	antity (kg/d	lay):	1.2832E-0)6			
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliab	ility		TT· 1	1	1		
	Metric 1:	Methodology	High	× 1	1	Information is from trusted sources	
Domain 2. Benree	sentative						
Domain 2. Repres	Metric 2:	Geographic Scope	Medium	× 1	2	Switzerland	
	Metric 3:	Applicability	High	$\times 2$	2	in scope	
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012	
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.	
Domain 3: Access	sibility/Clar	ity					
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Information is all clearly cited	
	.1., 1.1.1						
Domain 4: Variat	Motrie 7	Metadata Completeness	Low	× 1	9		
	metric 7:	Metadata Completeness	LOW	X 1	3	ino discussion of variability or uncertainty	
Orronall Orraliter D	at anna in a ti-		II: mb		16		
Overall Quality L	eterminatio	·11 ·	пıgn		1.0		

Source Citation: Z	Zhang, H.,Kuo, Y. Y.,Gerecke, A. C.,Wang, J 2012. Co-release of hexabromocyclododecane (HBCD) and Nano- and microparticles from thermal cutting of polystyrene foams. Environmental Science and Technology.							
Type of Data SourceRHero ID19	Releases to the Environment; Completed Exposure or Risk Assessments; 1927576							
EXTRACTION								
Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Disposal /Treatment Method: Environmental Media: Balaase or Emission Factor:		Processing EPS Thermal Cutting Thermal cutting operation modeled in a closed sampling system Particulate (dust) Release rate per hour during the thermal cutting operation 5 0F12 particulate par hour released on 240 1 ur HPCD per hour released						
Release Estimation 1	Method:		Measured		i nour	released of 210.1 ug fibeb per nour released		
Daily Release Quant	ity (kg/d	ay):	1.9928E-0)6				
· ·	, (),							
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliabilit M	y Ietric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Danain 9. Danaar								
Domain 2: Represen	tative letric 2.	Geographic Scope	Medium	$\times 1$	2	Switzerland		
N. N.	fetric 3.	Applicability	High	$^{\wedge 1}$ $\times 2$	$\frac{2}{2}$	in scope		
N	fetric 4:	Temporal Representativeness	High	$\times 2$	2	2012		
N	fetric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Accessibi M	lity/Clari Ietric 6:	ity Metadata Completeness	High	× 1	1	Information is all clearly cited		
Domain 4: Variabilit M	ty and Ur letric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality Dete	erminatio	\mathbf{n}^{\dagger}	High		1.6			
Source Citation:	European Flame Retardants, Association. 2015. Keeping fire in check an introduction to flame retardants used in transport applications.							
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Type of Data Source Hero ID	Releases to 3986543	the Environment; Reports for	Data or Inf	ormation	Other	than Exposure or Release Data;		
EXTRACTION								
Parameter			Data					
			4 11					
Life Cycle Stage:	- 1:		All					
Bolosso or Emissi	edia:		1 5 grams	ton HB	CD (wo	tor): 47.3 grams/ton HBCD (air) (2013)		
Release Of Edition	n Mothod		Fetimator	$\frac{1}{2}$ via ind	OD (wa	rvov		
Release Estimatio	n methou.		Estimated	i via illu	ustry su	i vey		
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
	•1•,							
Domain 1: Reliab	ility Motrie 1.	Mathadalam	Madium	× 1	0			
	Metric 1:	Methodology	Medium	× 1	Ζ	From industry survey		
Domain 2: Repres	sentative							
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
	Metric 3:	Applicability	Medium	$\times 2$	4	Captures releases from all possible stages, some of which are not in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	Unknown, but cites sources as recent as 2013		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Access	sibility/Clar	ity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variab	ility and U	ncertainty						
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
		~				· ·		
Overall Quality Determination ^{\dagger}		Medium		1.9				
-								

Source Citation:	Gao, S., Wang, J., Yu, Z., Guo, Q., Sheng, G., Fu, J 2011. Hexabromocyclododecanes in surface soils from E-waste recycling areas and industrial areas in South China: concentrations, diastereoisomer- and enantiomer-specific profiles, and inventory. Environmental Science and Technology								
Type of Data Source	Releases to	o the Environment: Environment	tal Release Data						
Hero ID	1927645			,					
EXTRACTION									
Parameter	arameter Data								
Life Cycle Stage:			Disposal /Bec	velo					
Life Cycle Descrip	otion (Subca	ategory of Use):	Disposal of Wa	aste of E	lectric a	nd Electronic Equipment (WEEE)			
Release Source:	(The mean con	centratio	ons of t	otal HBCDs in the surface soils ranged			
			from 0.22 to 0	0.79 and	from 0.	31 to 9.99 ng/g dw for two surrounding			
			e-waste recycli	ng sites :	and ind	ustrial areas.			
Release Estimatio	n Method:		90 soil samples	s were ta	ken				
Annual Release Q	uantity (kg	/yr):	Estimates of 3	.42 kg an	ıd 1.84 t	onnes for the e-waste recycling areas and			
			industrial area	s (these	areas 11	nclude electronics, textiles, and building			
			materials)						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Beliab	ility								
Domain 1. Renab	Metric 1:	Methodology	Medium	× 1	2	Release rate is an estimate for entire lifecycle			
Domain 2: Repres	sentative								
	Metric 2:	Geographic Scope	Low	$\times 1$	3	China			
	Metric 3:	Applicability	High	$\times 2$	2	Eelectronics recycling plants are in scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2011			
	Metric 5:	Sample Size	High	$\times 1$	1	Statistical distribution of samples is fully characterized.			
Dennin 9. Arres	:1:::+ /Cl								
Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Unacceptable × 1 4 Release data do not include a stand what the data represent evaluation					Release data do not include any needed metadata to under- stand what the data represent and are not usable in the risk evaluation				
Demain 4. V. 1	:1:41 TT								
Domain 4: Variab	inty and Ui	ncertainty							
Continued on next page									

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Source Citation:	Gao, S.,Wa areas and Environme	Gao, S., Wang, J., Yu, Z., Guo, Q., Sheng, G., Fu, J 2011. Hexabromocyclododecanes in surface soils from E-waste recycling areas and industrial areas in South China: concentrations, diastereoisomer- and enantiomer-specific profiles, and inventory. Environmental Science and Technology.							
Type of Data Source Hero ID	Releases to 1927645	eleases to the Environment; Environmental Release Data; 927645							
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
Overall Quality I	Unacceptable		4	Metric Mean Score: 1.7.					

* MWF = Metric Weighting Factor

Source Citation:	Morf, L. S., Tremp, J., Gloor, R., Huber, Y., Stengele, M., Zennegg, M. 2005. Brominated flame retardants in waste electrical and electronic equipment: substance flows in a recycling plant. Environmental Science and Technology.								
Type of Data Source Hero ID	Releases to 1927802	the Environment; Environment	tal Release	Data;					
EXTRACTION Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use):		Disposal /Recycle Disposal /Recycle of Waste of Electric and Electronic Equipment							
Release Source:			Proportio plant (fine tions) sho	n of HBC e particul wn in fig	CD that ates, co ure 3	ends up in various outputs from the recycling opper cbles, printed circuit boards, plastic frac-			
Environmental Media:		For the investigated plant, metals in iron and metal scrap and printed circuit boards are recovered in ferrous and non-ferrous metal processes (reuse). Plastic fractions are treated in municipal waste incineration plants. Pollution carriers (e.g., PCB capacitors, batteries) are either treated in high-temperature incineration plants or in a special recycling plant for the recovery of metals from batteries, accumulators, and Hg-							
Release or Emissio Release Estimatio	on Factor: n Method:		0.002 percent to off-gas Substance flow analysis and sampling						
EVALUATION									
Domain		Metric	Rating	\mathbf{MWF}^{\star}	Score	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	Medium	$\times 1$	2	Source only indicates loss fraction from off-gassing and does not provide loss fractions to other environmental media (e.g., water, landfill)			
Domain 2: Bonros	ontotivo								
Domain 2. Repres	Metric 2:	Geographic Scope	Medium	× 1	2	Switzerland			
	Metric 3:	Applicability	High	$\times 2$	2	Eelectronics recycling plants are in scope			
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2005			
	Metric 5:	Sample Size	Medium	$\times 1$	2	Only average values or single value provided			
Continued on next page									

		cont	mucu nom j	previous	page				
Source Citation: Type of Data Source Hero ID	Morf, L. S and electro Releases to 1927802	forf, L. S., Tremp, J., Gloor, R., Huber, Y., Stengele, M., Zennegg, M 2005. Brominated flame retardants in waste electrical nd electronic equipment: substance flows in a recycling plant. Environmental Science and Technology. Releases to the Environment; Environmental Release Data; 927802							
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Medium	$\times 1$	2	Data include media but not the source in the process or release frequency			
Domain 4: Variab	bility and Un Metric 7:	ncertainty Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
Overall Quality D	Determinatio	\mathbf{n}^{\dagger}	Medium		1.7				

continued from previous page

Source Citation:	Stubbings, W. A., Harrad, S. 2014. Extent and mechanisms of brominated flame retardant emissions from waste soft furnish- ings and fabrics: A critical review Environment International									
Type of Data Source Hero ID	Releases to 2528334	Releases to the Environment; Environmental Release Data; 2528334								
EXTRACTION Parameter			Data							
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Environmental Media: Release or Emission Factor:			Disposal waste textiltes emissions from waste textiles air 200-3000 mg HBCD/m2 textile-hour							
EVALUATION										
Domain		Metric	Rating	MWF*	Score	Comments				
Domain 1: Reliab	ility Metric 1:	Methodology	Medium	$\times 1$	2	Only represents air release from waste textiles				
Domain 2: Repres	sentative									
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	UK				
	Metric 3:	Applicability	High	$\times 2$	2	This disposal scenario is in scope				
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2014				
	Metric 5:	Sample Size	High	$\times 1$	1	Statistical distribution of samples is fully characterized.				
Domain 3: Access	sibility/Clar	ity								
	Metric 6:	Metadata Completeness	High	$\times 1$	1	data include all associated metadata,				
Domain 4: Variability and Uncertainty		II:ab	× 1	1						
	Metric 7:	Metadata Completeness	nıgn	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.				
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.2					

Source Citation:	Environment Canada and Health Canada. 2011. Screening assessment report on hexabromocyclododecane. Chemical Ab- stracts Service Registry Number 3194-55-6. Ottawa, Canada.								
Type of Data Source Hero ID	Releases to 1937209	Releases to the Environment; Completed Exposure or Risk Assessments; 1937209							
EXTRACTION									
Parameter			Data						
Life Cycle Stage:			All						
Life Cycle Descrip	otion (Subca	ategory of Use):	all packag	ging wast	e				
Release Source:			disposal d	of packag	ing that	t contained HBCD from manufacturers			
Disposal /Treatm	ent Method	:	landfill						
Release Estimatic	on Method:		industrial	survey					
Annual Release Q	Juantity (kg	/yr):	2017 kg/y	/r (2008)	; 309 kg	g/yr (2009)			
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	oility								
	Metric 1:	Methodology	Medium	$\times 1$	2	Industrial survey is contingent on voluntary participation			
Domain 2: Repres	sentative								
	Metric 2:	Geographic Scope	High	$\times 1$	1	Canada			
	Metric 3:	Applicability	Medium	$\times 2$	4	Captures releases from all possible stages, some of which are not in scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2011			
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics			
Domain 3: Access	sibility/Clar	ity							
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4. Variah	ility and U	agentainte							
Domain 4: Variat	Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
Overall Quality Determination ^{\dagger}		High		1.6					

Type of Data Source Releases to the Environment; Completed Exposure or Risk Assessments; Hero ID Data EXTRACTION Data Parameter Data Life Cycle Stage: All Life Cycle Description (Subcategory of Use): Unloading and container cleaning Release Source: Unloading and container cleaning Because Source: Unloading and container cleaning Release of Emission Factor: O to be percent Release Temission Factor: O to be percent Release Days per Year: 200 EXALUATION Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 data or techniques that are high quality Domain 2: Representative Metric 5: Sample Size Low X 1 Canada Metric 4: Temporal Representative High × 1 1 Canada Domain 3: Accessibility/Clarity Metric 6: Metric 8: Metric 8: Metric 7: Metadata Completeness High × 1 1 Assessment methods, results, and assumptions.	Source Citation:	Environment Canada and Health Canada. 2011. Screening assessment report on hexabromocyclododecane. Chemical Ab- stracts Service Registry Number 3194-55-6. Ottawa, Canada								
Data Data Life Cycle Description (Subcategory of Use): All Life Cycle Description (Subcategory of Use): unloading and container cleaning Release Source: Use rate of 100,000 kg/yr. Release from unloading and container cleaning Disposal / Treatment Method: dust to air Release or Emission Factor: 0.60 percent Release Estimation Method: 0.60 percent Release Days per Year: 200 Pomain Metric Release Days per Year: 200 Domain 1: Reliability Metric Metric 1: Methodology Metric 2: Geographic Scope Metric 3: Applicability Metric 4: Temporal Representative Metric 5: Sampel Size Metric 5: Sampel Size Metric 4: Temporal Representativeness Metric 5: Sampel Size Domain 3: Accessibility/Clarity Metric 5: Metric 7: Metadata Completeness Metric 7: Metadata Completeness Metric 7: Metadata Completeness Metric 7: Metadata Completeness	Type of Data Source Hero ID	Releases to 1937209	the Environment; Completed H	Exposure	or Risk A	Assessm	ients;			
Parameter Data Life Cycle Stage: All Life Cycle Description (Subcategory of Use): unloading and container cleaning Release Source: Use rate of 100,000 kg/yr. Release from unloading and container cleaning Disposal /Treatment Method: dust to air Release or Emission Factor: 0.000 kg/yr. Release from unloading and container cleaning Release Days per Year: 2004 Plastics compounding ESD EVALUATION 2004 Domain Metric Release Days per Year: 200 Evaluation Attack to air comments its data or techniques that are high quality Domain 1: Reliability High × 1 1 data or techniques that are high quality Domain 2: Representative Metric 2: Geographic Scope High × 1 1 canada Metric 4: Temporal Representativeness High × 2 2 This data is in scope because the estimation method is from the 2004 Compounding ESD Metric 5: Sample Size Life X 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	EXTRACTION									
Life Cycle Stage: All Life Cycle Description (Subcategory of Use): unloading and container cleaning Release Source: Use rate of 100,000 kg/yr. Release from unloading and container cleaning Disposal /Treatment Method: dust to air Release or Emission Factor: 0.000 Vg/yr. Release from unloading and container cleaning Release or Emission Factor: 0.000 Vg/yr. Release from unloading and container cleaning Release Days per Year: 2004 EVALUATION 2004 Domain 1: Reliability Metric Metric 1: Methodology High × 1 1 Jomain 2: Representative High × 1 1 Metric 3: Applicability High × 2 2 Metric 4: Temporal Representativeness High × 2 2 2 Metric 5: Sample Size Ligh × 1 3 characterized by no statistics Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty High <t< td=""><td>Parameter</td><td></td><td></td><td>Data</td><td></td><td></td><td></td></t<>	Parameter			Data						
Life Cycle Description (Subcategory of Use): All Life Cycle Description (Subcategory of Use): unloading and container cleaning Release Source: Use rate of 100,000 kg/yr. Release from unloading and container cleaning Disposal /Treatment Method: dust to air Release or Emission Factor: 0.60 percent Release Estimation Method: 2004 Plastics compounding ESD EVALUATION 200 Domain Metric Release Estimation Method: 200 EVALUATION 200 Domain Metric Netric 1: Methodology High × 1 1 data or techniques that are high quality Domain 2: Representative Metric 2: Geographic Scope Metric 3: Applicability Metric 4: Temporal Representativeness Metric 5: Sample Size Low × 1 3 Characterized by no statistics Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Continued on next page	Life Cruele Stame			A 11						
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Life Cycle Stage:	otion (Subce	tagory of Use).	unloadi	ng and g	ontaina	r cleaning			
Indexes control ing ing ing ing dust to air Release or Emission Factor: 0.60 percent Release Days per Year: 200 EVALUATION 2004 Plastics compounding ESD Domain Metric Rating Metric 1: Methodology High × 1 1 Domain 2: Representative Metric 2: Geographic Scope High × 1 1 Canada Metric 3: Applicability High × 2 2 This data is in scope because the estimation method is from the 2004 Compounding ESD Metric 4: Temporal Representative High × 1 1 Canada Metric 5: Sample Size Low × 1 3 characterized by no statistics Domain 3: Accessibility/Clarity High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Domain 4: Variability and Uncertainty	Belease Source	Subca	tegory of Use).	Use rate	e of 100 (100 kg/s	vr Belease from unloading and container clean-			
Disposal /Treatment Method: dust to air Release or Emission Factor: 0.60 percent Release Estimation Method: 2004 Plastics compounding ESD Release Days per Year: 200 EVALUATION 200 Domain Metric Release Days per Year: 200 EVALUATION 200 Domain Metric Release Days per Year: 200 EVALUATION 200 Domain 1: Reliability Metric 1: Metric 1: Methodology High × 1 1 data or techniques that are high quality Domain 2: Representative High × 1 1 Metric 3: Applicability High × 2 2 Metric 4: Temporal Representativeness High × 2 2 2011 Metric 5: Sample Size Low × 1 3 characterized by no statistics Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. D	reciclise Source.			ing	e or 100,0	, / soo	in the contained and contained clean			
Release or Emission Factor: 0.60 percent Release Estimation Method: 200 Release Days per Year: 200 EVALUATION 200 Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Metric 2: Geographic Scope High × 1 1 data or techniques that are high quality Domain 2: Representative Metric 3: Applicability High × 1 1 Canada Metric 4: Temporal Representativeness High × 2 2 This data is in scope because the estimation method is from the 2004 Compounding ESD Metric 5: Sample Size Low × 1 3 characterized by no statistics Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued o	Disposal /Treatm	ent Method	:	dust to	air					
Release Estimation Method: Release Days per Year: 2004 Plastics compounding ESD EVALUATION 200 Domain Metric Reliability Metric Domain 1: Reliability Metric 1: Metric 1: Methodology High × 1 1 data or techniques that are high quality Domain 2: Representative Metric 3: Metric 3: Applicability Metric 4: Temporal Representativeness Metric 5: Sample Size Low × 1 2 Domain 3: Accessibility/Clarity Metric 6: Metradata Completeness High × 1 1 Domain 4: Variability and Uncertainty High × 1 1 Domain 4: Variability and Uncertainty High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Domain 4: Variability and Uncertainty High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	Release or Emissi	on Factor:		0.60 per	rcent					
Release Days per Year: 200 EVALUATION Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 data or techniques that are high quality Domain 2: Representative Metric 3: Applicability High × 1 1 Canada Metric 3: Applicability High × 2 2 This data is in scope because the estimation method is from the 2004 Compounding ESD Metric 4: Temporal Representativeness High × 2 2 2011 Metric 5: Sample Size Low × 1 3 characterized by no statistics Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	Release Estimatio	on Method:		2004 Pl	astics con	mpound	ling ESD			
EVALUATION Domain Metric Rating MWF* Score Comments Domain Metric Rating MWF* Score Comments Domain I: Reliability Metric I data or techniques that are high quality Domain Metric Seographic Scope High × 1 1 data or techniques that are high quality Domain 2: Representative Metric Geographic Scope High × 1 1 Canada Metric 3: Applicability High × 2 2 This data is in scope because the estimation method is from the 2004 Compounding ESD Metric 4: Temporal Representativeness High × 2 2 2011 Low × 1 3 characterized by no statistics Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variabilit	Release Days per	Year:		200						
EVALUATION Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 data or techniques that are high quality Domain 2: Representative Metric 2: Geographic Scope High × 1 1 Canada Metric 3: Applicability High × 2 2 This data is in scope because the estimation method is from the 2004 Compounding ESD Metric 4: Temporal Representativeness High × 2 2 2011 Metric 5: Sample Size Low × 1 3 characterized by no statistics Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.										
Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 data or techniques that are high quality Domain 2: Representative Metric 2: Geographic Scope High × 1 1 Canada Metric 3: Applicability High × 2 2 This data is in scope because the estimation method is from the 2006 compounding ESD Metric 4: Temporal Representativeness High × 2 2 2011 Metric 5: Sample Size Low × 1 3 characterized by no statistics Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	EVALUATION									
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Renability Metric 1: Methodology High × 1 1 data or techniques that are high quality Domain 2: Representative Metric 2: Geographic Scope High × 1 1 Canada Metric 3: Applicability High × 2 2 This data is in scope because the estimation method is from the 2004 Compounding ESD Metric 4: Temporal Representativeness High × 2 2 2011 Metric 5: Sample Size Low × 1 3 characterized by no statistics Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	Domain 1, Polish	;1;+								
Image A 1 1 duated et compares that are high quarty Domain 2: Representative Metric 2: Geographic Scope High × 1 1 Canada Metric 3: Applicability High × 2 2 This data is in scope because the estimation method is from the 2004 Compounding ESD Metric 4: Temporal Representativeness High × 2 2 2011 Metric 5: Sample Size Low × 1 3 characterized by no statistics Domain 3: Accessibility/Clarity Metric 6: Metric 6: Metric 7: Metric 7: Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 Continued on next page Continued on next page 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	Domain 1: Kenau	Metric 1.	Methodology	High	× 1	1	data or techniques that are high quality			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		Meetic 1.	Methodology	mgn	~ 1	1	data of teeninques that are light quanty			
Metric 2: Geographic Scope High × 1 1 Canada Metric 3: Applicability High × 2 2 This data is in scope because the estimation method is from the 2004 Compounding ESD Metric 4: Temporal Representativeness High × 2 2 2011 Metric 5: Sample Size Low × 1 3 characterized by no statistics Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	Domain 2: Repres	sentative								
Metric 3:ApplicabilityHigh $\times 2$ 2This data is in scope because the estimation method is from the 2004 Compounding ESDMetric 4:Temporal RepresentativenessHigh $\times 2$ 22011Metric 5:Sample SizeLow $\times 1$ 3characterized by no statisticsDomain 3:Accessibility/Clarity Metric 6:Metadata CompletenessHigh $\times 1$ 1Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.Domain 4:Variability and Uncertainty Metric 7:High $\times 1$ 1The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.Continued on next page	1	Metric 2:	Geographic Scope	High	$\times 1$	1	Canada			
Metric 4: Temporal Representativeness High × 2 2 2011 Metric 5: Sample Size Low × 1 3 characterized by no statistics Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page		Metric 3:	Applicability	High	$\times 2$	2	This data is in scope because the estimation method is from the 2004 Compounding ESD			
Metric 5: Sample Size Low × 1 3 characterized by no statistics Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page		Metric 4:	Temporal Representativeness	High	$\times 2$	2	2011			
Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page		Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics			
Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page										
Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page Continued on next page Continued on next page	Domain 3: Access	sibility/Clar	ity			-				
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page		Metric 6:	Metadata Completeness	Hìgh	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page Continued on next page										
Continued on next page	Domain 4: Variat	Motrie 7:	Motadata Completeness	High	v 1	1	The accomment addresses and the set is set of the			
Continued on next page		Metric <i>i</i> : Metadata Completeness Hign × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.								
Continued on next page										
			Con	tinued or	n next pa	ge				

	$-\operatorname{cont}$	inued from	previo	us page			
Source Citation:	Environment Canada and Health Canada. 2011. Screening assessment report on hexabromocyclododecane. Chemical Ab- stracts Service Registry Number 3194-55-6. Ottawa, Canada.						
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;						
Hero ID	1937209						
EVALUATION							
Domain	Metric	Rating	MWF^{\star}	Score	Comments		
Overall Quality D	$\operatorname{Petermination}^\dagger$	High		1.2			

Source Citation:	Environment Canada and Health Canada. 2011. Screening assessment report on hexabromocyclododecane. Chemical Ab- stracts Service Registry Number 3194-55-6. Ottawa, Canada.									
Type of Data Source Hero ID	Releases to 1937209	Releases to the Environment; Completed Exposure or Risk Assessments; 1937209								
EXTRACTION			D /							
Parameter			Data							
Life Cycle Stage:			Process	ing						
Life Cycle Descri	otion (Subca	ategory of Use):	Compo	unding of	f Polysty	yrene Resin to Produce XPS Masterbatch				
Release Source:	· · · · ·		Use rat	e of 100,0	000 kg/y	yr. Release from compounding dust				
Disposal /Treatm	ent Method		dust to	air	-, -					
Release or Emissi	on Factor:		$0.055 \ p$	ercent						
Release Estimatio	on Method:		2004 Pl	astics con	mpound	ing ESD				
Release Days per	Year:		200							
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
Domain 1: Reliab	oility									
	Metric 1:	Methodology	Hìgh	$\times 1$	1	data or techniques that are high quality				
Domain 2. Ponno	antativa									
Domain 2. Repres	Motrie 2.	Coographic Scope	High	\vee 1	1	Canada				
	Metric 2.	Applicability	High	$^{\wedge 1}$ $^{\vee 2}$	2	This data is in scope because the estimation method is from				
	Meetile 5.	Applicability	mgn	~ 2	2	the 2004 Compounding ESD				
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2011				
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics				
Domain 3: Access	sibility/Clar	ity								
Domain 5. Access	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.				
Domain 4: Variat	Matuia 7	Metalata Canadatana	II:l.	v 1	1					
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.				
Overall Quelity F	otorminatio	nţ	High		19					
	Overan Quanty Determination High 1.2									
Continued on next page										

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Source Citation:	Environment Canada and Health Canada stracts Service Registry Number 3194-55-0	. 2011. S 6. Ottawa	Screening , Canada	assessmen	t report on hexabromocyclododecane. Chemical Ab-		
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;						
Hero ID	1937209						
EVALUATION							
Domain	Metric	Rating	MWF^{\star}	Score	Comments		

Source Citation:	Remberger, M., Sternbeck, J., Palm, A., Kaj, L., StrĶmberg, K., BrorstrĶm-Lundén, E. 2004. The environmental occurrence of hexabromocyclododecane in Sweden. Chemosphere.									
Type of Data Source Hero ID	Releases to 1927826	Releases to the Environment; Monitoring Data; 1927826								
EXTRACTION Parameter	Data									
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Environmental Media: Release or Emission Factor: Release Estimation Method: Number of Sites:			Use XPS Foam Samples were taked 300-700 meters from a Swedish textile factory that manufactures XPS treated with HBCD two weeks per year Water, Air, Land Air - 1070 ng/m3Soil - 140 to 1,300 ug/kg dry weight Concentration in the soil and air 1							
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments				
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Data from trusted source				
Domain 2: Repres	sentative									
	Metric 2: Metric 3:	Geographic Scope Applicability	Medium Unacceptable	$\times 1 \times 2$	$\frac{2}{8}$	Sweden Information related to in-scope scenario but not to engineering assessment				
	Metric 4: Metric 5:	Temporal Representativeness Sample Size	Medium Low	$\times 2 \times 1$	$\frac{4}{3}$	2004 characterized by no statistics.				
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.				
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty				
Overall Quality Determination ^{\dagger}		Unacceptable		4	Metric Mean Score: 2.4.					
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Source Citation:	Source Citation: Remberger, M., Sternbeck, J., Palm, A., Kaj, L., Strömberg, K., Brorström-Lundén, E 2004. The environmental occur- rence of hexabromocyclododecane in Sweden. Chemosphere.								
Type of Data Source	Releases to the Environment; Monitoring I	Releases to the Environment; Monitoring Data;							
Hero ID	1927826								
EVALUATION									
Domain	Metric	Rating	MWF^{\star}	Score	Comments				

* MWF = Metric Weighting Factor

Source Citation:	Remberger, M., Sternbeck, J., Palm, A., Kaj, L., Strömberg, K., Brorström-Lundén, E. 2004. The environmental occur- rence of hexabromocyclododecane in Sweden. Chemosphere							
Type of Data Source Hero ID	Releases to 1927826	the Environment; Monitoring	Data;					
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Disposal /Treatment Method: Environmental Media: Release or Emission Factor: Release Estimation Method: Number of Sites:			Disposal Landfill Samples of the air, landfill leachate, and sediment were taked landfill Water, Air, Land Air - 0.013 to 0.18 ng/m3 Water - 3 to 9 ng/LSediment - <0.1 ug/kg dry weight Concentration in the sediment, water, and air 1					
EVALUATION		Metric	Bating	MWF*	Score	Comments		
Domain 1: Reliab	oility Metric 1:	Methodology	High	× 1	1	Data from trusted source		
Domain 2: Repre	Medium Unacceptable Medium Low High	$ \begin{array}{c} \times 1 \\ \times 2 \\ \times 2 \\ \times 1 \\ \end{array} $	$2 \\ 8 \\ 4 \\ 3 \\ 1$	Sweden Information related to in-scope scenario but not to engineering assessment 2004 characterized by no statistics. Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.				
Domain 4: Varial	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
		(Continued on nex	t page				

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Source Citation: Remberger, M., Sternbeck, J., Palm, A., Kaj, L., StrĶmberg, K., BrorstrĶm-Lundén, E. 2004. The environmental occur- rence of hexabromocyclododecane in Sweden. Chemosphere.							
Type of Data Source	Releases to the Environment; Monitoring Data;						
Hero ID	1927826						
EVALUATION							
Domain	Metric	Rating	\mathbf{MWF}^{\star}	Score	Comments		
Overall Quality I	Unacceptable		4	Metric Mean Score: 2.4.			

* MWF = Metric Weighting Factor

Source Citation:	Remberger, M., Sternbeck, J., Palm, A., Kaj, L., Strömberg, K., Brorström-Lundén, E. 2004. The environmental occur- rence of hexabromocyclododecane in Sweden. Chemosphere.							
Type of Data Source Hero ID	Releases to 1927826	o the Environment; Monitoring l	Data;	-				
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source:		Use Textile industry Fish samples were taken up stream and down stream from a Swedish textile facility. Air samples were take 350 meters from the facility. Sur- face sediment samples were taked along the river (both upstream and						
Environmental Media: Release or Emission Factor:		downstream of the facility) Water, Air, Land Air - 0.019 to 0.74 ng/m3 Water - 31 ng/LSediment - <0.1 to 25 ug/kg dry weightFish - 65 to 1,800 ug/kg dry weightSewage sludge - 30 to 33						
Release Estimation Method: Number of Sites:			Concentration in the sediment, water, air, and sewage sludge 1					
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	oility Metric 1:	Methodology	High	$\times 1$	1	Data from trusted source		
Domain 2: Repres	sentative							
1	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Sweden		
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Information related to in-scope scenario but not to engineering assessment		
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2004		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Accoss	ribility/Clar	:+						
Domain 5. Access	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Continued on next page								

Source Citation:	Remberger rence of he	Remberger, M., Sternbeck, J., Palm, A., Kaj, L., Strömberg, K., Brorström-Lundén, E. 2004. The environmental occur- rence of hexabromocyclododecane in Sweden. Chemosphere.							
Hero ID	1927826	1927826							
EVALUATION									
Domain		Metric	Rating	MWF^*	Score	Comments			
Domain 4: Variab	oility and Uı Metric 7:	ncertainty Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty			
Overall Quality D	eterminatio	n^\dagger	Unacceptable		4	Metric Mean Score: 2.4.			

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** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation:	Rauert, C.,Lazarov, B.,Harrad, S.,Covaci, A.,Stranger, M 2014. A review of chamber experiments for determining specific emission rates and investigating migration pathways of flame retardants. Atmospheric Environment.						
Type of Data Source Hero ID	Releases to 2343745	b the Environment; Reports for 1	Data or Inf	ormation	Other	than Exposure or Release Data;	
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source:			Commercial Use Insulation boards Insulation board use was modeled in a chamber in another study (Kemm- lein et al., 2003)				
Release or Emission Factor:			0.0004 to	0.0029 u	g/m2h		
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
Demeir 9. Deme			0				
Domain 2: Repres	Metric 2.	Geographic Scope	Medium	× 1	2	ПК	
	Metric 3:	Applicability	High	$\times 2$	2	Potentially can be applied to occupational scenario (use of in- sulation in offices).	
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2013	
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.	
Domain 3: Accord	ibility/Clar	:+					
Domain 5. Access	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variah	vility and U	ncertainty					
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty	
Overall Quality Determination [†]			High		1.6		

Source Citation:	Kuo, Y. uY,Zhang, H.,Gerecke, A. C.,Wang, J. 2014. Chemical Composition of Nanoparticles Released from Thermal Cutting of Polystyrene Foams and the Associated Isomerization of Hexabromocyclododecane (HBCD) Diastereomers. Aerosol and Air Quality Research.								
Type of Data Source Hero ID	Releases to 2674624	Releases to the Environment; Completed Exposure or Risk Assessments; 2674624							
EXTRACTION									
Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Release or Emission Factor: Release Estimation Method:			Processing EPS Thermal Cutting From 1 hour long experiments cutting EPS foam 5.2 mg particles containing 160 ug HBCD per hour measured						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	oility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources			
Domain 2: Repres	sentative								
1	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Switzerland			
	Metric 3:	Applicability	High	$\times 2$	2	Information related to in-scope scenario			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2013			
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.			
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as-			
						sessment methods, results, and assumptions.			
Domain 4: Variah	oility and Ur	ncertainty							
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty			
Overall Quality Determination [†]		High		1.6					

Source Citation:	Kuo, Y. uY,Zhang, H.,Gerecke, A. C.,Wang, J 2014. Chemical Composition of Nanoparticles Released from Thermal Cutting of Polystyrene Foams and the Associated Isomerization of Hexabromocyclododecane (HBCD) Diastereomers. Aerosol and Air Quality Research.						
Hero ID	2674624	5 the Environment; Completed 1	exposure or	RISK AS	sessmer	us;	
EXTRACTION			_				
Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Release or Emission Factor: Release Estimation Method:			Processing XPS Thermal Cutting From 1 hour long experiments cutting XPS foam 4.5 mg particles containing 250 ug HBCD per hour measured				
EVALUATION							
Domain		Metric	Rating	$\rm MWF^{\star}$	Score	Comments	
Domain 1: Reliab	oility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources	
			0				
Domain 2: Repres	sentative	~		_	-		
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Switzerland	
	Metric 3:	Applicability	Hign High	$\times 2$	2	Information related to in-scope scenario	
	Metric 4: Motric 5:	Sample Size	Low	$\times 2$ $\times 1$	2	2013	
	Metric 5.	Sample Size	LOW	~ 1	5	characterized by no statistics.	
Domain 3: Access	sibility/Clar	ity					
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variah	oility and U	ncertainty					
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty	
Overall Quality Determination [†]		High		1.6			

Source Citation:	Rauert, C emission r	Rauert, C.,Lazarov, B.,Harrad, S.,Covaci, A.,Stranger, M 2014. A review of chamber experiments for determining specific emission rates and investigating migration pathways of flame retardants. Atmospheric Environment.						
Type of Data Source Hero ID	Releases to 2343745	b the Environment; Reports for	Data or Inf	ormation	Other	than Exposure or Release Data;		
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Environmental Media: Release or Emission Factor:			Commerce Insulation Emission Offices 300 ng/g	Commercial Use Insulation in Office Emission test in chamber Offices 300 ng/g HBCD in dust				
EVALUATION								
Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Repres	sentative							
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	UK		
	Metric 3:	Applicability	High	$\times 2$	2	Occupational scenario (use of insulation in offices).		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2013		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Access	ibility/Clar	ity						
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability and Uncertainty								
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality Determination [†]		High		1.6				

Source Citation:	Rauert, C., Lazarov, B., Harrad, S., Covaci, A., Stranger, M. 2014. A review of chamber experiments for determining specific emission rates and investigating migration pathways of flame retardants. Atmospheric Environment.								
Type of Data Source Hero ID	Releases to 2343745	the Environment; Reports for 1	Data or Informat	tion Othe	er than	Exposure or Release Data;			
EXTRACTION									
Parameter			Data						
			C II						
Life Cycle Stage:	otion (Subce	togory of Uso).	Lonsumer Use	omos					
Release Source:	Subca	tegory of Use).	Emission test i	n chamb	er				
Environmental M	edia:		Houses	ii chamb	01				
Release or Emissi	on Factor:		100 ng/g HBC	D in dust	t				
			0,0						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	Motrie 1.	Mathadalam	II: mb	V 1	1				
	Metric 1:	Methodology	підп	× 1	1	Information is from trusted sources			
Domain 2: Repres	sentative								
1	Metric 2:	Geographic Scope	Medium	$\times 1$	2	UK			
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Non-occupational scenario (in homes). No associated workers.			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2013			
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.			
D									
Domain 3: Access	sibility/Clari	ity	TT' 1	1	1				
	Metric 6:	Metadata Completeness	Hìgh	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Variab	ility and Ur	ncertainty	T		0				
	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty			
Overall Quality Determination ^{\dagger}		Unacceptable		4	Metric Mean Score: 2.2.				
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Source Citation:	Rauert, C.,Lazarov, B.,Harrad, S.,Covaci, A.,Stranger, M 2014. A review of chamber experiments for determining specific emission rates and investigating migration pathways of flame retardants. Atmospheric Environment.							
Type of Data Source Hero ID	Releases to the Environment; Reports for 2343745	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 2343745						
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score	Comments			

* MWF = Metric Weighting Factor

Source Citation:	Rauert, C., Lazarov, B., Harrad, S., Covaci, A., Stranger, M. 2014. A review of chamber experiments for determining specific emission rates and investigating migration pathways of flame retardants. Atmospheric Environment.						
Type of Data Source Hero ID	Releases to 2343745	b the Environment; Reports for 1	Data or Informat	tion Othe	er than	Exposure or Release Data;	
EXTRACTION							
Parameter			Data				
Life Cycle Stage:			Consumer Use				
Life Cycle Descrit	otion (Subca	ategory of Use):	Insulation in h	omes			
Release Source:	(Emission test i	n chamb	er		
Environmental M	edia:		Near electronic	equipme	ent (5 n	neters from TV)	
Release or Emissi	on Factor:		5,700 to 24,000) ng/g Hl	BCD in	dust	
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliab	Matula 1		TT:l.	1	1		
	Metric 1:	Methodology	High	× 1	1	Information is from trusted sources	
Domain 2: Repres	sentative						
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	UK	
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Non-occupational scenario (in homes). No associated workers.	
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2013	
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.	
Domain 3: Access	sibility/Clari	ity Mata data Gammalatan an	II:l.	1	1		
	Metric 6:	Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variab	ility and Ur	ncertainty	T				
	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty	
Overall Quality Determination ^{\dagger}		Unacceptable		4	Metric Mean Score: 2.2.		
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Source Citation:	Rauert, C.,Lazarov, B.,Harrad, S.,Covaci, A.,Stranger, M. 2014. A review of chamber experiments for determining specific emission rates and investigating migration pathways of flame retardants. Atmospheric Environment.							
Type of Data Source Hero ID	Releases to the Environment; Reports for 2343745	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 2343745						
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score	Comments			

* MWF = Metric Weighting Factor

Source Citation:	Kuo, Y. uY, Zhang, H., Gerecke, A. C., Wang, J 2014. Chemical Composition of Nanoparticles Released from Thermal Cutting of Polystyrene Foams and the Associated Isomerization of Hexabromocyclododecane (HBCD) Diastereomers. Aerosol and Air Quality Research.								
Type of Data Source Hero ID	Releases to 2674624	2674624							
EXTRACTION									
Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Release or Emission Factor: Release Estimation Method:			Processing EPS Thermal Cutting From 1 hour long experiments cutting EPS foam 15 - 40 mg/g for specified particle size range 10 - 1,000 nm (HBCD was the highest concentrations for these size par- ticles)						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility								
	Metric 1:	Methodology	High	× 1	1	Information is from trusted sources			
Domain 2: Repres	sentative								
- ••r-••r	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Switzerland			
	Metric 3:	Applicability	High	$\times 2$	2	Information related to in-scope scenario			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2013			
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.			
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
						·, ·			
Domain 4: Variab	oility and U	ncertainty							
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty			
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.6				

Source Citation:	Kuo, Y. uY, Zhang, H., Gerecke, A. C., Wang, J 2014. Chemical Composition of Nanoparticles Released from Thermal Cutting of Polystyrene Foams and the Associated Isomerization of Hexabromocyclododecane (HBCD) Diastereomers. Aerosol and Air Quality Research.								
Type of Data Source Hero ID	Releases to 2674624	2674624							
EXTRACTION									
Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Release or Emission Factor: Release Estimation Method:			Processing XPS Thermal Cutting From 1 hour long experiments cutting XPS foam 20 - 60 mg HBCD/g particle generated, for specified particle size range 10 - 1,000 nm (HBCD was the highest concentrations for these size par- ticles)						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	\mathbf{Score}	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources			
Domain 2: Repres	sentative								
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Switzerland			
	Metric 3:	Applicability	High	$\times 2$	2	Information related to in-scope scenario			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2013			
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.			
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions			
Domain 4: Variab	ility and U	ncertainty							
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty			
Overall Quality Determination [†]		High		1.6					

Source Citation: Ni,	Ni, H. G.,Lu, S. Y.,Mo, T.,Zeng, H. 2016. Brominated flame retardant emissions from the open burning of five plastic wastes and implications for environmental exposure in China. Environmental Pollution							
Type of Data SourceRelHero ID335	Releases to the Environment; Environmental Release Data; 3350474							
EXTRACTION Parameter			Data					
Life Cycle Stage:			Disposal					
Life Cycle Description	(Subca	terory of Use).	Incinerati	on of pla	stic was	stos		
Belease Source:	i (Dubca	legory of ese).	Two incir	neration	nlants ii	n China		
Disposal /Treatment N	Method:		airborne	particle (51 perce	ent), followed by residualash (44 percent) and		
	a		the gas p	hase (5.1)	percent	t):		
Environmental Media:	:		air		I			
Release or Emission Fa	actor:		airborne	particle -	26.8 to	5,290 ng HBCD/g plastic wasteresidual ash -		
			4.9 to 77.	1 ng HBC	CD/g pla	astic wastegas phase - 10.2 to 17.1 ng HBCD/g		
			plastic wa	\mathbf{aste}				
Release Estimation M	ethod:		Measured					
Annual Release Quant	tity (kg/	/yr):	25.5 kg/y	r				
Number of Sites:			2					
EVALUATION					~	~		
Domain		Metric	Rating	MWF'*	Score	Comments		
Domain 1: Reliability								
Me	tric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
		00						
Domain 2: Representa	ative							
Me	tric 2:	Geographic Scope	Low	$\times 1$	3	China		
Me	etric 3:	Applicability	Medium	$\times 2$	4	disposal in scope		
Me	tric 4:	Temporal Representativeness	High	$\times 2$	2	2016		
Me	etric 5:	Sample Size	High	$\times 1$	1	Statistical distribution of samples is fully characterized.		
Domain 3: Accessibilit	tv/Clari	ity						
Me	tric 6:	Metadata Completeness	High	$\times 1$	1	data include all associated metadata,		
		*	_					
Domain 4: Variability	Domain 4: Variability and Uncertainty							
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Source Citation:	Ni, H. G.,I and implic	Ni, H. G.,Lu, S. Y.,Mo, T.,Zeng, H 2016. Brominated flame retardant emissions from the open burning of five plastic wastes and implications for environmental exposure in China. Environmental Pollution.								
Type of Data Source Hero ID	Releases to 3350474	Releases to the Environment; Environmental Release Data; 3350474								
EVALUATION										
Domain		Metric	Rating	$\rm MWF^{\star}$	Score	Comments				
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.				
Overall Quality I	High		1.4							

Source Citation: Ni, and	Ni, H. G.,Lu, S. Y.,Mo, T.,Zeng, H. 2016. Brominated flame retardant emissions from the open burning of five plastic wastes and implications for environmental exposure in China. Environmental Pollution									
Type of Data SourceReleHero ID3350	eases to 0474	o the Environment; Environment	tal Release	Data;						
EXTRACTION			Data							
1 al allieter			Data							
Life Cycle Stage:			Disposal							
Life Cycle Description	(Subca	ategory of Use):	Incinerati	ion of pla	astic was	stes				
Release Source:			Two incir	neration	plants in	n China				
Disposal /Treatment N	lethod	:	airborne j	particle (51 perce	ent), followed by residualash (44 percent) and				
			the gas p	hase (5.1)	percent	t);				
Environmental Media:			land							
Release or Emission Fa	ctor:		airborne	particle -	26.8 to	5,290 ng HBCD/g plastic wasteresidual ash -				
			4.9 to 77.	I ng HB(CD/g pla	astic wastegas phase - 10.2 to 17.1 ng HBCD/g				
Delegge Fatimation Me	thad.		plastic wa	plastic waste						
Annual Boloaso Quanti	tnoa: tv (ka	/vr)·	71.7 kg/v	l T						
Number of Sites	ty (kg	/ y1).	2	1						
italiiser of sites.			-							
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
Domain 1: Reliability										
Met	ric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources				
Domain 2: Representat	ive									
Met	ric 2:	Geographic Scope	Low	$\times 1$	3	China				
Met	ric 3:	Applicability	Medium	$\times 2$	4	disposal in scope				
Met	ric 4:	Temporal Representativeness	High	$\times 2$	2	2016				
Met	ric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.				
Domain 3: Accessibility	y/Clar	ity								
Met	ric 6:	Metadata Completeness	High	$\times 1$	1	data include all associated metadata,				
Domain 4: Variability	and U	ncertainty								
Continued on next page										

- continued from previous page										
Source Citation:	Ni, H. G.,I and implic	Ni, H. G.,Lu, S. Y.,Mo, T.,Zeng, H 2016. Brominated flame retardant emissions from the open burning of five plastic wastes and implications for environmental exposure in China. Environmental Pollution.								
Type of Data Source Hero ID	Releases to 3350474	Releases to the Environment; Environmental Release Data; 3350474								
EVALUATION										
Domain		Metric	Rating	$\rm MWF^{\star}$	Score	Comments				
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.				
Overall Quality I	High		1.4							

Source Citation:	Li, L., Weber, R., Liu, J., Hu, J 2016. Long-term emissions of hexabromocyclododecane as a chemical of concern in products in China. Environment International.								
Type of Data Source Hero ID	Releases to 3350476	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3350476							
EXTRACTION Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Release or Emission Factor:			Manufacturing HBCD production All releases were modeled from previous risk assessments, reports, and China's HBCD industry data 3.30E-07						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	Medium	$\times 1$	2	Information compiled from several different sources			
Domain 2: Repres	sentative								
Domain 2. Repres	Metric 2:	Geographic Scope	Low	$\times 1$	3	China			
	Metric 3:	Applicability	Medium	$\times 2$	4	Manufacturing not in scope but maybe can be applied to importation			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2016			
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.			
Domain 3: Access	sibility/Clar	ity							
	Metric 6:	Metadata Completeness	Medium	$\times 1$	2	Data sources are generally described but not fully transparent.			
Domain 4: Variability and Uncertainty Matria 7: Matadata Completeness		Low	× 1	3	No discussion of variability or uncertainty				
			30						
Overall Quality D	eterminatio	n^\dagger	Medium		2.1				

Source Citation:	Li, L., Weber, R., Liu, J., Hu, J 2016. Long-term emissions of hexabromocyclododecane as a chemical of concern in products in China. Environment International							
Type of Data Source Hero ID	Releases to 3350476	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3350476						
EXTRACTION								
Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source:			Processing EPS Foam All releases were modeled from previous risk assessments, reports, and					
Release or Emission Factor:			5.2E-6 to	3.3E-5	lubily c			
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	Medium	× 1	2	Information compiled from several different sources		
Domain 2: Repres	Sentative	Communitie Commu	т	1	9			
	Metric 2:	Geographic Scope	LOW	× 1	ა ი	China		
	Metric 5:	Tomporal Representativeness	Підії High	$\times 2$ $\times 2$	2	in scope		
	Metric 5.	Sample Size	Low	× 1	2 3	2010 characterized by no statistics		
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	Medium	× 1	2	Data sources are generally described but not fully transparent.		
Domain 4: Variab	ility and Ur Motric 7:	ncertainty Motadata Completeness	Low	× 1	3	No discussion of versionality or uncertainty		
	ME011C 1.	metadata Completeness	LOW	^ 1	J			
Overall Quality D	eterminatio	n^\dagger	Medium		1.9			

Source Citation:	Li, L., Weber, R., Liu, J., Hu, J 2016. Long-term emissions of hexabromocyclododecane as a chemical of concern in products in China. Environment International							
Type of Data Source Hero ID	Releases to 3350476	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3350476						
EXTRACTION								
Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use):			Processing XPS Foar All release	Processing XPS Foam				
Tierease Source.			China's H	BCD inc	lustry d	lata		
Release or Emission Factor:			6.9E-6 to	1.7E-5	0			
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Beliah	ility							
	Metric 1:	Methodology	Medium	$\times 1$	2	Information compiled from several different sources		
Domain 2: Repres	sentative							
	Metric 2:	Geographic Scope	Low	$\times 1$	3	China		
	Metric 3:	Applicability	High	$\times 2$	2	in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2016		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Access	ibility/Clari	itv						
	Metric 6:	Metadata Completeness	Medium	$\times 1$	2	Data sources are generally described but not fully transparent.		
Domain 4: Variah	ility and Ur	ncertainty						
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Medium		1.9			

Source Citation:	Li, L., Weber, R., Liu, J., Hu, J 2016. Long-term emissions of hexabromocyclododecane as a chemical of concern in products in China. Environment International							
Type of Data Source Hero ID	Releases to 3350476	b the Environment; Reports for 1	Data or Informa	tion Othe	er than	Exposure or Release Data;		
	0000110							
EXTRACTION Parameter			Data					
1 di dificitei			Data					
Life Cycle Stage:			Processing					
Life Cycle Descrip	otion (Subca	ategory of Use):	Textiles					
Release Source:			All releases we	re model	ed from	previous risk assessments, reports, and		
	_		China's HBCD	industry	v data			
Release or Emission Factor:		7.0E-6 to 7.3E-	-6					
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1. Reliab	ility							
	Metric 1:	Methodology	Medium	$\times 1$	2	Information compiled from several different sources		
Domain 2: Repres	sentative							
- ••r-••r	Metric 2:	Geographic Scope	Low	$\times 1$	3	China		
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Out of scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2016		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Access	vibility/Clar	it v/						
Domain 5. Access	Metric 6:	Metadata Completeness	Medium	$\times 1$	2	Data sources are generally described but not fully transparent.		
		*				- · · · ·		
Domain 4: Variab	oility and Ur	ncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty		
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.6.		

* MWF = Metric Weighting Factor

Source Citation:	Li, L., Weber, R., Liu, J., Hu, J 2016. Long-term emissions of hexabromocyclododecane as a chemical of concern in products in China. Environment International.								
Type of Data Source Hero ID	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3350476								
EXTRACTION									
Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source:			Consumer Use EPS, XPS, or textiles All releases were modeled from previous risk assessments, reports, and						
Release or Emission Factor:			China's HBCD 5.8E-8 to 1.4E-	industry -4	y data				
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	Medium	× 1	2	Information compiled from several different sources			
		0				Ċ.			
Domain 2: Repres	Sentative	Coorrentie Soone	Low	v 1	2				
	Metric 2: Metric 3:	Applicability	Low Unacceptable	$\times 1$ $\times 2$	3 8	China Non-occupational scenario (consumer use of textiles). No as-			
						sociated industrial /commercial information.			
	Metric 4: Motric 5:	Temporal Representativeness Sample Size	High	$\times 2$ $\times 1$	2	2016 characterized by no statistics			
Domain 3: Access	ibility/Clari Metric 6:	ity Metadata Completeness	Medium	× 1	2	Data sources are generally described but not fully transparent.			
Domain 4: Variab	ility and Ur Metric 7:	ncertainty Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty			
Overall Quality D	eterminatio	n [†]	Unacceptable		4	Metric Mean Score: 2.6.			
Continued on next page									
- continued from previous page									
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Source Citation:	Li, L., Weber, R., Liu, J., Hu, J 2016. Lor in China. Environment International.	ng-term emission	s of hexab	promocyc	lododecane as a chemical of concern in products				
Type of Data Source Hero ID	Releases to the Environment; Reports for 3350476	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3350476							
EVALUATION									
Domain	Metric	Rating	MWF^{\star}	Score	Comments				

** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation:	Li, L.,Web	Li, L., Weber, R., Liu, J., Hu, J 2016. Long-term emissions of hexabromocyclododecane as a chemical of concern in products in China. Environment International							
Type of Data Source Hero ID	Releases to 3350476	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3350476							
EXTRACTION Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use):			Disposal Demolitio HBCD	Disposal Demolition, recycling, landfill, or incineration of products containing HBCD					
Release Source:			All releas	es were r	nodeled	from previous risk assessments, reports, and			
Release or Emission Factor:			China's H 1.0E-6 to	BCD inc 9.0E-5	lustry d	ata			
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility								
	Metric 1:	Methodology	Medium	$\times 1$	2	Information compiled from several different sources			
Domain 2: Repres	sentative								
	Metric 2:	Geographic Scope	Low	$\times 1$	3	China			
	Metric 3:	Applicability	High	$\times 2$	2	in scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2016			
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.			
Domain 3: Access	sibility/Clar	itv							
	Metric 6:	Metadata Completeness	Medium	$\times 1$	2	Data sources are generally described but not fully transparent.			
Domain 4: Variah	oility and Ur	ncertainty							
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty			
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Medium		1.9				

 \star MWF = Metric Weighting Factor

Source Citation:	Takigami, solid waste	H.,Watanabe, M.,Kajiwara, N., e containing expanded and extru	2014. De	struction vrene ins	behavi	ior of hexabromocyclododecanes during incineration of foams. Chemosphere.
Hero ID Hero ID	Releases to 2343703	o the Environment; Reports for 1	Data or Inf	ormation	Other	than Exposure or Release Data;
EXTRACTION						
Parameter			Data			
Life Cycle Stage:			Disposal			
Life Cycle Descri	ption (Subca	ategory of Use):	EPS and	XPS insu	ilation	
Release Source:			EPS and	XPS ma	terials	were respectively blended with refuse derived
			fuel (RDI	F) as inp	ut wast	es for incineration. Concentrations of HBCDs
			contained	in the E	PS- and	d XPS-added RDFs, were 140 and 1100 mg kg
Dianagal /Tugator	ant Mathad		1, respect	ively.		un anim ant
Waste Treatment	Method		During th	on destru	action e	experiments with EPS and XPS, primary and
waste meathem	method.		secondary	z combus	tion zor	pes were maintained at temperatures of 840 C
			and 900	C. The r	residenc	times of waste in the primary combustion
			zone and	flue gas	in the	secondary combustion zone was 30 min and
			three seco	onds, resp	pectively	у.
P2 Control & per	rcent Efficier	ıcy:	Concentra	ation leve	els of th	he total HBCDs in the bag filter exit gas for
			the two e	experime	nts with	h EPS and XPS were 0.7 and 0.6 ng/m3, re-
			and fly a	7. HBCD	s were	also not detected $(\langle 0.2 \text{ ng/g} \rangle)$ in the bottom
			HBCDs w	vere suffic	iently d	estroyed in the whole incineration process with
			destructio	on efficier	icies of	more than 99.9999 for both of EPS and XPS
			cases.			
EVALUATION						
Domain		Metric	Rating	MWF^*	Score	Comments
Domain 1. Boliat	hility					
Domain 1. Itenat	Metric 1.	Methodology	High	× 1	1	Information is from trusted sources
	meene r.	wicehouology	111811		1	
Domain 9, Doma	wietitie 1.	wethodology	111.911		1	
Domain 2: Repre	esentative Metric 2:	Geographic Scope	Medium	× 1	- - -	Japan
Domain 2: Repre	esentative Metric 2: Metric 3:	Geographic Scope	Medium High	$\times 1$ $\times 2$	2	Japan in scope

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Source Citation:	Takigami, H., Watanabe, M., Kajiwara, N. 2014. Destruction behavior of hexabromocyclododecanes during incineration of solid waste containing expanded and extruded polystyrene insulation foams. Chemosphere.								
Type of Data Source Hero ID	Releases to 2343703	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 2343703							
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
	Metric 5:	Sample Size	High	$\times 1$	1	Study contains all sampling data results, from which statistics can be surmised			
Domain 3: Access	sibility/Clar	ity							
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Variab	Domain 4: Variability and Uncertainty								
	Metric 7:	Metadata Completeness	High	$\times 1$	1	well characterized			
Overall Quality Determination [†] High 1.1									

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Source Citation: Stubbin	Stubbings, W. A., Kajiwara, N., Takigami, H., Harrad, S 2016. Leaching behaviour of hexabromocyclododecane from treated curtains. Chemosphere						
Type of Data SourceReleasesHero ID3162362	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3162362						
EXTRACTION							
Parameter	Data						
Life Cycle Stage:		Disposal					
Life Cycle Description (Sub	category of Use):	Textiles					
Release Source:		HBCD in	to leacha	te			
Disposal /Treatment Meth	od:	landfill					
Release Estimation Method	:	Concentra	ation of	HBCD	in leachate in which textiles were submerged		
		was meas	ured over	r time			
Annual Release Quantity (.	(g/yr):	310,000 t	onnes of	textiles	are disposed of by householders annually		
EVALUATION							
Domain	Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliability							
Metric 1	: Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Representative							
Metric 2	: Geographic Scope	Medium	$\times 1$	2	Japan		
Metric :	: Applicability	High	$\times 2$	2	This disposal scenario is in scope		
Metric 4	: Temporal Representativeness	High	× 2	2	2016		
Metric 3	: Sample Size	High	× 1	1	Study contains all sampling data results, from which statistics can be surmised		
Domain 3: Accessibility/Cl	arity						
Metric 6	: Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
	rr , · ,						
Domain 4: Variability and	Uncertainty Matadata Completeness	Himb	× 1	1			
Metric 4	: Metadata Completeness	High	× 1	1	well characterized		
Overall Quality Determination ^{\dagger}				1.1			
	Continued on next page						

	– continued from previous page	
Source Citation:	Stubbings, W. A., Kajiwara, N., Takigami, H., Harrad, S 2016. Leaching behaviour of hexabromocyclododecane from treated curtains. Chemosphere.	ed
Type of Data Source Hero ID	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3162362	
EVALUATION		
Domain	Metric Rating MWF^* Score Comments	

Source Citation:	Guerra, P.	Guerra, P.,De La Cal, A.,Marsh, G.,Eljarrat, E.,Barcelo, D 2009. Transfer of hexabromocyclododecane from industrial							
Type of Data Source Hero ID	Releases to 3575325	Releases to the Environment; Environmental Release Data; 3575325							
EXTRACTION									
Parameter		Data							
Life Charle Channel									
Life Cycle Descri	ntion (Subca	ategory of Use):	EPS resin mfg						
Environmental M	edia:	longer, er eve).	surface water						
Release or Emissi	on Factor:		2 ug HBCD/L	wastewa	ter efflu	lent			
Release Estimatio	on Method:		sampled in WV	N effluen	t				
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	oility		N.C. 11	1	0				
	Metric 1:	Methodology	Medium	× 1	2	does not cover all release sources at the site			
Domain 2: Repre	sentative								
1	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Spain			
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	This use is out of scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2009			
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.			
Densis 2. Acces	:1::1::+ /Cl	·							
Domain 3: Access	Motrie 6:	Notadata Completeness	Low	~ 1	2	includes poloses modio hut no other metodate			
	Metric 0.	Metadata Completeness	LOW	~ 1	5	includes release media but no other metadata			
Domain 4: Varial	oility and Ui	ncertainty							
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty			
Overall Quality I	Determinatio	n'	Unacceptable		4	Metric Mean Score: 2.6.			

* MWF = Metric Weighting Factor

Data Data Life Cycle Stage: All Life Cycle Description (Subcategory of Use): All Release Estimation Method: EUSES model Waster Treatment Method: overall HBCD removal at WUTP of 80 percent; The major part is expected to be adsorbed P2 Control & percent Efficiency: Metric Rating MWF* Sore Comments Domain Metric 1: Methodology Medium × 1 2 The assessment or report uses high quality data and/or tech integers that are not from trusted information does not indicate flaws or quality issues. Domain 1: Reliability Metric 2: Geographic Scope Medium × 1 2 EU Metric 2: Geographic Scope Medium × 1 2 EU Metric 4: Temporal Representativeness Medium × 2 4 Morration is not from a particular scenario, but can be applicable to this data type. This figure was obtained from a model Domain 3: Accessibility/Clastity Metric 6: N/A N/A 3 Assessment or report provides results, but the underlying spatial and the data type. This figure was obtained from a model Domain 3: Accessibility/Clastity Metric 7: Metadata Completeness<	Source Citation:OType of Data SourceReHero ID38	ecd,. 200 eleases to 309146	7. SIDS initial assessment profi	le: Hexabro Data or Inf	omocyclo	dodecan Other	e (HBCDD). than Exposure or Release Data;		
Life Cycle Stage: All Life Cycle Description (Subcategory of Use): All Release Estimation Method: EUSES model Waste Treatment Method: overall HBCD removal at WWTP of 80 percent ; The major part is expected to be adsorbed to the sludge EVALUATION Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology Medium × 1 2 The assessment or report uses high quality data and/or tech information does not indicate flaws or quality issues. Domain 1: Reliability Metric 2: Geographic Scope Medium × 1 2 EU Metric 3: Applicability Medium × 1 2 EU Metric 4: Temporal Representative Medium × 2 4 Information is not from a particular scenario, but can be applied to in-scope uses Metric 4: Temporal Representativeness Medium × 1 2 EU Metric 6: Sample Size N/A N/A N/A N/A Domain 3: Accessibility/Clarity Low × 1 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.	EXTRACTION Parameter			Data					
EVALUATION Domain Metric Rating MWF* Score Comments Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology Medium $\times 1$ 2 The assessment or report uses high quality data and/or techniques that are not from trusted sources; however, Associated information does not indicate flaws or quality issues. Domain 2: Representative Metric 2: Geographic Scope Medium $\times 1$ 2 EU Metric 3: Applicability Medium $\times 2$ 4 Information is not from a particular scenario, but can be applied to in-scope uses Metric 4: Temporal Representativeness Medium $\times 2$ 4 2007 Metric 5: Sample Size N/A N/A N/A This metric is not applicable to this data type. This figure was obtained from a model Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low $\times 1$ 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Low	Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Estimation Method: Waste Treatment Method: P2 Control & percent Efficiency:				All All EUSES model wastewater treatment overall HBCD removal at WWTP of 80 percent ; The major part is expected to be adsorbed to the sludge				
Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology Medium $\times 1$ 2 The assessment or report uses high quality data and/or techniques that are not from trusted sources; however, Associated information does not indicate flaws or quality issues. Domain 2: Representative Metric 2: Geographic Scope Medium $\times 1$ 2 EU Metric 3: Applicability Medium $\times 2$ 4 Information is not from a particular scenario, but can be applied to in-scope uses Metric 4: Temporal Representativeness Medium $\times 2$ 4 2007 Metric 5: Sample Size N/A N/A N/A This metric is not applicable to this data type. This figure was obtained from a model Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low $\times 1$ 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent. Domain 4: Variability and Uncertainty Low $\times 1$ 3 No discussion of variability or uncertainty Overall Quality Determination [†] Low 2.3 Continued on next page 2.3	EVALUATION		N	D		a			
Domain 1: Reliability Metric 1: Methodology Medium $\times 1$ 2 The assessment or report uses high quality data and/or techniques that are not from trusted sources; however, Associated information does not indicate flaws or quality issues. Domain 2: Representative Metric 3: Medium $\times 1$ 2 EU Metric 4: Geographic Scope Metric 5: Medium $\times 2$ 4 Information is not from a particular scenario, but can be applied to in-scope uses Metric 4: Temporal Representativeness Metric 5: Medium $\times 2$ 4 2007 Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low $\times 1$ 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent. Domain 4: Variability and Uncertainty Metric 7: Low $\times 1$ 3 No discussion of variability or uncertainty Overall Quality Determination [†] Low 2.3 Continued on next page	Domain		Metric	Rating	MWF'*	Score	Comments		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Domain 1: Reliability M	y Tetric 1:	Methodology	Medium	$\times 1$	2	The assessment or report uses high quality data and/or tech- niques that are not from trusted sources; however, Associated information does not indicate flaws or quality issues.		
Domain 2. Representative Metric 2: Geographic Scope Medium $\times 1$ 2 EU Metric 3: Applicability Medium $\times 2$ 4 Information is not from a particular scenario, but can be applied to in-scope uses Metric 4: Temporal Representativeness Medium $\times 2$ 4 2007 Metric 5: Sample Size N/A N/A This metric is not applicable to this data type. This figure was obtained from a model Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low $\times 1$ 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Low $\times 1$ 3 No discussion of variability or uncertainty Overall Quality Determination [†] Low 2.3	Domain 2. Bepresent	ativo							
Metric 3: Applicability Medium $\times 2$ 4 Information is not from a particular scenario, but can be applied to in-scope uses Metric 4: Temporal Representativeness Medium $\times 2$ 4 2007 Metric 5: Sample Size N/A N/A This metric is not applicable to this data type. This figure was obtained from a model Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low $\times 1$ 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent. Domain 4: Variability and Uncertainty Low $\times 1$ 3 No discussion of variability or uncertainty Overall Quality Determination [†] Low 2.3 Continued on next page	M	letric 2:	Geographic Scope	Medium	$\times 1$	2	EU		
Metric 4: Temporal Representativeness Medium $\times 2$ 4 2007 Metric 5: Sample Size N/A N/A N/A This metric is not applicable to this data type. This figure was obtained from a model Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low $\times 1$ 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent. Domain 4: Variability and Uncertainty Low $\times 1$ 3 No discussion of variability or uncertainty Overall Quality Determination [†] Low 2.3 Continued on next page	М	etric 3:	Applicability	Medium	$\times 2$	4	Information is not from a particular scenario, but can be applied to in-scope uses		
Metric 5: Sample Size N/A N/A This metric is not applicable to this data type. This figure was obtained from a model Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low × 1 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent. Domain 4: Variability and Uncertainty Low × 1 3 No discussion of variability or uncertainty Overall Quality Determination [†] Low 2.3 Continued on next page	Μ	etric 4:	Temporal Representativeness	Medium	$\times 2$	4	2007		
Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low × 1 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty Overall Quality Determination [†] Low 2.3 Continued on next page Continued on next page	М	etric 5:	Sample Size	N/A		N/A	This metric is not applicable to this data type. This figure was obtained from a model		
Metric 6: Metadata Completeness Low × 1 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty Overall Quality Determination [†] Low 2.3 Continued on next page	Domain 3: Accessibil	itv/Clari	tv						
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty Overall Quality Determination [†] Low 2.3 Continued on next page	M	letric 6:	Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.		
Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty Overall Quality Determination [†] Low 2.3 Continued on next page	Domain 4: Variability	v and Un	ocertainty						
Overall Quality Determination [†] Low 2.3 Continued on next page	M	etric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty		
Continued on next page	Overall Quality Deter	rminatio	n [†]	Low		2.3			
			Cor	tinued on r	next page	9			

	contin	ueu nom p	nonous	page	
Source Citation: Type of Data Source Hero ID	Oecd,. 2007. SIDS initial assessment prof Releases to the Environment; Reports for 3809146	ile: Hexabro Data or Info	mocycloc ormation	lodecane (l Other tha	HBCDD). n Exposure or Release Data;
EVALUATION Domain	Metric	Rating	MWF*	Score	Comments

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Source Citation: Type of Data Source Hero ID	Priddy, D. B., et al., 2000. Kirk-Othmer Encyclopedia of Chemical TechnologyStyrene plastics. Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3981049							
EXTRACTION								
Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source:		All Styrene Plastic Does not ment	All Styrene Plastics Does not mention HBCD but describes the chemical and physical prop-					
			erties of styren	e plastic	s in deta	ail.		
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility							
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Bopros	contativo							
Domain 2. Repres	Metric 2:	Geographic Scope	High	$\times 1$	1	US		
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Toxicity information is relevant to the Risk Assessment, but is not utilized by the engineering assessors		
	Metric 4:	Temporal Representativeness	Low	$\times 2$	6	No Date (earliest sources from 1996)		
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type		
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans-		
						parent.		
Domain 4: Variab	oility and Ui Metric 7	ncertainty Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty		
					<u> </u>			
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.8.		

* MWF = Metric Weighting Factor

Source Citation:	Echa, 2009. Data on manufacture, import, export, uses and releases of HBCDD as well as information on potential alternatives to its use							
Type of Data Source Hero ID	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data; 3809166							
EXTRACTION								
Parameter			Data					
Life Cycle Stage: Life Cycle Descrip Release Source:	All scription (Subcategory of Use): All se: Summarizes releases that are presented in the EURAR (HERO ID 3970747)							
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Repres	sentative	Commendie Comme	M	v 1	0			
	Metric 2:	Geographic Scope	Medium	× 1 × 2	2	Multiple European countries		
	Metric 3.	Tomporal Representativeness	High	$\times 2$	4 9	Provides information on both in-scope and out of scope uses.		
	Metric 5:	Sample Size	Medium	$\times 2 \times 1$	$\frac{2}{2}$	Distribution of samples is characterized by a range with uncer- tain statistics. It is unclear if analysis is representative.		
Domain 3: Access	sibility/Clar Motric 6:	ity Motadata Completeness	High	× 1	1	fully transport		
	metric 0.	metadata Completeness	111511	^ I	1	iuny mansparent.		
Domain 4: Variab	oility and U	ncertainty						
	Metric 7:	Metadata Completeness	High	$\times 1$	1	discussion of variability or uncertainty		
Overall Quality D	eterminatio	n^\dagger	High		1.4			

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Managaki S, Y. Miyake, Y. Yokoyama, H. Hondo, S. Masunaga, S. Nakai, T. Kobayashi, T. Kameya, A. Kimura, T. Nakarai, Y. Oka, H. Otani, A. Miyake. 2009. Emission Load of Hexabromocyclododecane in Japan Based on the Substance Flow Analysis. Organohalogen Compounds. Releases to the Environment; Environmental Release Data; 5079146								
EXTRACTION									
Parameter	Data								
Life Cycle Stage:AllLife Cycle Description (Subcategory of Use):AllRelease Source:Life cycle analysis with releases from multiple stages.Release or Emission Factor:Refer to figure 1Release Estimation Method:Life cycle analysis									
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	Medium	× 1	2	The release data methodology is known or expected to be ac- curate (e.g., trusted source) but not fully explicit			
Domain 2: Repres	Sentative Motrie 2	Coographia Saona	Modium	× 1	0	Too see			
	Metric 2: Metric 3:	Applicability	High	$\times 1$ $\times 2$	2	Japan Contains multiple conditions of use that are in scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	$\frac{2}{2}$	2009			
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.			
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Medium	× 1	2	Release data include most critical metadata, including release media and release frequency, but lacks additional metadata, such as process, unit operation, and/or activity that is the source of the release.			
Domain 4. Variah	vility and U	ncertainty							
	Metric 7:	Metadata Completeness	High	$\times 1$	1	discussion of variability or uncertainty			
Overall Quality D	eterminatio	n†	High		1.6				
Continued on next page									

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Source Citation:	Managaki S, Y. Miyake, Y. Yokoyama, H Y. Oka, H. Otani, A. Miyake. 2009. E Analysis. Organohalogen Compounds.	. Hondo, S. I mission Load	Masunaga 1 of Hexa	a, S. Naka abromocy	i, T. Kobayashi, T. Kameya, A. Kimura, T. Nakarai, clododecane in Japan Based on the Substance Flow
Type of Data Source	Releases to the Environment; Environme	ntal Release	Data;		
Hero ID	5079146				
EVALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments

Source Citation: Type of Data Source Hero ID	L. Morf, A. M. Buser, R. Taverna, H. P. Bader, R. Scheidegger. 2008. Dynamic substance flow analysis as a valuable risk evaluation tool - A case study for brominated flame retardants as an example of potential endocrine disrupters. Chimia. Releases to the Environment; Environmental Release Data; 1927966							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Descrip Release Source: Release or Emissi Release Estimatio	ategory of Use):	All All Life cycle analysis with releases from multiple stages. Refer to figure 4 Life cycle analysis						
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliab	oility Metric 1:	Methodology	Medium	× 1	2	The release data methodology is known or expected to be ac- curate (e.g., trusted source) but not fully explicit		
Domain 2: Repre	sentative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High Low	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 3	Sweden Contains multiple conditions of use that are in scope 2008 Distribution of samples is qualitative or characterized by no statistics.		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Medium	× 1	2	Release data include most critical metadata, including release media and release frequency, but lacks additional metadata, such as process, unit operation, and/or activity that is the source of the release.		
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High $\times 1$ 1 discussion of variability or uncertainty								
Overall Quality Determination ^{\dagger}					1.6			
Continued on next page								

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Source Citation:	L. Morf, A. M. Buser, R. Taverna, H. F evaluation tool - A case study for bromin	P. Bader, R. S. nated flame r	Scheidegg etardants	er. 2008 as an ex	Dynamic substance flow analysis as a valuable risk ample of potential endocrine disrupters. Chimia.		
Type of Data Source	Releases to the Environmenti; Environmental Release Data;						
Hero ID	1927966						
EVALUATION							
Domain	Metric	Rating	MWF^{\star}	Score	Comments		

Source Citation:	U.S. Environmental Protection Agency. 1998. Characterization of building-related construction and demolition debris in the United States								
Type of Data Source Hero ID	Releases to the Environment; Environmental Release Data; 6388491								
EXTRACTION Parameter	Data								
Life Cycle Stage:			Use						
Life Cycle Descrip	ption (Subca	ategory of Use):	Constucti	ion and I	Demoliti	ion disposal			
Release Source:			Disposal	of constr	uction a	and demolition waste			
Disposal /Treatment Method: Release or Emission Factor:		construct and comb landfills, 35 to 45 j C&D was recovery)	construction and demolition (C&D) landfill; recovered - reuse, recycling, and combustion with energy recovery; municipal solid waste (MSW) landfills, unpermitted landfills, combustion facilities and other sites 35 to 45 percent of C&D waste is to C&D landfills; 20 to 30 percent of C&D waste is recovered (reuse, recycling, and combustion with energy						
Release Estimation Method: Annual Release Quantity (kg/yr): Number of Sites:		combustion facilities and other sites based on 1996 life cycle analysis (see page 51) 136 million tons/yr (1996) 1800 C&D recycling facilities (in 1996); 3500 C&D recyclers (1998)							
EVALUATION									
Domain		Metric	Rating	MWF*	Score	Comments			
Domain 1: Reliab	oility Metric 1:	Methodology	Medium	× 1	2	The release data methodology is known or expected to be ac- curate (e.g., trusted source) but not fully explicit			
	_								
Domain 2: Repres	sentative		TT: 1	1	1				
	Metric 2:	Geographic Scope	High	$\times 1$	1	United States			
	Metric 3:	Applicability	High	× 2	2	Construction and demolition are in scope			
	Metric 4: Metric 5:	Semple Size	Low	× 2 × 1	0	1996-1998			
	metric 9;	Sample Size	meann	× 1	2	characterized by a range with uncertain statistics			
Domain 3: Access	sibility/Clar	ity							
	Metric 6:	Metadata Completeness	Low	$\times 1$	3	Release data include release media but no other metadata			
	Continued on next page								

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Source Citation:	U.S. Environmental Protection Agency. United States.	1998. Charac	terizatio	n of bui	lding-related construction and demolition debris in the
Type of Data Source	Releases to the Environment; Environm	ental Release	Data;		
Hero ID	6388491		,		
EVALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments
Domain 4: Variab	oility and Uncertainty Metric 7: Metadata Completeness	High	× 1	1	addresses variability in the determinants of release
Overall Quality I	$\operatorname{Determination}^\dagger$	Medium		1.9	

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Source Citation:U.S. EnvirType of Data SourceReleases tHero ID6388382	ronmental Protection Agency. 20 o the Environment; Environmen	003. unadju tal Release	isted dat Data;	a for Un	ited States.		
EXTRACTION							
Parameter		Data					
		* *					
Life Cycle Stage:		Use		D 1.4.	1. 1		
Life Cycle Description (Subc	ategory of Use):	Constuct:	ion and I	Demoliti	on disposal		
Release Source:		Disposal	or constr	domo aliti	and demonstron waste		
Disposal / Treatment Method	.:	construct	ion and o	iemolitie	on (C&D) landnii, recovered - reuse, recycling,		
Dalaaga on Emission Faston		E2 monorm	t of Cl-I	ntn ener	gy recovery		
Release of Elinssion Factor.		some to	MSW la	ndfille a	nd other sites): 48 percent recovered (reuse		
		recycling	and con	nums a	with energy recovery) (likely an overestimate		
		due to th	e inclusi	on of no	n-C&D waste)		
Release Estimation Method:		based on	2003 sta	te data			
Annual Release Quantity (kg	/vr):	170 millio	$\frac{1}{2}$ on tons/y	vr (2003)			
Number of Sites:	<i>y y</i> - <i>y</i> -	1900 C&D landfills (2002); 1500 C&D landfills (2004)					
				· · · ·	,		
EVALUATION							
Domain	Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Boliability							
Metric 1.	Methodology	High	× 1	1	Methodology is known and explicit (state-specific data pro-		
	Wethodology	111511	~ 1	1	vided)		
Domain 2: Representative	~						
Metric 2:	Geographic Scope	High	× 1	1	United States		
Metric 3:	Applicability	High	$\times 2$	2	Construction and demolition are in scope		
Metric 4:	Temporal Representativeness	Medium	× 2	4	2003		
Metric 5:	Sample Size	Medium	× 1	2	unclear if analysis of selected states is representative of na- tional practices		
Domain 3: Accessibility/Clar	ity						
Metric 6:	Metadata Completeness	Low	$\times 1$	3	Release data include release media but no other metadata		
Domain 4: Variability and U	ncertainty						
	ancer validation of the second s						
	Cor	ntinued on i	next pag	e			

commade nom providus page							
Source Citation: Type of Data Source Hero ID	U.S. Envire Releases to 6388382	onmental Protection Agency. the Environment; Environme	2003. unadju ental Release	sted data Data;	ı for Un	ited States.	
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
	Metric 7:	Metadata Completeness	High	$\times 1$	1	addresses variability in the determinants of release	
Overall Quality E	Determination	n^\dagger	High		1.6		

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* MWF = Metric Weighting Factor

Source Citation:	Townsend, T.; Ingwersen, W.; Niblick, B.; Jain, P.; Wally. J 2019. CDDPath: A method for quantifying the loss and recovery of construction and demolition debris in the United States. Waste Management.								
Type of Data Source Hero ID	Releases to 6388403	Releases to the Environment; Published Models for Exposures or Releases; 6388403							
EXTRACTION									
Parameter			Data						
Life Cycle Stage:			Use						
Life Cycle Descrip	otion (Subca	ategory of Use):	Constu	ction and	l Demol	ition disposal			
Release Source:	(Disposa	l of cons	struction	and demolition waste			
Disposal /Treatm	ent Method	:	construe	ction and	d demoli	tion (C&D) landfill, recovered - reuse, recycling,			
1 /			and con	nbustion	with en	nergy recovery			
Release or Emissi	on Factor:		70 perce	ent of C&	zD wast	e goes to landfill (excludes concrete and asphalt,			
			which s	way the	number	s); 30 percent processed for reuse, recycling, or			
			energy i	recovery					
Release Estimatio	on Method:		materia	l flow an	alysis u	sing 2014 state data			
Annual Release Q	Quantity (kg	/yr):	540 metric tons (2014)						
EVALUATION	EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	oility		TT' 1	1	1				
	Metric 1:	Methodology	High	× 1	1	model is free of mathematical errors and is based on scientifi- cally sound approaches or methods			
Domain 2: Repres	sentative		TT: 1	1	1				
	Metric 2:	Geographic Scope	High	× 1	1	United States			
	Metric 3:	Applicability	High Hish	× 2	2	Construction and demolition are in scope			
	Metric 4: Metric 5:	Semple Size	M/Λ	× 2	Z N / A	based on 2014 data			
	Metric 5:	Sample Size	N/A		N/A	not applicable to this data source			
Domain 3: Accoss	aibility /Clar	ity							
Domain 5. Access	Metric 6	Metadata Completeness	High	× 1	1	Model approach equations, and choice of parameter values are			
		moudade compreteness	111811	~ 1	-	transport and clear and can be evaluated			
	Methe 0.	*				transparent and clear and can be evaluated			
	wienie o.					transparent and clear and can be evaluated			
Domain 4: Variab	bility and U	ncertainty				transparent and clear and can be evaluated			
Domain 4: Variab	bility and Un Metric 7:	ncertainty Metadata Completeness	High	× 1	1	addresses variability in the determinants of release			
Domain 4: Variab	bility and Un Metric 7:	ncertainty Metadata Completeness Con	High tinued on	× 1	1 age	addresses variability in the determinants of release			

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Source Citation:	Townsend, T.; Ingwersen, W.; Niblick, I	B.; Jain, F	P.; Wally.	J 2019	CDDPath: A method for quantifying the loss and			
Type of Data Source Hero ID	Releases to the Environment; Published Models for Exposures or Releases; 6388403							
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score	Comments			
Overall Quality D	$\operatorname{Petermination}^{\dagger}$	High		1.0				

Source Citation:Texas Commission on Environmental QuType of Data SourceReleases to the Environment; EnvironmentHero ID6388402	ality. 2017 ental Releas	. Study o se Data;	on the e	economic impacts of recycling, final report.		
EXTRACTION Parameter	Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Disposal /Treatment Method: Release or Emission Factor: Release Estimation Method: Annual Release Quantity (kg/yr): Number of Sites:	Use Constu Disposa disposa 33 perc 2015 da C&D w 10 land	Use Constuction and Demolition disposal Disposal of construction and demolition waste disposal and recycling 33 percent is recycled in texas 2015 data from voluntary surveys C&D waste disposed of = 6,359,056C&D recycled = 3,136,727 10 landfills, 8 transfer stations, 22 C&D processing facilities, 18 unknown				
EVALUATION Domain Metric	Bating	MWF*	Score	Comments		
Domain 1: Reliability Metric 1: Methodology	High	× 1	1	Methodology is known and explicit (state-specific data pro- vided)		
Domain 2: Representative Metric 2: Geographic Scope Metric 3: Applicability Metric 4: Temporal Representativeness Metric 5: Sample Size	High High s High Low	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	1 2 2 3	United States Construction and demolition are in scope based on 2015 data texas data not likely representative of national practices		
Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata		
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness	High	× 1	1	addresses variability in the determinants of release		
Overall Quality Determination ^{\dagger}	High		1.4			

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	 U.S. Environmental Protection Agency. 2018. Sustainable management of construction and demolition materials. Releases to the Environment; Environmental Release Data; 6388385 							
EXTRACTION								
Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Disposal /Treatment Method: Release or Emission Factor: Release Estimation Method:			Use Constuction and Demolition disposal Disposal of construction and demolition waste disposal and recycling 36 percent recycled; 64 percent disposed of (landfill) based on 2011 data and extrapolation					
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Methodology is known and explicit (state-specific data pro- vided)		
Domain 2: Repres	sentative							
	Metric 2:	Geographic Scope	High	$\times 1$	1	United States		
	Metric 3:	Applicability	High	$\times 2$	2	Construction and demolition are in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	based on 2011 data		
	Metric 5:	Sample Size	Medium	$\times 1$	2	characterized by a range with uncertain statistics		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	$\times 1$	3	Release data include release media but no other metadata		
Domain 4: Variab	bility and Un Metric <u>7:</u>	ncertainty Metadata Completeness	High	× 1	1	addresses variability in the determinants of release		
Overall Quality D	Determinatio	n [†]	High		1.3			

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	U.S. Environmental Protection Agency. 2018. Advancing sustainable materials management: 2015 fact sheet. Releases to the Environment; Environmental Release Data; 6388383							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Release Source: Disposal /Treatment Method: Release or Emission Factor: Release Estimation Method:			Disposal Municipal Solid Waste disposal of municipal solid waste (MSW) landfill, combustion with energy recovery, recycling, composting 12.8 percent energy to recovery; 52.5 percent landfill; 25.8 recycle; 8.9 percent composting based on 2015 data					
EVALUATION		Metric	Bating	MWF*	Score	Comments		
		Wiethe	Itating	101 00 1	Beore	Commentes		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Methodology is known and explicit (state-specific data pro- vided)		
Demeir 9. Deme								
Domain 2: Repres	Motric 2.	Geographic Scope	High	~ 1	1	United States		
	Metric 3:	Applicability	Low	$\times 1 \times 2$	6	Disposal of MSW not in scope but may be related to disposal of C&D waste		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	based on 2015 data		
	Metric 5:	Sample Size	Medium	$\times 1$	2	characterized by a range with uncertain statistics		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata		
	1.100110 0.		2011	<u></u>	9			
Domain 4: Variab	oility and Ui	ncertainty						
	Metric 7:	Metadata Completeness	High	$\times 1$	1	addresses variability in the determinants of release		
Overall Quality E	Determinatio	\mathbf{n}^{\dagger}	Medium		1.8			

* MWF = Metric Weighting Factor

Occupational Exposure

Source Citation: Type of Data Source Hero ID	Thomsen, C.,Molander, P.,Daae, H. L.,JanÃ _i k, K.,Froshaug, M.,Liane, V. H.,Thorud, S.,Becher, G.,Dybing, E. 2007. Occupational exposure to hexabromocyclododecane at an industrial plant. Environmental Science and Technology. Occupational Exposure; Monitoring Data; 787728								
EXTRACTION Parameter			Data						
Life Cycle Stage: Life Cycle Descrip Physical Form:	tion (Subca	tegory of Use):	Processin EPS Resi Dust	g n produc	tion				
Route of Exposure Exposure Concent Number of Sample	Route of Exposure: Exposure Concentration (Unit): Number of Samples:			ı 3 - 150 uş	g/m3				
Number of Sites: Type of Measurement or Method: Worker Activity:			1 8-hr TWA reactor w PS granu sifting ar	1 8-hr TWA reactor work (reactor), including weighing and addition of HBCD to the PS granulates in the reactor, and subsequent washing, centrifugation,					
Number of Worker Type of Sampling Sampling Location	Number of Workers: Type of Sampling: Sampling Location:			10 total for all activities Personal breathing zone Reactor (24 samples)					
Exposure Duration: Exposure Frequency:		8-hr HBCD co times a y usually la work shif least a 7-c	8-hr HBCD containing products are produced in intermittent periods, 8 to 10 times a year at the plant under investigation, and a production period usually lasts up to 14 days with 24-hr operation divided into three 8-h work shifts a day. Every production period is regularly followed by at least a 7 day period where and usta pet containing HBCD are produced						
Bulk and Dust Pa	rticle Size I	Distribution:	20 nm to	2 mm Hl	3CD pa	rticles were added to EPS			
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments			
Domain 1: Reliabi	lity Metric 1:	Methodology	High	× 1	1	Per article "This methodology is validated and is in routine use at the National Institute of Occupational HealthA certi- fied occupationalhygienist from the company"s Occupational- Health Service executed the practical air sampling accordingto a detailed protocol."			
			Continued on r	next page					

		contin	ucu nom j	proviou	page				
Source Citation:	Thomsen, C.,Molander, P.,Daae, H. L.,JanÃjk, K.,Froshaug, M.,Liane, V. H.,Thorud, S.,Becher, G.,Dybing, E. 2007. Occupational exposure to hexabromocyclododecane at an industrial plant. Environmental Science and Technology.								
Type of Data Source Hero ID	Occupation 787728	Occupational Exposure; Monitoring Data; 787728							
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 2: Repres	sentative								
	Metric 2:	Geographic Scope	Medium	× 1	2	A Scandanavian Industrial Plant. Since all scandanavian coun- tries (Sweden, Denmark, Finland, Norway, Iceland) are in OECD this score is a 2.			
	Metric 3:	Applicability	Medium	$\times 2$	4	Manufacturing EPS is not in scope, but some information may be applicable to other scenarios that are in scope			
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	The report was published in $2007 (> 10 \text{ years ago})$			
	Metric 5:	Sample Size	High	$\times 1$	1	Discrete sample points provided			
Domain 3. Access	sibility/Clar	ity							
Domain 5. Access	Metric 6:	Metadata Completeness	High	$\times 1$	1	All pertinent monitoring data is provided.			
Domain 4: Variat	$M \rightarrow 7$	ncertainty	т		9				
	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty			
Overall Quality I	Oeterminatio	\mathbf{n}^{\dagger}	Medium		1.8				

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Source Citation: Type of Data Source Hero ID	Thomsen, C.,Molander, P.,Daae, H. L.,JanÃ _i k, K.,Froshaug, M.,Liane, V. H.,Thorud, S.,Becher, G.,Dybing, E. 2007. Occupational exposure to hexabromocyclododecane at an industrial plant. Environmental Science and Technology. Occupational Exposure; Monitoring Data; 787728								
EXTRACTION Parameter			Data						
Life Cycle Stage:	. (7.1		Processin	g	_				
Life Cycle Descrip	otion (Subca	tegory of Use):	EPS Resi	n produc	tion				
Physical Form:			Dust	_					
Route of Exposur	e: motion (IImi	+).	Innalatio	n 					
Exposure Concern	tration (Oni	t):	0.24 ug/1	115 - 0.80	ug/m5				
Number of Sites:	es.		0						
Type of Measurer	pont or Mot	hod	1 8 hr TW/	\					
Worker Activity:	licite of mice	nou.	mixing pi	1 rocedures	(mixer) a closed automated processexcluding poten-			
Worker Healvily.			tial conta	ct with n	eat HB	CD			
Number of Worke	rs:		10 total for all activities						
Type of Sampling	:		Personal breathing zone						
Sampling Location	n:		Mixer (6 samples)						
Exposure Duratio	n:		8-hr						
Exposure Frequen	cy:		HBCD containing products are produced in intermittent periods, 8 to 10						
Bulk and Dust Particle Size Distribution:			times a y usually la work shif least a 7-6 20 nm to	ear at thusts up to ts a day. day period 2 mm Hl	e plant 14 day Every d where BCD pa	under investigation, and a production period vs with 24-hr operation divided into three 8-h production period is regularly followed by at products not containing HBCD are produced. articles were added to EPS			
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility Motria 1	Mothodology	Uimh	× 1	1				
	Metric 1.	Methodology	mgn	~ 1	1	use at the National Institute of Occupational HealthA certi- fied occupationalhygienist from the company's Occupational- Health Service executed the practical air sampling according to a detailed protocol."			
			Continued on a	next page					

Source Citation: Type of Data Source	Thomsen, C.,Molander, P.,Daae, H. L.,JanÃ _i k, K.,Froshaug, M.,Liane, V. H.,Thorud, S.,Becher, G.,Dybing, E. 2007. Occupational exposure to hexabromocyclododecane at an industrial plant. Environmental Science and Technology. Occupational Exposure; Monitoring Data;								
Hero ID	787728	787728							
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 2: Repres	sentative								
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	A Scandanavian Industrial Plant. Since all scandanavian coun- tries (Sweden, Denmark, Finland, Norway, Iceland) are in OECD this score is a 2.			
	Metric 3:	Applicability	Medium	$\times 2$	4	Manufacturing EPS is not in scope, but some information may be applicable to other scenarios that are in scope			
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	The report was published in $2007 (> 10 \text{ years ago})$			
	Metric 5:	Sample Size	High	$\times 1$	1	Discrete sample points provided			
Domain 3: Access	sibility/Clar	itv							
	Metric 6:	Metadata Completeness	High	$\times 1$	1	All pertinent monitoring data is provided.			
Domain 4: Variab	oility and U	ncertainty							
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty			
Overall Quality D	Determinatio	\mathbf{n}^{\dagger}	Medium		1.8				

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* MWF = Metric Weighting Factor

in Birmingham UK: implications for hu	Abdallah, M. A., Harrad, S., Covaci, A 2008. Hexabromocyclododecanes and tetrabromobisphenol-A in indoor air and dust					
Type of Data SourceOccupational Exposure; Monitoring DataHero ID1079114	n;	Ivironine	intai Scie	ence and recimology.		
EXTRACTION	_					
Parameter	Data					
Life Cycle Stage:	Consumer Use	:				
Life Cycle Description (Subcategory of Use):	Insulation pro-	ducts in	Homes			
Physical Form:	settled dust					
Route of Exposure:	Inhalation					
Exposure Concentration (Unit):	67 - 1,300 pg/:	m3 (mea	n - 250 j	pg/m3)		
Number of Sites:	33					
Type of Measurement or Method:	TWA					
Worker Activity:	Modeled data	based o	n HBCI	O concentration in dust. No associated		
	worker activity	7.				
Sampling Location:	Homes					
EVALUATION						
Domain Metric	Rating	MWF*	Score	Comments		
Domain 1. Beliability						
Metric 1: Methodology	Medium	$\times 1$	2	Describes how the data was modeled from the HBCD dust concentrations		
Domain 2: Representative						
Metric 2: Geographic Scope	Medium	$\times 1$	2	UK		
Metric 3: Applicability	Unacceptable	$\times 2$	8	Non-occupational scenario (settled dust in homes). No associ- ated worker activites.		
Metric 4: Temporal Representativeness	Medium	$\times 2$	4	Published in 2008 (10 years ago)		
Metric 5: Sample Size	High	$\times 1$	1	Indicates number of locations but does not specify number of samples at each location. However, provides several statistics of the sample size.		
Domain 3: Accessibility/Clarity						
Metric 6. Metadata Completeness	High	× 1	1	Specific details of studied samples sampling and applytical-		
Monte 0. Monadata Completeness	111511	/\ I	1	protocols, as well as statistical summaries of concentrations of individual HBCD in each sample are available online as well		
	Continued on nex	t page				

		- cont	tinued from pre	evious p	age			
Source Citation:	Abdallah, in Birming	Abdallah, M. A., Harrad, S., Covaci, A. 2008. Hexabromocyclododecanes and tetrabromobisphenol-A in indoor air and dust in Birmingham, U.K: implications for human exposure. Environmental Science and Technology.						
Type of Data Source	Occupation	nal Exposure; Monitoring Data	;					
Hero ID	1079114							
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 4: Varial	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality I	Determinatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.3.		

* MWF = Metric Weighting Factor

Source Citation: Abdal	Abdallah, M. A., Harrad, S., Covaci, A 2008. Hexabromocyclododecanes and tetrabromobisphenol-A in indoor air and dust							
Type of Data Source Occup Hero ID 10791	Occupational Exposure; Monitoring Data; 1079114							
EXTRACTION		_						
Parameter		Data						
Life Cycle Stage:		Commerical U	se					
Life Cycle Description (S	ubcategory of Use):	Insulation pro-	ducts in	Offices				
Physical Form:		settled dust						
Route of Exposure:		Inhalation						
Exposure Concentration	(Unit):	70 - 460 pg/m	3 (mean	- 180 pg	s/m3)			
Number of Sites:		25						
Type of Measurement or	Method:	TWA						
Worker Activity:		Modeled data	based of	n HBCI	O concentration in dust. No associated			
		worker activity	7.					
Sampling Location:		Offices						
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1. Beliability								
Metric	1: Methodology	Medium	$\times 1$	2	Describes how the data was modeled from the HBCD dust concentrations			
Domain 2: Representativ	2							
Metrie	2: Geographic Scope	Medium	$\times 1$	2	UK			
Metrie	3: Applicability	Unacceptable	$\times 2$	8	Occupational scenario (use of insulation in offices). No associ- ated worker activities.			
Metrie	4: Temporal Representativeness	Medium	$\times 2$	4	Published in 2008 (10 years ago)			
Metrie	5: Sample Size	High	$\times 1$	1	Indicates number of locations but does not specify number of samples at each location. However, provides several statistics of the sample size.			
Domain 3: Accessibility/]]arity							
Metric	6: Metadata Completeness	High	× 1	1	Specific details of studied samples, sampling and analytical-			
	Metric 6: Metadata Completeness High × 1 1 Specific details of studied samples, sampling and as protocols, as well as statistical summaries of concent individual HBCD in each sample are available online							
		Continued on nex	t page					

		- cont	tinued from pre	evious p	age			
Source Citation:	Abdallah, in Birming	Abdallah, M. A., Harrad, S., Covaci, A. 2008. Hexabromocyclododecanes and tetrabromobisphenol-A in indoor air and dust in Birmingham, U.K: implications for human exposure. Environmental Science and Technology.						
Type of Data Source	Occupation	nal Exposure; Monitoring Data	;					
Hero ID	1079114							
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 4: Varial	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality I	Determinatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.3.		

* MWF = Metric Weighting Factor

Source Citation: Abdall	Abdallah, M. A., Harrad, S., Covaci, A 2008. Hexabromocyclododecanes and tetrabromobisphenol-A in indoor air and dust in Birmingham, U.K. implications for human concerns. Environmental Science and Technology								
Type of Data Source Occup Hero ID 107911	Occupational Exposure; Monitoring Data; 1079114								
EXTRACTION		_							
Parameter		Data							
Life Cycle Stage:		Consumer Use							
Life Cycle Description (St	bcategory of Use):	Insulation pro-	ducts in	indoor p	public microenvironments				
Physical Form:		settled dust							
Route of Exposure:		Inhalation							
Exposure Concentration (Unit):	820- 960 pg/m	13 (mean	- 900 pg	g/m3)				
Number of Sites:		4							
Type of Measurement or	Method:	TWA							
Worker Activity:		Modeled data	based o	n HBCI	O concentration in dust. No associated				
		worker activity	7.						
Sampling Location:	Sampling Location:				Public Microenvironments				
EVALUATION									
Domain	Metric	Rating	MWF^{\star}	Score	Comments				
Domain 1: Reliability									
Metric	1: Methodology	Medium	$\times 1$	2	Describes how the data was modeled from the HBCD dust concentrations				
Domain 2: Representative									
Metric	2: Geographic Scope	Medium	$\times 1$	2	UK				
Metric	3: Applicability	Unacceptable	$\times 2$	8	Non-occupational scenario (settled dust in gen pop areas). No associated worker activites.				
Metric	4: Temporal Representativeness	Medium	$\times 2$	4	Published in 2008 (10 years ago)				
Metric	5: Sample Size	High	$\times 1$	1	Indicates number of locations but does not specify number of samples at each location. However, provides several statistics of the sample size.				
Domain 3. Accessibility/0	larity								
Metric	6: Metadata Completeness	High	× 1	1	Specific details of studied samples, sampling and analytical-				
	Metric 6: Metadata Completeness High × 1 1 Specific details of studied samples, sampling and a protocols, as well as statistical summaries of concen individual HBCD in eachsample are available online								
		Continued on nex	ct page						

		- cont	tinued from pre	evious p	age			
Source Citation:	Abdallah, in Birming	Abdallah, M. A., Harrad, S., Covaci, A. 2008. Hexabromocyclododecanes and tetrabromobisphenol-A in indoor air and dust in Birmingham, U.K: implications for human exposure. Environmental Science and Technology.						
Type of Data Source	Occupation	nal Exposure; Monitoring Data	;					
Hero ID	1079114							
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 4: Varial	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality I	Determinatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.3.		

* MWF = Metric Weighting Factor

Type of Data Source Occupational Exposure; Monitoring Data;	ian exposure. En	wnonne	mai scie	shee and rechnology.		
Hero ID 1079114						
EXTRACTION	_					
Parameter	Data					
Life Cycle Stage:	Consumer Use					
Life Cycle Description (Subcategory of Use):	Outdoor Air					
Physical Form:	Dust					
Route of Exposure:	Inhalation					
Exposure Concentration (Unit):	34 - $40~\mathrm{pg/m3}$	(mean -	37 pg/n	n3)		
Number of Sites:	5					
Type of Measurement or Method:	TWA					
Worker Activity:	Modeled data	based of	n HBCI	O concentration in dust. No associated		
	worker activity	<i>.</i>				
Sampling Location:	Outdoor Air					
EVALUATION						
Domain Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliability						
Metric 1: Methodology	Medium	$\times 1$	2	Describes how the data was modeled from the HBCD dust concentrations		
Domain 2: Representative						
Metric 2: Geographic Scope	Medium	$\times 1$	2	UK		
Metric 3: Applicability	Unacceptable	$\times 2$	8	Non-occupational scenario (outdoor air dust in gen pop areas). No associated worker activites.		
Metric 4: Temporal Representativeness	Medium	$\times 2$	4	Published in 2008 (10 years ago)		
Metric 5: Sample Size	High	$\times 1$	1	Indicates number of locations but does not specify number of samples at each location. However, provides several statistics of the sample size.		
Domain 3: Accessibility/Clarity						
Metric 6: Metadata Completeness	High	× 1	1	Specific details of studied samples sampling and applytical-		
		× 1	T	protocols, as well as statistical summaries of concentrations of individual HBCD in each sample are available online as well		
(Continued on nex	t page				

		- cont	tinued from pre	evious p	age			
Source Citation:	Abdallah, in Birming	Abdallah, M. A., Harrad, S., Covaci, A. 2008. Hexabromocyclododecanes and tetrabromobisphenol-A in indoor air and dust in Birmingham, U.K: implications for human exposure. Environmental Science and Technology.						
Type of Data Source	Occupation	nal Exposure; Monitoring Data	;					
Hero ID	1079114							
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 4: Varial	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality I	Determinatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.3.		

* MWF = Metric Weighting Factor
| Source Citation: | Abdallah, M. A.,Harrad, S.,Covaci, A 2008. Hexabromocyclododecanes and tetrabromobisphenol-A in indoor air and dust
in Birmingham, U.K. implications for human exposure. Environmental Science and Technology | | | | | | | | |
|--------------------------------|--|-----------------------------|------------------|---------------|----------|---|--|--|--|
| Type of Data Source
Hero ID | Occupational Exposure; Monitoring Data;
1079114 | | | | | | | | |
| EXTRACTION | | | | | | | | | |
| Parameter | Data | | | | | | | | |
| Life Cycle Stage: | | | Consumer Use | | | | | | |
| Life Cycle Descrip | Indoor Air | | | | | | | | |
| Physical Form: | × × | | Dust | | | | | | |
| Route of Exposure | e: | | Inhalation | | | | | | |
| Exposure Concent | ration (Uni | t): | 90 ng/g - 140,0 | 000 ng/g | (mean · | - 8,300 ng/g) | | | |
| Number of Sites: | | | 97 | | | | | | |
| Type of Measuren | nent or Met | hod: | Concentration | in dust | | | | | |
| Worker Activity: | | | HBCDs found | from sev | eral pro | oducts used in indoor environments. No | | | |
| | | | associated wor | ker activi | ity. | | | | |
| EVALUATION | | | | | | | | | |
| Domain | | Metric | Rating | MWF^{\star} | Score | Comments | | | |
| Domain 1. Daliah | :1:4 | | | | | | | | |
| Domain 1: Kenab | Metric 1: | Methodology | Medium | $\times 1$ | 2 | Describes how the data was modeled from the HBCD dust con-
centrations | | | |
| Domain 2: Benres | entative | | | | | | | | |
| Domain 2. Roproc | Metric 2: | Geographic Scope | Medium | × 1 | 2 | UK | | | |
| | Metric 3: | Applicability | Unacceptable | $\times 2$ | 8 | Non-occupational scenario (outdoor air dust in gen pop areas).
No associated worker activites. | | | |
| | Metric 4: | Temporal Representativeness | Medium | $\times 2$ | 4 | Published in 2008 (10 years ago) | | | |
| | Metric 5: | Sample Size | High | $\times 1$ | 1 | Indicates number of locations but does not specify number of
samples at each location. However, provides several statistics
of the sample size. | | | |
| Domain 3: Accoss | ibility/Clar | it v | | | | | | | |
| Domain 5. Access | Metric 6: | Metadata Completeness | Low | $\times 1$ | 3 | Only includes amount in dust (essentially an HBCD concentration) | | | |
| Domain 4: Variab | ility and Ur | ncertainty | | | | | | | |
| | | (| Continued on nex | t page | | | | | |

providus page								
Source Citation: Type of Data Source Hero ID	Abdallah, M. A.,Harrad, S.,Covaci, A 2008. Hexabromocyclododecanes and tetrabromobisphenol-A in indoor air and dust in Birmingham, U.K: implications for human exposure. Environmental Science and Technology. Occupational Exposure; Monitoring Data; 1079114							
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty		
Overall Quality Determination [†] Unacceptable 4 Metric Mean Score: 2.6.								

** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	ToxNet Hazardous Substances Data, Bank. 2017. HSDB: Hexabromocyclododecane. Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 3970277								
EXTRACTION									
Parameter			Data						
Life Cycle Stage:		Import	Import						
Worker Activity:	ption (Subca	itegory of Use):	Import Workers	at import	ation a	nd manufacturing sites per 2012 CDB			
Number of Worke	ers:		<10 to 25	5-49 work	ers per	site			
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	oility								
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources			
Domain 2: Repres	sentative								
	Metric 2:	Geographic Scope	High	$\times 1$	1	US			
	Metric 3:	Applicability	High	$\times 2$	2	Importation is in scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012			
	Metric 5:	Sample Size	Medium	× 1	2	Information is from 3 CDR reporting sites, which represents only the sites exceeding the reporting threshold, so maybe not every possible site			
Domain 3: Access	sibility/Clar	itv							
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Information is all clearly cited			
Domain 4: Variab	oility and Ur	ncertainty							
	Metric 7:	Metadata Completeness	Medium	× 1	2	Report addresses CBI claims, but not much else			
Overall Quality I	Determinatio	\mathbf{n}^{\dagger}	High		1.2				

* MWF = Metric Weighting Factor

Source Citation:	sion: Nicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34.								
Hero ID 3	3978355	nai Exposure, Completed Expos	ure of filsk Asse	ssmems;					
EXTRACTION Parameter			Data						
			a						
Life Cycle Stage:	Commerical Us	se Le cha in d	Off						
Life Cycle Descript:	ion (Subca	itegory of Use):	Insulation proc	iucts in (Omces				
Route of Exposure:			Inhalation						
Exposure Concentra	ation (Uni	t).	Mean $-$ 1400 i	io/ko du	st Medi	an — 650 ug/kg dust (UK): Mean — 592			
Exposure concentra			ug/kg dust. M	dian = 1	367 ug/l	kg dust (Belgium)			
Number of Samples	:		16	oundin	001 48/1	is and (Boistain)			
Number of Sites:			Unknown (>10))					
Type of Measureme	ent or Met	hod:	HBCD concent	ration in	dust wa	as measured and exposure was calculated			
			with assumption	ons. See	assumpt	ions on page 59.			
Worker Activity:			Office workers. No associated worker activity.						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliabili	itv								
	/								
	Metric 1:	Methodology	High	$\times 1$	1	Information collected from journal studies			
Domain 2: Represe	Metric 1:	Methodology	High	× 1	1	Information collected from journal studies			
Domain 2: Represe	Metric 1: ntative Metric 2:	Methodology Geographic Scope	High Medium	× 1 × 1	1	Information collected from journal studies			
Domain 2: Represe	Metric 1: ntative Metric 2: Metric 3:	Methodology Geographic Scope Applicability	High Medium Unacceptable	$\begin{array}{c} \times 1 \\ \times 1 \\ \times 2 \end{array}$	1 2 8	Information collected from journal studies UK, Belgium Occupational scenario (use of insulation in offices). No associ- ated worker activities.			
Domain 2: Represe	Metric 1: ntative Metric 2: Metric 3: Metric 4:	Methodology Geographic Scope Applicability Temporal Representativeness	High Medium Unacceptable High	$\begin{array}{c} \times 1 \\ \times 1 \\ \times 2 \\ \times 2 \end{array}$	1 2 8 2	Information collected from journal studies UK, Belgium Occupational scenario (use of insulation in offices). No associ- ated worker activities. 2008-2010			
Domain 2: Represe 1 1 1	Metric 1: ntative Metric 2: Metric 3: Metric 4: Metric 5:	Methodology Geographic Scope Applicability Temporal Representativeness Sample Size	High Medium Unacceptable High Medium	$\begin{array}{c} \times 1 \\ \times 1 \\ \times 2 \\ \times 2 \\ \times 1 \end{array}$	1 2 8 2 2	Information collected from journal studies UK, Belgium Occupational scenario (use of insulation in offices). No associ- ated worker activities. 2008-2010 Mean and median provided, no other statistics. 16 samples, unknown # of sites			
Domain 2: Represe	Metric 1: ntative Metric 2: Metric 3: Metric 4: Metric 5:	Methodology Geographic Scope Applicability Temporal Representativeness Sample Size	High Medium Unacceptable High Medium	$\begin{array}{c} \times 1 \\ \times 1 \\ \times 2 \\ \times 2 \\ \times 1 \end{array}$	1 2 8 2 2	 Information collected from journal studies UK, Belgium Occupational scenario (use of insulation in offices). No associated worker activities. 2008-2010 Mean and median provided, no other statistics. 16 samples, unknown # of sites 			
Domain 2: Represe]]]] Domain 3: Accessib	Metric 1: ntative Metric 2: Metric 3: Metric 4: Metric 5: Dility/Clar	Methodology Geographic Scope Applicability Temporal Representativeness Sample Size	High Medium Unacceptable High Medium	$\begin{array}{c} \times 1 \\ \times 1 \\ \times 2 \\ \times 2 \\ \times 1 \end{array}$	1 2 8 2 2	Information collected from journal studies UK, Belgium Occupational scenario (use of insulation in offices). No associ- ated worker activities. 2008-2010 Mean and median provided, no other statistics. 16 samples, unknown # of sites			
Domain 2: Represe 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Metric 1: ntative Metric 2: Metric 3: Metric 4: Metric 5: pility/Clar: Metric 6:	Methodology Geographic Scope Applicability Temporal Representativeness Sample Size	High Medium Unacceptable High Medium	$\begin{array}{c} \times 1 \\ \times 1 \\ \times 2 \\ \times 2 \\ \times 1 \\ \times 1 \end{array}$	1 2 8 2 2 1	Information collected from journal studies UK, Belgium Occupational scenario (use of insulation in offices). No associ- ated worker activities. 2008-2010 Mean and median provided, no other statistics. 16 samples, unknown # of sites Information is all clearly cited			
Domain 2: Represe 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Metric 1: ntative Metric 2: Metric 3: Metric 4: Metric 5: bility/Clar: Metric 6: ity and II	Methodology Geographic Scope Applicability Temporal Representativeness Sample Size ity Metadata Completeness	High Medium Unacceptable High Medium High	$\begin{array}{c} \times 1 \\ \times 1 \\ \times 2 \\ \times 2 \\ \times 1 \\ \end{array}$	1 2 8 2 2 1	Information collected from journal studies UK, Belgium Occupational scenario (use of insulation in offices). No associ- ated worker activities. 2008-2010 Mean and median provided, no other statistics. 16 samples, unknown # of sites Information is all clearly cited			
Domain 2: Represe Domain 2: Represe Domain 3: Accessib Domain 4: Variabil	Metric 1: ntative Metric 2: Metric 3: Metric 4: Metric 5: bility/Clar: Metric 6: ity and Un Metric 7:	Methodology Geographic Scope Applicability Temporal Representativeness Sample Size ity Metadata Completeness neertainty Metadata Completeness	High Medium Unacceptable High Medium High	$\begin{array}{c} \times 1 \\ \times 1 \\ \times 2 \\ \times 2 \\ \times 1 \\ \end{array}$ $\times 1 \\ \times 1$	1 2 8 2 2 1 2	Information collected from journal studies UK, Belgium Occupational scenario (use of insulation in offices). No associ- ated worker activities. 2008-2010 Mean and median provided, no other statistics. 16 samples, unknown # of sites Information is all clearly cited Limited discussion on uncertainty and variability			
Domain 2: Represe 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Metric 1: ntative Metric 2: Metric 3: Metric 4: Metric 5: Dility/Clar: Metric 6: ity and Un Metric 7:	Methodology Geographic Scope Applicability Temporal Representativeness Sample Size ity Metadata Completeness ncertainty Metadata Completeness	High Medium Unacceptable High Medium High Medium	$ \begin{array}{c} \times 1 \\ \times 1 \\ \times 2 \\ \times 2 \\ \times 1 \\ \end{array} \\ \times 1 \\ \end{array} $	1 2 8 2 2 1 2	Information collected from journal studies UK, Belgium Occupational scenario (use of insulation in offices). No associ- ated worker activities. 2008-2010 Mean and median provided, no other statistics. 16 samples, unknown # of sites Information is all clearly cited Limited discussion on uncertainty and variability			

				_				
Source Citation: Type of Data Source Hero ID	Nicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34. Occupational Exposure; Completed Exposure or Risk Assessments; 3978355							
EVALUATION Domain	Metric	Rating	MWF*	Score	Comments			
Overall Quality D	$\operatorname{Determination}^\dagger$	Unacceptable		4	Metric Mean Score: 2.0.			

** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Nicnas, 20 Occupation	012. Priority existing chemical a nal Exposure; Completed Expos	ssessments: ure or Risk	Hyexab Assessm	romocy ents;	clododecane (HBCD)- PEC34.	
EXTRACTION Parameter	3310300		Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity:			Import Import Dust Inhalation 0.20.5 mg/m3 (typical); 0.55 mg/m3 (worst case) Modelled (section 6.4) repackaging into smaller pack sizes or in the event of an accident or spill				
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Based on accepted model from Europe	
Domain 2: Repres	Sentative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High High	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 1	Australia Use in scope 2012 Model - uncertainty provided, distribution of results provided	
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Information is all clearly cited	
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	High	$\times 1$	1	Uncertainty and variability discussion provided	
Overall Quality D	eterminatio	n [†]	High		1.1		

 \star MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Nicnas, 20 Occupation 3978355	012. Priority existing chemical a nal Exposure; Completed Expos	ssessments: ure or Risk	Hyexab Assessm	romocy ents;	clododecane (HBCD)- PEC34.	
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity:			Import Import Dust Dermal 57570 ?g/kg bw/d (powder); 29290 ?g/kg bw/d (granules) Modelled (section 6.4) repackaging into smaller pack sizes or in the event of an accident or spill				
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Based on accepted model from Europe	
Domain 2: Repres	sentative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High High	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 1	Australia Use in scope 2012 Model - uncertainty provided, distribution of results provided	
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Information is all clearly cited	
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	High	× 1	1	Uncertainty and variability discussion provided	
Overall Quality D	Determinatio	\mathbf{n}^{\dagger}	High		1.1		

 \star MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Nicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34. Occupational Exposure; Completed Exposure or Risk Assessments; 3978355								
	0010000								
Parameter			Data						
			Dutu						
Life Cycle Stage:			Processing						
Life Cycle Descrip	ption (Subca	ategory of Use):	EPS com	pounding	5				
Physical Form:			Dust						
Type of Measurer	ment or Met	hod:	responder	nts from s	survey				
Worker Activity:			Adding H	IBCD to	the mix	ture			
Number of Worke	ers:		1 10						
Exposure Duratic	on:		10 min/d	ay /					
Bulk and Dust P	icy. articlo Sizo I	Distribution	2 mm gra	yı nulos or	50 60 11	m nowdor			
Engineering Cont	rol & percer	at Exposure Reduction:	LEV	inules of	50-00 u	in powder			
PPE.	ioi & percei	it Exposure reduction.	Overalls	safety øl:	asses le	ather or chemical resistant gloves dust masks			
112.			and respirators						
			The second se						
EVALUATION									
Domain		Metric	Rating	MWF*	Score	Comments			
			0						
Domain 1: Reliab	oility								
Domain II Toonas	Metric 1:	Methodology	High	$\times 1$	1	Information collected from surevey respondents			
		00	0			v x			
Domain 2: Repre	sentative								
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Australia			
	Metric 3:	Applicability	Medium	$\times 2$	4	Manufacturing EPS is not in scope, but some information may be applicable to other scenarios that are in scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012			
	Metric 5:	Sample Size	Medium	$\times 1$	2	Results from 1 respndent			
Domain 3: Access	sibility/Clar	ity	··· ·						
	Metric 6:	Metadata Completeness	High	× 1	1	Information is all clearly cited			
Domain 4. Varial	ility and II-	neerteinty							
Domain 4: Variat	Motric 7	Motadata Completeness	Low	$\times 1$	3	No discussion			
	metric 7.	metadata Completeness	LOW	^ 1	J				
Continued on next page									

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Vicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34. Occupational Exposure; Completed Exposure or Risk Assessments; 3978355									
Metric	Rating	MWF^{\star}	Score	Comments					
Overall Quality Determination [†] Medium 1.7									
	– con Nicnas,. 2012. Priority existing chemic Occupational Exposure; Completed Ex 3978355 Metric termination [†]	- continued from p Nicnas,. 2012. Priority existing chemical assessments: Occupational Exposure; Completed Exposure or Risk 3978355 Metric Rating termination [†] Medium	- continued from previous Nicnas,. 2012. Priority existing chemical assessments: Hyexabi Occupational Exposure; Completed Exposure or Risk Assessme 3978355 Metric Rating MWF* termination [†] Medium	- continued from previous page Nicnas,. 2012. Priority existing chemical assessments: Hyexabromocycloc Occupational Exposure; Completed Exposure or Risk Assessments; 3978355 Metric Rating Metric Rating Metric Netric 1.7					

Source Citation: Type of Data Source Hero ID	Nicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34. Occupational Exposure; Completed Exposure or Risk Assessments; 3978355							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Number of Samples: Number of Sites: Type of Measurement or Method: Worker Activity: Type of Sampling: Exposure Duration:				Processing EPS compounding Dust Inhalation 2.89-21.5 mg/m3 12 2 Short-term Adding HBCD powder to the mixture personal 13-56 mins				
EVALUATION								
Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Results extracted from a study in Scotland		
Domain 2. Benres	sentative							
Domain 2. Repres	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Scotland		
	Metric 3:	Applicability	Medium	$\times 2$	4	Manufacturing EPS is not in scope, but some information may be applicable to other scenarios that are in scope or may be used as surrogate data		
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2005		
	Metric 5:	Sample Size	High	$\times 1$	1	Statistical distribution provided; Sample size provided and seems sufficient		
Domain 3: Access	ibility/Clar	ity						
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Information is all clearly cited		
Domain 4: Variab	ility and U	ncertainty						
Continued on next page								

Source Citation: Type of Data Source Hero ID	Nicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34. Occupational Exposure; Completed Exposure or Risk Assessments; 3978355								
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
	Metric 7:	Metadata Completeness	High	$\times 1$	1	Uncertainty and variability discussion provided			
Overall Quality I	Determination	'nţ	High		1.6				

Source Citation: Type of Data Source Hero ID	Nicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34. Occupational Exposure; Completed Exposure or Risk Assessments; 3978355							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Number of Samples: Number of Sites: Type of Measurement or Method: Worker Activity: Type of Sampling: Exposure Duration:				Data Processing EPS compounding Dust Inhalation 0.12-3.36 mg/m3 12 2 8 hr TWA Adding HBCD powder to the mixture personal 480 mins				
EVALUATION		Matrice	Deting	MAND		Commente		
Domain		Metric	Rating	MWF^	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Results extracted from a study in Scotland		
Domain 2: Repres	entative							
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Scotland		
	Metric 3:	Applicability	Medium	$\times 2$	4	Manufacturing EPS is not in scope, but some information may be applicable to other scenarios that are in scope or may be used as surrogate data		
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2005		
	Metric 5:	Sample Size	High	$\times 1$	1	Statistical distribution provided; Sample size provided and seems sufficient		
Domain 3: Access	ibilitv/Clar	itv						
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Information is all clearly cited		
Domain 4: Variab	ility and U	ncertainty	<i></i>	t				
Continued on next page								

Source Citation: Type of Data Source Hero ID	Nicnas,. 20 Occupation 3978355	Nicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34. Occupational Exposure; Completed Exposure or Risk Assessments; 3978355						
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
	Metric 7:	Metadata Completeness	High	$\times 1$	1	Uncertainty and variability discussion provided		
Overall Quality E	Determination	'nţ	High		1.6			

Source Citation:Nicnas, 2Type of Data SourceOccupatioHero ID3978355	012. Priority existing chemical a nal Exposure; Completed Expos	ure or Risk	Hyexab Assessm	ents;	clododecane (HBCD)- PEC34.
EXTRACTION					
Parameter		Data			
Life Cycle Stage:		Processin	g		
Life Cycle Description (Subca	ategory of Use):	EPS com	pounding	S	
Physical Form:		Dust			
Route of Exposure:		Inhalation	n .		
Exposure Concentration (Uni	it):	0.07 - 14.7	mg/m3		
Number of Samples:		18			
Number of Sites:		3			
Type of Measurement or Met	shod:	full-shift		1 (
Worker Activity:		Adding H	IBCD po	wder to	the mixture
Type of Sampling:		personal			
Exposure Duration.		275-504 1	liilis		
EVALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments
Domain 1. Poliability					
Metric 1:	Methodology	High	$\times 1$	1	Results extracted from a study in Scotland
Domain 2: Representative	Coormanhia Coora	Madium	~ 1	0	
Metric 2:	Appliesbility	Medium	$\times 1$	2	Scotland
metric 3.	Applicability	meanni	× 2	4	Manufacturing LPS is not in scope, but some information may be applicable to other scenarios that are in scope or may be used as surrogate data
Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2005
Metric 5:	Sample Size	High	× 1	1	Statistical distribution provided; Sample size provided and seems sufficient
Domain 3: Accessibility/Clar	ity				
Metric 6:	Metadata Completeness	High	$\times 1$	1	Information is all clearly cited
Domain 4: Variability and U	ncertainty				
	Cor	ntinued on r	next page	e	

Source Citation: Type of Data Source Hero ID	Nicnas,. 20 Occupation 3978355	Nicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34. Occupational Exposure; Completed Exposure or Risk Assessments; 3978355						
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
	Metric 7:	Metadata Completeness	High	$\times 1$	1	Uncertainty and variability discussion provided		
Overall Quality E	Determination	'nţ	High		1.6			

Source Citation:Nicnas,. 2012. Priority existing chemical asType of Data SourceOccupational Exposure; Completed ExposuHero ID3978355	ssessments: 1re or Risk	Hyexab Assessm	eromocy ents;	clododecane (HBCD)- PEC34.
EXTRACTION				
Parameter	Data			
Life Cycle Stage:	Processin	g		
Life Cycle Description (Subcategory of Use):	EPS com	pounding	g	
Physical Form:	Dust			
Route of Exposure:	Inhalation	1		
Exposure Concentration (Unit):	4.35-12.1	mg/m3		
Number of Samples:	4			
Number of Sites: Turne of Measurement on Mathada	Z			
Worker Activity:	Woighing	HRCD	owdor	before addition
Type of Sampling	personal	IIDOD I	bowder	before addition
Exposure Duration	124-350 n	nins		
	121 000 1			
EVALUATION				
Domain Metric	Rating	MWF^{\star}	Score	Comments
Dennia 1. Deliekiliter				
Metric 1: Methodology	High	$\times 1$	1	Results extracted from a study in Scotland
	0			
Domain 2: Representative				
Metric 2: Geographic Scope	Medium	$\times 1$	2	Scotland
Metric 3: Applicability	Medium	$\times 2$	4	Manufacturing EPS is not in scope, but some information may be applicable to other scenarios that are in scope or may be used as surrogate data
Metric 4: Temporal Representativeness	Medium	$\times 2$	4	2005
Metric 5: Sample Size	High	$\times 1$	1	Statistical distribution provided; Sample size provided and seems sufficient
Domain 3: Accessibility/Clarity				
Metric 6: Metadata Completeness	High	× 1	1	Information is all clearly cited
	8	··· ÷	-	
Domain 4: Variability and Uncertainty				
Con	tinued on r	ext nage	<u> </u>	

Source Citation: Type of Data Source Hero ID	Nicnas,. 20 Occupation 3978355	Nicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34. Occupational Exposure; Completed Exposure or Risk Assessments; 3978355						
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
	Metric 7:	Metadata Completeness	High	$\times 1$	1	Uncertainty and variability discussion provided		
Overall Quality E	Determination	'nţ	High		1.6			

Source Citation:Nicnas, 2Type of Data SourceOccupatioHero ID3978355	012. Priority existing chemical a nal Exposure; Completed Expos	ure or Risk	: Hyexab Assessm	romocy ents;	clododecane (HBCD)- PEC34.	
EXTRACTION						
Parameter		Data				
Life Cycle Stage:		Processin	g			
Life Cycle Description (Subca	ategory of Use):	XPS proc	luction			
Physical Form:		Dust				
Route of Exposure:		Inhalation	n			
Exposure Concentration (Uni	it):	2-880 ug/	m3			
Number of Samples:		17				
Number of Sites:		6				
Type of Measurement or Met	chod:	full-shift				
Worker Activity:		area samj	pling at f	eed decl	k	
Type of Sampling:		area				
Sampling Location:		feed deck				
Exposure Duration:		4.4-23.9 ł	nours			
EVALUATION						
Domain	Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliability						
Metric 1:	Methodology	High	$\times 1$	1	Results extracted from journal article	
Domain 2: Representative						
Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe	
Metric 3:	Applicability	High	$\times 2$	2	Use in scope	
Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2001	
Metric 5:	Sample Size	High	$\times 1$	1	Statistical distribution provided; Sample size provided and seems sufficient	
Domain 3: Accessibility/Clar	ity					
Metric 6:	Metadata Completeness	High	$\times 1$	1	Information is all clearly cited	
Domain 4. Variability and U	ncortainty					
Metric 7:	Metadata Completeness	Medium	$\times 1$	2	Limited discussion on uncertainty	
	~			-	······································	
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Source Citation: Type of Data Source Hero ID	Nicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34. Occupational Exposure; Completed Exposure or Risk Assessments; 3978355							
EVALUATION								
Domain	Μ	letric	Rating	$\rm MWF^{\star}$	Score	Comments		
Overall Quality Determination [†] High 1.4								

XTRACTION					
Parameter		Data			
		_			
Life Cycle Stage:		Processin	g		
Life Cycle Description (Subca	ategory of Use):	XPS proc	luction		
Physical Form:		Dust			
Route of Exposure:		Inhalation	1		
Exposure Concentration (Uni	t):	3-15 ug/n	n3		
Number of Samples:		9			
Number of Sites:	1 1	6			
Worker A stivity	nod:	Snort-teri	n orl		
True of Semaling		routine w	OFK		
Type of Sampling: Exposure Duration:		$\frac{273}{2}$ bro			
Exposure Duration.		3-7.3 IIIS			
VALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	$\times 1$	1	Results extracted from journal article
Domain 2: Representative					
Metric 2:	Geographic Scope	Medium	× 1	2	Europe
Metric 3:	Applicability	High	$\times 2$	2	Use in scope
Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2001
Metric 5:	Sample Size	High	$\times 1$	1	Statistical distribution provided; Sample size provided an seems sufficient
Domain 2. Accordibility / Class					
Domain 3: Accessibility/Clar	Notodoto Commistenega	Himb	× 1	1	
Metric 0:	Metadata Completeness	піgn	× 1	1	Information is all clearly cited
Domain 4: Variability and Ur	ncertainty				
Metric 7:	Metadata Completeness	Medium	$\times 1$	2	Limited discussion on uncertainty

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Source Citation: Type of Data Source Hero ID	Nicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34. Occupational Exposure; Completed Exposure or Risk Assessments; 3978355					
EVALUATION						
Domain	Metric	Rating	$\rm MWF^{\star}$	Score	Comments	
Overall Quality I	$\operatorname{Determination}^\dagger$	High		1.4		

* MWF = Metric Weighting Factor

TTRACTION					
Parameter		Data			
		Data			
Life Cycle Stage:		Processin	g		
Life Cycle Description (Subca	ategory of Use):	XPS prod	luction		
Physical Form:		Dust			
Route of Exposure:		Inhalation	n		
Exposure Concentration (Uni	t):	40 ug/m3	5		
Number of Samples:		6			
Number of Sites:		6			
Type of Measurement or Met	hod:	Short-teri	m		
Worker Activity:		cleaning f	eed deck		
Type of Sampling:		personal			
Exposure Duration:		1 hr			
VALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	$\times 1$	1	Results extracted from journal article
Domain 2: Representative					
Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe
Metric 3:	Applicability	High	$\times 2$	2	Use in scope
Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2001
Metric 5:	Sample Size	High	$\times 1$	1	Statistical distribution provided; Sample size provided an seems sufficient
Domain 3: Accessibility/Clar	ity				
Metric 6	Metadata Completeness	High	× 1	1	Information is all clearly cited
		8	/\ I	*	
Domain 4: Variability and U	ncertainty				
Metric 7:	Metadata Completeness	Medium	× 1	2	Limited discussion on uncertainty

		omaoa nom p		Puge		
Source Citation: Type of Data Source Hero ID	Nicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34. Occupational Exposure; Completed Exposure or Risk Assessments; 3978355					
EVALUATION						
Domain	Metric	Rating	MWF^{\star}	Score	Comments	
Overall Quality I	$\operatorname{Petermination}^\dagger$	High		1.4		

* MWF = Metric Weighting Factor

Source Citation:Nicnas,. 20Type of Data SourceOccupationHero ID3978355	112. Priority existing chemical a nal Exposure; Completed Expos	ssessments: ure or Risk	Hyexab Assessm	romocy ents;	clododecane (HBCD)- PEC34.
EXTRACTION Parameter		Data			
Life Cycle Stage: Life Cycle Description (Subca Physical Form: Route of Exposure: Exposure Concentration (Unit Number of Samples: Number of Sites: Type of Measurement or Meth Number of Workers: Type of Sampling: Sampling Location: Exposure Duration:	tegory of Use): t): nod:	Processin EPS conv Dust Inhalation Mean = 0 6 1 full-shift 3/shift area mixer roo 8 hr	g eerting n).5 ug/m; om	3	
EVALUATION Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability Metric 1:	Methodology	High	× 1	1	Results extracted from journal article
Domain 2: Representative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High Medium High	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 4 1	Norway Use in scope 2007 Statistical distribution provided; Sample size provided and seems sufficient
Domain 3: Accessibility/Clari Metric 6:	ty Metadata Completeness	High	$\times 1$	1	Information is all clearly cited
Domain 4: Variability and Un Metric 7:	certainty Metadata Completeness Cor	High itinued on r	$\times 1$	1	Uncertainty and variability discussion provided

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Source Citation: Type of Data Source Hero ID	Jicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34. Occupational Exposure; Completed Exposure or Risk Assessments; 978355					
EVALUATION						
Domain	Metr	c Rating	\mathbf{MWF}^{\star}	Score	Comments	
Overall Quality Determination [†] High 1.3						

Source Citation:Nicnas,. 2Type of Data SourceOccupationHero ID3978355	012. Priority existing chemical a nal Exposure; Completed Expos	ssessments: ure or Risk	Hyexab Assessm	romocy ents;	clododecane (HBCD)- PEC34.
EXTRACTION Parameter		Data			
Life Cycle Stage: Life Cycle Description (Subca Physical Form: Route of Exposure: Exposure Concentration (Uni Number of Samples: Number of Sites: Type of Measurement or Met Number of Workers: Type of Sampling: Sampling Location: Exposure Duration:	ategory of Use): t): hod:	Processin EPS conv Dust Inhalation Mean = 1 24 1 full-shift 3/shift area reactor ro 8 hr	g erting 15.1 ug/n	13	
EVALUATION Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability Metric 1:	Methodology	High	× 1	1	Results extracted from journal article
Domain 2: Representative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High Medium High	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 4 1	Norway Use in scope 2007 Statistical distribution provided; Sample size provided and seems sufficient
Domain 3: Accessibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Information is all clearly cited
Domain 4: Variability and Un Metric 7:	ncertainty Metadata Completeness Cor	High tinued on r	$\times 1$	1	Uncertainty and variability discussion provided

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Source Citation: Type of Data Source Hero ID	Jicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34. Occupational Exposure; Completed Exposure or Risk Assessments; 978355					
EVALUATION						
Domain	Metr	c Rating	\mathbf{MWF}^{\star}	Score	Comments	
Overall Quality Determination [†] High 1.3						

Source Citation:NType of Data SourceOHero ID39	licnas,. 20 Occupation 978355	112. Priority existing chemical a nal Exposure; Completed Expos	ssessments: ure or Risk	Hyexabi Assessm	romocy ents;	clododecane (HBCD)- PEC34.
EXTRACTION Parameter			Data			
Life Cycle Stage: Life Cycle Descriptio Physical Form: Route of Exposure: Exposure Concentra Type of Measuremer Worker Activity:	on (Subca tion (Uni ht or Met	tegory of Use): t): hod:	Processin XPS com Dust dermal 0.11 mg/c Modelled direct har	g pounding cm2/d. (section adling and	6.5) d interr	nittent, non-dispersive use
EVALUATION Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliabilit M	y fetric 1:	Methodology	High	× 1	1	Based on accepted model from Europe
Domain 2: Represen M M M	tative fetric 2: fetric 3: fetric 4: fetric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High High	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 1	Australia Use in scope 2012 Model - uncertainty provided, distribution of results provided
Domain 3: Accessibi M	lity/Clari Ietric 6:	ty Metadata Completeness	High	× 1	1	Information is all clearly cited
Domain 4: Variabilit	y and Ur letric 7:	acertainty Metadata Completeness	High	$\times 1$	1	Uncertainty and variability discussion provided
Overall Quality Dete	erminatio	\mathbf{n}^{\dagger}	High		1.1	

 * MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hore ID	Nicnas,. 20 Occupation	112. Priority existing chemical a nal Exposure; Completed Expos	ssessments: ure or Risk	Hyexab Assessm	romocyo ents;	clododecane (HBCD)- PEC34.	
EXTRACTION Parameter	3910303		Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity: Exposure Duration:				Processing Polymer processing Dust Inhalation Typical: 2 to 5Worst-case: 5 to 50 mg/m3 Modelled (section 6.5) addition and weighing 8 hr			
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliabil	lity Metric 1:	Methodology	High	× 1	1	Based on accepted model from Europe	
Domain 2: Represe	entative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High High	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 1	Australia Use in scope 2012 Model - uncertainty provided, distribution of results provided	
Domain 3: Accessi	bility/Clari Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Information is all clearly cited	
Domain 4: Variabi	lity and Ur Metric 7:	ncertainty Metadata Completeness	High	× 1	1	Uncertainty and variability discussion provided	
Overall Quality De	eterminatio	\mathbf{n}^{\dagger}	High		1.1		

Source Citation: Type of Data Source Hero ID	Nicnas, 20 Occupation 3978355	012. Priority existing chemical a nal Exposure; Completed Expos	ssessments: ure or Risk	Hyexab Assessm	romocy ents;	clododecane (HBCD)- PEC34.	
EXTRACTION Parameter	0010000		Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity: Exposure Duration:				Processing Polymer processing Granules Inhalation Typical: 0.2 to 0.5Worst-case: 0.5 to 5 Modelled (section 6.5) addition and weighing 8 hr			
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliabi	lity Metric 1:	Methodology	High	× 1	1	Based on accepted model from Europe	
Domain 2: Repres	entative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High High	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 1	Australia Use in scope 2012 Model - uncertainty provided, distribution of results provided	
Domain 3: Accessi	bility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Information is all clearly cited	
Domain 4: Variabi	ility and Ur Metric 7:	ncertainty Metadata Completeness	High	× 1	1	Uncertainty and variability discussion provided	
Overall Quality De	eterminatio	\mathbf{n}^{\dagger}	High		1.1		

Source Citation:	Nicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34.						
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;						
Hero ID	3978355						
EXTRACTION							
Parameter			Data				
Life Cycle Stage:			All				
Life Cycle Descrip	otion (Subca	tegory of Use):	HBCD in	dust			
Physical Form:			\mathbf{Dust}				
Route of Exposure	e:		Oral to d	ust			
Exposure Concent	tration (Uni	t):	1.9 (typic	al) to 12	(worst	case) ng/kg-day	
Type of Measuren	nent or Met	hod:	Modelled	(section	6.5.5)		
Worker Activity:			Exposure	to HBCI) in ind	loor soil and dust	
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Boliah	ility						
Domain 1. Renad	Metric 1:	Methodology	High	× 1	1	Based on accepted model from Europe	
		internetations,	8		-		
Domain 2: Repres	sentative						
-	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Australia	
	Metric 3:	Applicability	Low	$\times 2$	6	Non-occupational exposure that can be applied to occupational	
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2003	
	Metric 5:	Sample Size	High	$\times 1$	1	Model - uncertainty provided, distribution of results provided	
Domain 3: Access	ibility/Clar	ity	TT· 1	-	-		
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Information is all clearly cited	
Domain 4. Variab	ility and Ur	ocertainty					
Domain 4. Variab	Metric 7.	Metadata Completeness	High	× 1	1	Uncertainty and variability discussion provided	
		metadata compreteness	111511	~ 1	1	encertainty and variability discussion provided	
Overall Quality D	eterminatio	n^{\dagger}	Medium		18		
Gveran gaanty D	0.001111110010	**	mount		1.0		

 \star MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Haz, Map. 2017. Haz-Map: Agent name: 1,2,5,6,9,10-Hexabromocyclododecane. Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 3970257					
EXTRACTION						
Parameter			Data			
Life Cycle Stage:			A11			
Worker Activity:			worker esitmat	e across	entire li	fecvcle
Number of Worke	ers:		100 to 999			
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
	•1•,					
Domain 1: Reliab	Motrie 1.	Mathadalam	Low	× 1	9	
	Metric 1:	Methodology	LOW	× 1	3	Unknown
Domain 2: Repres	sentative					
	Metric 2:	Geographic Scope	High	$\times 1$	1	US
	Metric 3:	Applicability	Medium	$\times 2$	4	Captures all possible stages, some of which are not in scope
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2016
	Metric 5:	Sample Size	Low	$\times 1$	3	Unknown
Damain 9. Aaraa	:1.:1:+ / <i>C</i> 1					
Domain 3: Access	Metric 6	Ity Metadata Completeness	Unaccentable	× 1	4	Unknown
	Metric 0.	Metadata Completeness	Onacceptable	~ 1	т	CIIKIOWII
Domain 4: Variab	oility and Ur	ncertainty				
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion
Overall Quality D	eterminatio	n [†]	Unacceptable		4	Metric Mean Score: 2.2.

** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation:Echa., 2008. RiskType of Data SourceOccupational ExpHero ID3970747	Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970747						
EXTRACTION Parameter		Data					
Life Cycle Stage:		Monufacturo					
Life Cycle Description (Subcategory	of Use).	Manufacture					
Physical Form:	01 030).	dust					
Route of Exposure:		Inhalation					
Exposure Concentration (Unit):		0.00028 - 0.028	35 mg/m	3			
Number of Samples:		3		Č.			
Number of Sites:		1					
Type of Measurement or Method:		short-term, 51-	-120 min	s			
Worker Activity:		Occasional sam	pling at	the rea	ctor. Worker activity may or may not be		
		occurring durin	ng the m	easurem	ent.		
Type of Sampling:		area					
Sampling Location:		reactor					
EVALUATION							
Domain	Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliability							
Metric 1: Metho	odology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Representative							
Metric 2: Geogr	aphic Scope	Medium	$\times 1$	2	Europe		
Metric 3: Applie	cability	Unacceptable	$\times 2$	8	Manufacture is not in scope and data cannot be applied to other conditions of use		
Metric 4: Tempo	oral Representativeness	High	$\times 2$	2	2008		
Metric 5: Sampl	le Size	High	$\times 1$	1	All data points provided		
Domain 3: Accessibility/Clarity							
Metric 6: Metad	lata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability and Uncertain	ty						
	С	Continued on nex	t page				

					0	
Source Citation: Type of Data Source Hero ID	Echa,. 200 Occupation 3970747	8. Risk assessment: hexabromo- nal Exposure; Completed Expos	cyclododecane. aure or Risk Asse	ssments;		
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
	Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality D	Determinatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 1.8.

** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation:Echa, 2008. Risk assessment: hexabromocyclododecane.Type of Data SourceOccupational Exposure; Completed Exposure or Risk Assessments;UU							
Hero ID 3970747							
EXTRACTION							
Parameter	Data						
Life Cycle Stage:	Manufact	ure					
Life Cycle Description (Subcategory of Use):	Manufact	ure					
Physical Form: Doute of Europeuro:	aust Inholotion	dust					
Fundame Concentration (Unit):		Inhalation					
Number of Samples:	0.0094-0.0	J97 IIIg/1	611				
Number of Sites	1						
Type of Measurement or Method:	short-terr	n. 88 mii	าร				
Worker Activity:	filling of 2	25 kg or	1 ton ba	A2S			
Type of Sampling:	area	- 0 -					
Exposure Duration:	$88 \mathrm{~mins}$						
Bulk and Dust Particle Size Distribution:	20-150 ?n	20-150 ?m					
EVALUATION							
Domain Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Beliability							
Metric 1: Methodology	High	$\times 1$	1	Information is from trusted sources			
	0						
Domain 2: Representative							
Metric 2: Geographic Scope	Medium	$\times 1$	2	Europe			
Metric 3: Applicability	Medium	$\times 2$	4	Manufacture is not in scope but filling of bags can be applied to Import			
Metric 4: Temporal Representativeness	High	$\times 2$	2	2008			
Metric 5: Sample Size	High	$\times 1$	1	All data points provided			
Domain 3: Accessibility/Clarity	TT: 1	1	1				
Metric 6: Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
				······			
Domain 4: Variability and Uncertainty							
Con	ntinued on 1	next page) 				

		contin	ucu nom	previous	page		
Source Citation: Type of Data Source Hero ID	Echa,. 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970747						
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality D	Determination	\mathbf{n}^{\dagger}	High		1.3		
Source Citation:EchType of Data SourceOcHero ID397	ha,. 2008 cupation 70747	3. Risk assessment: hexabromod al Exposure; Completed Expos	cyclododeca ure or Risk	ne. Assessm	ents;		
--	---	--	--	---	-----------	---	--
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Number of Samples: Type of Measurement or Method: Worker Activity: Type of Sampling:			Manufacture Manufacture dust Inhalation 4.0-4.5 mg/m3 unknown unknown Bagging HBCD product unknown				
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliability Me	etric 1:	Methodology	High	× 1	1	Information is from trusted sources	
Domain 2: Representa Me Me	ative etric 2: etric 3: etric 4:	Geographic Scope Applicability Temporal Representativeness	Medium Medium High	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \end{array}$	2 4 2	Europe Manufacture is not in scope but filling of bags can be applied to Import 2008	
Me	etric 5: tv/Clari	Sample Size	Medium	× 1	2	Range	
Me	etric 6:	Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variability Me	and Un etric 7:	certainty Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
		Con	tinued on n	ext page			

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Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970747							
EVALUATION								
Domain	Metric	Rating MWF	* Score	Comments				
Overall Quality D	$etermination^{\dagger}$	High	1.4					

Source Citation: Type of Data Source	Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments;						
Hero ID	3970747						
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Number of Samples: Number of Sites: Type of Measurement or Method: Worker Activity: Type of Sampling:			Manufacture Manufacture dust Inhalation Mean: 1.23Median: 0.8990th percentile: 1.89Max: 3 mg/m3 10 1 8-hr TWA During sample measurement, worker activity may include packing, com- pactation, process operations, and working in the warehouse personal				
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources	
			0				
Domain 2: Repres	sentative Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe	
	Metric 3:	Applicability	Medium	$\times 2$	4	Manufacture is not in scope but operations can be applied to Import	
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008	
	Metric 5:	Sample Size	Medium	$\times 1$	2	Some statistics provided, others unknown	
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variab	oility and U	ncertainty				, , .	
		Con	tinued on r	next page	Э		

		contin	ucu nom	previous	page			
Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970747							
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality D	Determination	\mathbf{n}^{\dagger}	High		1.4			

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Source Citation: Type of Data Source	Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments;								
Hero ID	3970747								
EXTRACTION Parameter			Data						
Life Cycle Stage:			Manufacturo						
Life Cycle Descrip	tion (Subca	ategory of Use):	Manufacture						
Physical Form:	tion (Suber	acegory of ebe).	dust						
Route of Exposure	e:		Inhalation						
Exposure Concent	ration (Uni	t):	Mean: 23 90th	percenti	le: 35 n	m ng/m3			
Number of Sample	es:		4	-					
Number of Sites:			1						
Type of Measurem	nent or Met	hod:	8-hr TWA						
Worker Activity:			Not specified.	Worker a	activity	may include several different tasks.			
Type of Sampling:			personal						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1. Beliabi	lity								
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources			
Domain 2: Repres	entative								
1	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe			
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Manufacture is not in scope and data cannot be applied to other conditions of use due to uncertainties			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008			
	Metric 5:	Sample Size	Medium	$\times 1$	2	Some statistics provided, others unknown			
Damain 9. Arrent	:1:::+ /Cl:								
Domain 5: Access	Motric 6:	Motadata Completeness	High	~ 1	1	Accomment on report clearly decuments its data services as			
	Wether 0.	Metadata Completeness	mgn	~ 1	1	Assessment of report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Variab	ility and Ur	ncertainty							
	Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
		(Continued on nex	t page					

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Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970747							
EVALUATION Domain	Metric Rating MWF* Score Comments							
Overall Quality D	$\operatorname{Determination}^\dagger$	Unacceptable		4	Metric Mean Score: 1.9.			

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** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation: Echa,. 2 Type of Data Source Occupat	urce Citation: Echa, 2008. Risk assessment: hexabromocyclododecane.							
Hero ID 3970747				,				
EXTRACTION								
Parameter		Data						
Life Cycle Stage		Manufact	ure					
Life Cycle Description (Sub	category of Use):	Manufact	ure					
Physical Form:		dust						
Route of Exposure:		Inhalation	1					
Exposure Concentration (U	nit):	1.9 mg/m	.3					
Number of Samples:		1						
Number of Sites:		1						
Type of Measurement or Method:		300 min	0.1 TTT					
Worker Activity:		Transfer o	of the HE	SCD in	the hammer-mill to 28 drums			
Type of Sampling:	personal							
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliability								
Metric 1	Methodology	High	$\times 1$	1	Information is from trusted sources			
Domain 2: Representative								
Metric 2	: Geographic Scope	Medium	$\times 1$	2	Europe			
Metric 3	: Applicability	Medium	$\times 2$	4	Manufacture is not in scope but operations can be applied to Import			
Metric 4	: Temporal Representativeness	High	$\times 2$	2	2008			
Metric 5	: Sample Size	High	$\times 1$	1	Discrete data point provided			
Domain 3: Accessibility/Cl	arit v							
Metric 6	: Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4. Variability and	Incortainty							
Metric 7	: Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
	Cor	ntinued on r	next page	1				

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Echa,. 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970747							
	Metric	Rating	MWF^{\star}	Score	Comments		
$\operatorname{Petermination}^\dagger$		High		1.3			
	Echa,. 2008. Risk ass Occupational Exposu 3970747 Determination [†]	– continu Echa,. 2008. Risk assessment: hexabromod Occupational Exposure; Completed Expos 3970747 Metric	- continued from p Echa,. 2008. Risk assessment: hexabromocyclododeca Occupational Exposure; Completed Exposure or Risk 3970747 Metric Rating Determination [†]	 – continued from previous Echa,. 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessme 3970747 Metric Rating MWF* Determination[†] High 	- continued from previous page Echa,. 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970747 Metric Rating Metric Rating Metric 1.3		

Here ID 30/04/ EXTRACTION Parameter Data EXTRACTION Parameter Data Life Cycle Stage: Life Cycle Description (Subcategory of Use): Manufacture dust Route of Exposure: Physical Form: Route of Exposure: Or Samples: Inhalation Number of Starses: Unknown Number of Starses: Unknown Number of Starse: Unknown Worker Activity: packing and compaction of powders Type of Measurement or Method: Unknown Worker Activity: packing and compaction of powders Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Metric Scope Metric 2: Medium × 1 1 Information is from trusted sources Domain 2: Representative Metric 4: Medium × 1 2 Europe Medium Medium × 2 2 2008 Domain 3: Accessibility/Clarity Metric 6: High × 1 1 Assessment or report clearly documents its data sources, assessment andreases variability and uncertainty in the result. Uncertainty is well characterized. Domain 4: Variability and Uncertainty Metric 7: High × 1<	Source Citation:Echa, 2008. Risk assessment: hexabromocyclododecane.Type of Data SourceOccupational Exposure; Completed Exposure or Risk Assessments;Harra ID2070747								
Data Data Life Cycle Stage: Manufacture Life Cycle Stage: Manufacture Life Cycle Stage: Manufacture Hysical Form: dust Route of Exposure: Inhalation Exposure Concentration (Unit): Respirable, Mean: 0.18Inhalable, Mean: 1.23 mg/m3 Number of Stamples: unknown Number of Stamples: unknown Type of Measurement or Method: unknown Worker Activity: packing and compaction of powders Type of Sampling: unknown Domain 1: Reliability Metric Metric 1: Methodology Metric 2: Geographic Scope Metric 3: Applicability Metric 4: Temporal Representativeness Metric 5: Sample Size Metric 5: Sample Size Metric 5: Sample Size Metric 6: Medium × 1 2 Metric 6: Temporal Representativeness Metric 7: Temporal Representativeness Metric 7: Metric 6: Medium × 1 2 Metric 7: Temporal Representativeness Metric 7: Metric 6: Medium × 1 2 Sample Size Medium × 1 <td< td=""><td>Hero ID 3</td><td>3970747</td><td></td><td></td><td></td><td></td><td></td></td<>	Hero ID 3	3970747							
Parameter Data Life Cycle Stage: Manufacture Life Cycle Description (Subcategory of Use): Manufacture dust Inhalation Route of Exposure: Inhalation Exposure Concentration (Unit): Respirable, Mean: 0.18Inhalable, Mean: 1.23 mg/m3 Number of Samples: unknown Number of Samples: unknown Pype of Measurement or Method: unknown Worker Activity: packing and compaction of powders Type of Sampling: unknown Bomain Metric Retric Rating Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 1: Reliability Medium × 1 2 Domain 2: Representative Medium × 1 2 Europe Metric 2: Geographic Scope Medium × 1 2 Source Metric 3: Applicability Medium × 1 2 Source Metric 4: Temporal Representativeness High × 1 1 Information is none peetu operations can be applied to Import. Metric 5: Sample Size Medium × 1 2 Soure sessement or report clearly documents its data sources, asesse	EXTRACTION								
Life Cycle Stage: Manufacture Manufacture Manufacture Life Cycle Description (Subcategory of Use): Manufacture Must Manufacture State Structure Matter Structure Structure Matter Structure Structure Matter Structure	Parameter			Data					
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Life Cycle Stage:			Manufact	ure				
Physical Form: dust Route of Exposure: Inhalation Exposure: Concentration (Unit): Respirable, Mean: 0.18Inhalable, Mean: 1.23 mg/m3 Number of Samples: unknown Number of Sites: unknown Type of Measurement or Method: unknown Worker Activity: packing and compaction of powders Type of Sampling: unknown Bomain Metric Respirable, Mey Number Score Comments Comments Domain 1: Reliability Metric 2: Metric 2: Geographic Scope Metric 3: Applicability Metric 4: Temporal Representative Metric 4: Temporal Representative Metric 4: Temporal Representative Metric 5: Sample Size Metric 6: Metadata Completeness Metric 6: Metadata Completeness Metric 7: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 3: Accessibility/Clarity High × 1 1 <t< td=""><td>Life Cycle Descripti</td><td>ion (Subca</td><td>tegory of Use):</td><td>Manufact</td><td>ure</td><td></td><td></td></t<>	Life Cycle Descripti	ion (Subca	tegory of Use):	Manufact	ure				
Route of Exposure: Inhalation Exposure Concentration (Unit): Respirable, Mean: 0.18Inhalable, Mean: 1.23 mg/m3 Number of Samples: unknown Number of Sites: unknown Type of Measurement or Method: unknown Worker Activity: packing and compaction of powders Type of Sampling: unknown Worker Activity: packing and compaction of powders Type of Sampling: unknown Worker Activity: packing and compaction of powders Type of Sampling: unknown Worker Activity: packing and compaction of powders Type of Sampling: unknown Unknown unknown Domain 1: Reliability Metric Metric 2: Geographic Scope Metric 3: Applicability Metric 4: Temporal Representativeness Metric 5: Sample Size Metric 6: Metadata Completeness Metric 6: Metadata Completeness Metric 7: Metadata Completeness Metric 7: Metadata Completeness Metric 7: Metadata Completeness Metric 7: <td>Physical Form:</td> <td>(</td> <td></td> <td>dust</td> <td></td> <td></td> <td></td>	Physical Form:	(dust					
Exposure Concentration (Unit): Information (Unit): Info	Route of Exposure:			Inhalation	ı				
Number of Samples: unknown Number of Sites: unknown Number of Measurement or Method: unknown Worker Activity: packing and compaction of powders Type of Sampling: unknown Bomain Metric Retric Rating Mumber of Sites: unknown Jomain Metric Retric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 3: Applicability Metric 4: Temporal Representativeness Metric 5: Sample Size Metric 5: Sample Size Metric 6: Metadata Completeness Metric 7: Metadata Completeness High × 1 1 Assessment nor report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty High × 1 1 Metric 7: Metadata Completeness High × 1 1 Domain 4: Variability and Uncertainty High × 1 1 1	Exposure Concentra	ation (Uni	t):	Respirabl	e, Mean:	0.18Inł	nalable, Mean: 1.23 mg/m3		
Number of Sites: Type of Measurement or Method:unknown unknownunknownWorker Activity: Type of Sampling:metricpowders unknownEVALUATION DomainMetricRatingMWF*ScoreCommentsDomainMetricRatingMWF*ScoreCommentsDomainMetric 1:MethodologyHigh $\times 1$ 1Information is from trusted sourcesDomain 2:Representative Metric 2:Geographic Scope Metric 3:Medium $\times 1$ 2Europe MediumMetric 2:Geographic Scope Metric 3:High $\times 2$ 22008Metric 4:Temporal Representative Medium $\times 1$ 2Some statistics provided, others unknownDomain 3:Accessibility/Clarity Metric 6:High $\times 1$ 2Some statistics provided, others unknownDomain 4:Variability and Uncertainty Metric 7:Metadata CompletenessHigh $\times 1$ 1The assessment or report clearly documents its data sources, assessment methods, results, and assumptions.Domain 4:Variability and Uncertainty Metric 7:Metadata CompletenessHigh $\times 1$ 1The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	Number of Samples	:	,	unknown			,		
Type of Measurement or Method: Worker Activity: Type of Sampling: unknown packing and compaction of powders unknown EVALUATION Number of Sampling: Metric Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Metric 3: Medium × 1 2 Europe Manufacture is not in scope but operations can be applied to Import Metric 4: Temporal Representativeness Metric 5: High × 2 2 2008 Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions. Domain 4: Variability and Urcertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	Number of Sites:			unknown					
Worker Activity: Type of Sampling: packing and compaction of powders unknown EVALUATION Netric Rating MWF* Score Comments Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Metric 3: Medium × 1 2 Europe Import Metric 4: Temporal Representative Metric 5: Sample Size High × 2 2 2008 Domain 3: Accessibility/Clar:ty Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Urertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	Type of Measureme	ent or Metl	hod:	unknown					
Type of Sampling: unknown EVALUATION Rating MWF* Score Comments Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Metric 3: Medium × 1 2 Europe Manfacture is not in scope but operations can be applied to Import Metric 4: Temporal Representativeness Metric 5: High × 2 2 2008 Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Urertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	Worker Activity:			packing a	nd comp	action o	of powders		
EVALUATION Domain Metric Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Europe Metric 3: Applicability Medium × 2 4 Manufacture is not in scope but operations can be applied to Import Metric 4: Temporal Representativeness High × 2 2 20008 Domain 3: Accessibility/Clarity Mediata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	Type of Sampling:			unknown					
Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Europe Metric 3: Applicability Medium × 2 4 Manufacture is not in scope but operations can be applied to Import Metric 4: Temporal Representativenesss High × 2 2 2008 Metric 5: Sample Size Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity- Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	EVALUATION								
Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Europe Metric 3: Applicability Medium × 2 4 Manufacture is not in scope but operations can be applied to Import Metric 4: Temporal Representativeness High × 2 2 2008 Metric 5: Sample Size Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Europe Metric 3: Applicability Medium × 2 4 Manufacture is not in scope but operations can be applied to Import Metric 4: Temporal Representativeness High × 2 2 2008 Metric 5: Sample Size Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page									
Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Europe Metric 3: Applicability Medium × 2 4 Manufacture is not in scope but operations can be applied to Import Metric 4: Temporal Representativeness High × 2 2 2008 Metric 5: Sample Size Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	Domain 1: Reliabili	ty							
Domain 2: Representative Metric 2: Geographic Scope Medium $\times 1$ 2 Europe Metric 3: Applicability Medium $\times 2$ 4 Manufacture is not in scope but operations can be applied to Import Metric 4: Temporal Representativeness High $\times 2$ 2 2008 Metric 5: Sample Size High $\times 1$ 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High $\times 1$ 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty High $\times 1$ 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	1	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2. http://sentative Metric 2: Geographic Scope Medium × 1 2 Europe Metric 3: Applicability Medium × 2 4 Manufacture is not in scope but operations can be applied to Import Metric 4: Temporal Representativeness High × 2 2 2008 Metric 5: Sample Size Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	Domain 2: Bonroson	ntativo							
Metric 2. Geographic Scope Metrium × 1 2 Durbpe Metric 3: Applicability Medium × 2 4 Manufacture is not in scope but operations can be applied to Import Metric 4: Temporal Representativeness High × 2 2 2008 Metric 5: Sample Size Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	Domain 2. Represei	Metric 2.	Geographic Scope	Medium	× 1	2	Furopo		
Metric 6: Applicability Medrium × 2 1 Immort Metric 4: Temporal Representativeness High × 2 2 2008 Metric 5: Sample Size Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	- M	Metric 3.	Applicability	Medium	$\times 2$	2 4	Manufacture is not in scope but operations can be applied to		
Metric 4: Temporal Representativeness High × 2 2 2008 Metric 5: Sample Size Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	Ŧ	victific 0.	ripplicability	Medium	A 2	1	Import		
Metric 5: Sample Size Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	I	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008		
Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	I	Metric 5:	Sample Size	Medium	$\times 1$	2	Some statistics provided, others unknown		
Domain 5. Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	Domain 2. Accordin	ility /Clari							
Implemente of Metric of M	Domain 5: Accessid	Metric 6	Metadata Completeness	High	× 1	1	Assessment or report clearly desumants its data sources as		
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page		Metric 0.	Metadata Completeness	Ingli	~ 1	1	Assessment of report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4. variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	Domain 4. Variabili	ity and Un	aantaintu						
Continued on next page	Domain 4: variabili	uy and Un Motrie 7:	Motadata Completeness	High	~ 1	1	The approximate addresses marketility and uncertainty in the		
Continued on next page			metadata Completeness	111g11	× 1	1	results. Uncertainty is well characterized.		
			Con	tinued on r	next page	9			

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Source Citation: Type of Data Source Hero ID	Echa,. 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970747						
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Overall Quality D	$\operatorname{Petermination}^\dagger$		High		1.4		

Source Citation:EType of Data SourceCHero ID3	Echa,. 200 Decupation 8970747	8. Risk assessment: hexabromodial Exposure; Completed Expos	cyclododeca ure or Risk	nne. Assessm	ents;	
EXTRACTION			Data			
Parameter			Data			
Life Cycle Stage:			Manufact	ure		
Life Cycle Description	on (Subca	tegory of Use):	Manufact	ure		
Physical Form:			dust			
Route of Exposure:			Inhalation	1		
Exposure Concentra	ation (Uni	t):	0.0102 - 0	$0.0283 \mathrm{mg}$	g/m3	
Number of Samples:	:		14			
Number of Sites:			unknown			
Type of Measuremen	nt or Met	hod:	unknown			
Worker Activity:			Weighing	and mix	ing	
Type of Sampling:			personal			
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliabilit	ty Jotnia 1.	Mathadalam	IIimh	× 1	1	
1	Metric 1:	Methodology	High	× 1	1	Information is from trusted sources
Domain 2: Represen	ntative					
I N	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe
Ν	Metric 3:	Applicability	Medium	$\times 2$	4	Manufacture is not in scope but operations can be applied to Import
Ν	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008
N	Metric 5:	Sample Size	Medium	$\times 1$	2	Some statistics provided, others unknown
Domain 2. According	ility /Clari	+				
Domain 5. Accessio.	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4. Ward 191	ter on J TT					
Domain 4: variabili N	Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
		Con	tinued on r	next page		

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Source Citation: Type of Data Source Hero ID	Echa,. 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970747						
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Overall Quality D	$\operatorname{Petermination}^\dagger$		High		1.4		

Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970747						
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity:			Manufacture Manufacture dust Dermal 1 to 5 mg/cm2/day Modelled by EASE filling of 25 kg or 1 ton bags				
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources	
Domain 2: Repres	sentative Metric 2: Metric 3:	Geographic Scope Applicability	Medium Medium	$\times 1 \times 2$	$2 \\ 4$	Europe Manufacture is not in scope but filling of bags can be applied to Import	
	Metric 4: Metric 5:	Temporal Representativeness Sample Size	High Medium	$\times 2 \times 1$	$\frac{2}{2}$	2008 characterized by a range uncertain statistics	
Domain 3: Access	ibility/Clari Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variab	ility and Ur Metric 7:	ncertainty Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.4		

Source Citation: Echa Type of Data Source Occu	. 20 patic	08. Risk assessment: hexabromoonal Exposure; Completed Expos	cyclododeca ure or Risk	ane. Assessn	nents;	
DYED A CELON	41					
Parameter			Data			
			Data			
Life Cycle Stage:			Processin	g		
Life Cycle Description (Subc	ategory of Use):	XPS mas	terbatch		
Physical Form:			granule			
Route of Exposure:	/	- >	Inhalation	n		
Exposure Concentration	(Un	lit):	$\max_{n} 7.5$	(for 2 hc	ours)Mea	an: 1.89Median: 0.8390 th percentile: 5.4 mg/
Number of Semples			m3 10			
Type of Measurement of	Mo	thod:	10 short torr	n		
Worker Activity	wie	thou.	mixing ar	n nd weigh	ing	
Type of Sampling:			area	ia weigh		
Exposure Duration:			Measuren	nents rar	nge from	19 to 295 minutes.
-					0	
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliability						
Metr	c 1:	Methodology	High	$\times 1$	1	Information is from trusted sources
Domain 2: Representati	re - D	Gaaman bis Gaama	Mallin	1	0	7
Metr	с 2:	Geographic Scope	Medium	× 1 × 2	2	Europe
Metr	c_{-1}	Tomporal Roprosontativonoss	Medium	$\times 2$ $\times 2$	2 1	in scope
Metr	с4. с5:	Sample Size	Medium	$\times 1^{-1}$	2	Some statistics provided, others unknown
		Sample Sille	mourain	~ 1	-	
Domain 3: Accessibility	'Clai	rity				
Metr	c 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability a	nd U	ncertainty	TT: 1	1	1	
Metr	с 7:	metadata Completeness	High	× 1	T	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
		Cor	tinued on a	levt nam	۵	
		Cor		ioni pag	0	

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Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 9970747							
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Overall Quality Determination [†] High 1.4								

Source Citation:EcType of Data SourceOcHero ID39	cha,. 200 ccupation 070747	8. Risk assessment: hexabromodial Exposure; Completed Expos	cyclododeca ure or Risk	ane. Assessm	ents;	
EXTRACTION						
Parameter			Data			
Life Cycle Stage:			Processin	g		
Life Cycle Description	n (Subca	tegory of Use):	XPS mast	terbatch		
Physical Form:		,	granule			
Route of Exposure:			Inhalation	1		
Exposure Concentrat	ion (Uni	t):	0.88 (mea	n), 1.36	(90th) r	ng/m3
Number of Samples:			10			
Type of Measurement	t or Met	hod:	8-hr TWA	A		
Worker Activity:			mixing an	nd weighi	ng	
Type of Sampling:			personal			
Exposure Duration:			19-295 mi	in		
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Roliability	7					
Me	etric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources
Domain 2: Represent	ative					
M	etric 2:	Geographic Scope	Medium	$\times 1$	2	Europe
M	etric 3:	Applicability	High	$\times 2$	2	In scope
M	etric 4:	Temporal Representativeness	Medium	$\times 2$	4	2005
M	etric 5:	Sample Size	Medium	$\times 1$	2	Some statistics provided, others unknown
Domain 3: Accessibili	ity/Clari	ty				
M	etric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4: Variability	v and Un	certainty				
$\begin{array}{cccc} \text{Metric 7: Metadata Completeness} & \text{High} & \times 1 & 1 & \text{The assessment addresses variability and uncertainty} \\ & \text{results. Uncertainty is well characterized.} \end{array}$						The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
		Q	tinued or -	out mage		
		Con	unued on r	iext page		

	- continued from previous page								
Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromod Occupational Exposure; Completed Expos 3970747	cyclododecane. ure or Risk Assess	ements;						
EVALUATION									
Domain	Metric	Rating MWF	* Score	Comments					
Overall Quality D	$etermination^{\dagger}$	High	1.4						

Source Citation: Type of Data Source	Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments;						
Hero ID	3970747						
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Number of Samples: Type of Measurement or Method: Worker Activity: Type of Sampling: Exposure Duration:			Processin, XPS mast granule Inhalation Mean: 0.1 4 unknown extruder of personal 5 hours	g terbatch 12Median operator	: 0.100.	.16 mg/m3 (90th)	
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliabi	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
	, , .						
Domain 2: Repres	Motric 2:	Geographic Scope	Modium	~ 1	2	Furene	
	Metric 3:	Applicability	High	$^{\wedge 1}$ $\times 2$	2	In scope	
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2005	
	Metric 5:	Sample Size	Medium	$\times 1$	2	Some statistics provided, others unknown	
Domain 3: Access	ibility/Clari Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
	.1., 1.7.						
Domain 4: Variab	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
		Con	tinued on r	ext page			

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Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromod Occupational Exposure; Completed Expos 3970747	cyclododecane. ure or Risk Assess	ements;						
EVALUATION									
Domain	Metric	Rating MWF	* Score	Comments					
Overall Quality D	$etermination^{\dagger}$	High	1.4						

Source Citation: Echa,. 200 Type of Data Source Occupatio Hero ID 3970747	08. Risk assessment: hexabromoonal Exposure; Completed Expos	cyclododeca ure or Risk	ane. Assessm	ents;	
EXTRACTION					
Parameter		Data			
Life Cycle Stage:		Processin	٥.		
Life Cycle Description (Subc	ategory of Use):	XPS mas	terbatch		
Physical Form:	0, ,	unknown			
Route of Exposure:		Inhalation	n		
Exposure Concentration (Un	it):	negligible			
Number of Samples:	,	3			
Number of Sites:		1			
Type of Measurement or Met	thod:	unknown			
Worker Activity:		Automate	ed handli	ng of H	BCD
Type of Sampling:		unknown			
Exposure Duration:		unknown			
EVALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources
Domain 2: Representative					
Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe
Metric 3:	Applicability	High	$\times 2$	2	In scope
Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2005
Metric 5:	Sample Size	Low	$\times 1$	3	Qualitative
Domain 3: Accessibility/Clar	ity				
Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4: Variability and U	ncertainty				
Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
	Cor	tinued on r	next page	•	

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Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 9970747							
Metric	Rating	$\rm MWF^{\star}$	Score	Comments			
$\operatorname{ermination}^\dagger$	High		1.6				
	ccha,. 2008. Risk assessment: hexabromod Occupational Exposure; Completed Expos 970747 Metric ermination [†]	Ccha,. 2008. Risk assessment: hexabromocyclododeca Occupational Exposure; Completed Exposure or Risk 970747 Metric Rating ermination [†] High	Ccha,. 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessme 970747 Metric Rating MWF* ermination [†] High	Channess and Provide Property Chan, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 970747 Metric Rating MWF* Score ermination [†] High 1.6			

Hero ID 3970747 EXTRACTION Parameter Data Life Cycle Stage: Processing Life Cycle Description (Subcategory of Use): XPS masterbatch powder Physical Form: powder Route of Exposure: Inhalation Exposure Concentration (Unit): ND to 1.6 mg/m3 Number of States: 2 Type of Measurement or Method: unknown Worker Activity: unknown Type of Samplis: 46-480 min EXALUATION Metric Retric 1: Metric Rating MWF* Domain Metric Rating Metric 2: Geographic Scope Metric 3: Medium × 1 1 Information is from trusted sources Medium × 1 2 Europe Metric 2: Geographic Scope Metric 3: Medium × 1 2 Europe Metric 4: Temporal Representative Metric 4: High × 1 1 Information is from trusted sources Domain 3: Accessibility/Clarity Metric 6: High × 1 1 Assessment or report clearly documents its data sources, assessment mothod, results. Uncertainty is well characterized.	Source Citation:Echa, 2008. Risk assessment: hexabromocyclododecane.Type of Data SourceOccupational Exposure; Completed Exposure or Risk Assessments;								
Data Parameter Parameter Parameter Processing Life Cycle Description (Subcategory of Use): Processing Physical Form: powder Physical Form: powder Number of Exposure Concentration (Unit): ND to 1.6 mg/m3 Number of Sites: 2 Physical Form: NU to 1.6 mg/m3 Number of Sites: 2 Type of Measurement or Method: unknown Motric 1: Metric 2: Comments Pomain 1: Reliability Area Domain 1: Reliability Metric 2: Geographic Scope Metrim X X 2 2 Europe Metric 2: Geographic Scope Medium X 1 2 Europe Metric 3: Papilcability Medium X 1 2 Some statistics provided, others unknown Metric 4: Temporal Representativeness </td <td>Hero ID 397</td> <td>70747</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Hero ID 397	70747							
Life Cycle Stage: Processing XPS masterbatch Processing MSP masterbatch Physical Form: powder Rotte of Exposure: Inhalation Exposure Concentration (Unit): ND to 1.6 mg/m3 Number of Samples: 16 Number of Sites: 2 Type of Measurement or Method: unknown Worker Activity: unknown Type of Sampling: area Exposure Duration: 40-480 min FVALUATION Metric Domain 1: Reliability Metric Metric 2: Geographic Scope Metric 2: Geographic Scope Metric 3: Sample Size Metric 4: Temporal Representativeness Metric 5: Sample Size Metric 5: Sample Size Metric 6: Meduum × 1 2 Some statistics provided, others unknown Metric 6: Metadata Completeness Metric 7: Metadata Completeness Metric 7: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, asesessment methods, results, and assumptions.<	EXTRACTION Parameter			Data					
Life Cycle Description (Subcategory of Use): XPS masterbatch Physical Form: powder Route of Exposure: Inhalation Exposure Concentration (Unit): ND to 1.6 mg/m3 Number of Samples: 16 Number of Sites: 2 Type of Measurement or Method: unknown Worker Activity: anknown Worker Activity: anknown Worker Activity: area Exposure Duration: 40-480 min EVALUATION Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Metric 2: Geographic Scope Medium × 1 2 Metric 2: Geographic Scope Medium × 1 2 Metric 2: Geographic Scope Medium × 1 2 Metric 3: Applicability Metric 5: Sample Size Medium × 1 2 Metric 4: Temporal Representativeness Medium × 1 2 Metric 5: Sample Size Medium × 1 2 Some statistics provided, others unknown Metric 6: Metadata Completeness High × 1 1 Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 Continued on next page									
Life Cycle Description (Subcategory of Use): YPS masterbatch Physical Form: powder Route of Exposure: Inhalation Exposure Concentration (Unit): ND to 1.6 mg/m3 Number of Samples: 106 Numbor of Samples: 217 Type of Measurement or Method: 21 Worker Activity: 21 Type of Sampling: 21 EVALUATION Domain Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Metric 4: Temporal Representative Metric 5: Sample Size Medium × 1 2 Europe Metric 4: Temporal Representativeness Metric 4: Temporal Representativeness Metric 5: Sample Size Medium × 1 2 Some statistics provided, others unknown Metric 6: Metadata Completeness Metric 7: Metadata Completeness Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Continued on next page	Life Cycle Stage:	(-) -		Processin	g				
Physical Form: powder Route of Exposure: Inhalation - Exposure Concentration (Unit): ND to 1.6 mg/m3 Number of Samples: 16 Number of Sites: 2 Type of Measurement or Method: unknown Worker Activity: unknown Type of Sampling: area Exposure Duration: 40-480 min EVALUATION Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 1: Reliability Metric 2: Geographic Scope Metric 3: Applicability Metric 4: Temporal Representativeness Medium × 1 2 Europe Metric 4: Temporal Representativeness Medium × 1 2 Europe Metric 5: Sample Size Medium × 1 2 Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Europe High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	Life Cycle Description	n (Subca	ategory of Use):	XPS mas	terbatch				
Route of Exposure: Infinitiation Exposure: Concentration (Unit): ND to 1.6 mg/m3 Number of Samples: 16 Number of Sites: 2 Type of Measurement or Method: unknown Worker Activity: unknown Type of Sampling: area Exposure Duration: 40.480 min FVALUATION Domain Metric Rating MWF* Score Comments Domain 1: Reliability High × 1 Metric 2: Geographic Scope Medium × 1 2 Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Metric 4: Temporal Representativeness Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Medium × 1 2 Some statistics provided, others unknown Domain 4: Variability and Uncertainty High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	Physical Form:			powder					
Expositive Concentration (Unit): NUD to 1.6 mg/m3 Number of Samples: 16 Number of Samples: 2 Type of Measurement or Method: unknown Worker Activity: unknown Type of Sampling: area Exposure Duration: 40-480 min EVALUATION Metric Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Europe Metric 4: Temporal Representativeenses Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Domain 4: Variability and Uncertainty Metric 7: Metad	Route of Exposure:	/TT ·		Inhalation	1				
Number of Stamples: 10 Number of Sites: 2 Type of Measurement or Method: unknown Worker Activity: unknown Type of Sampling: area Exposure Duration: 40-480 min Fevaluation: EVALUATION Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Metric 2: Geographic Scope Metric 3: Applicability Metric 4: Temporal Representative Metric 5: Sample Size Metric 5: Sample Size Metric 6: Metadata Completeness Metric 7: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty High × 1 1 Metric 7: Metadata Completeness High × 1 1 Continued on next page Continued on next page Source stability und Uncertainty in the results. Uncertainty is well characterized.	Exposure Concentrati	ion (Uni	t):	ND to 1.0	o mg/m3				
Type of Measurement or Method: unknown Worker Activity: unknown Type of Sampling: area Exposure Duration: 40-480 min EVALUATION Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 3: Applicability Metric 5: Sample Size Metric 5: Sample Size Metric 6: Metadata Completeness Metric 6: Metric 6: Metric 7: Metric 8: High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty High × 1 1 Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	Number of Sites:			10 2					
Appendix mathematication of includer. uminowin Worker Activity: umknown Type of Sampling: area Exposure Duration: 40-480 min EVALUATION 0omain Domain Metric Rating MWF* Score Comments Domain 1: Reliability High × 1 1 Metric 1: Methodology High × 1 2 Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Europe Metric 2: Applicability High × 2 2 In scope Metric 4: Temporal Representativeness Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Medium × 1 2 Some statistics provided, others unknown Domain 4: Variability and Uncertainty Metric 6: Metadata Completeness High × 1 1 The assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty High × 1 1 The assessment addresses variability and uncertai	Type of Measurement	or Met	hod	2 unknown					
Type of Sampling: Exposure Duration: area 40-480 min EVALUATION Metric Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 3: Ketric 2: Metric 3: Applicability High × 1 2 Metric 4: Temporal Representative Metric 5: Sample Size Metric 5: Sample Size Medium × 2 4 Domain 3: Accessibility/Clarity Metric 6: Medium × 1 2 Some statistics provided, others unknown Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment or report clearly documents its data sources, as- sessement methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	Worker Activity:	01 10100	nou.	unknown					
Exposure Duration: 40-480 min EVALUATION Netric Rating MWF* Score Comments Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Europe Metric 3: Applicability High × 2 2 In scope Metric 4: Temporal Representativeness Medium × 2 4 2001 Metric 5: Sample Size Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Mediata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Ur-crtainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Domain 4: Variability and Ur-crtainty Metric 7: Metric 7: Metric 7:	Type of Sampling:			area					
EVALUATION Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Europe Metric 3: Applicability High × 2 2 In scope Metric 4: Temporal Representative Medium × 2 4 2001 Metric 5: Sample Size Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Domain 4: Variability and Uncertainty High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	Exposure Duration:			40-480 m	in				
EVALUATION Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Europe Metric 3: Applicability High × 2 2 In scope Metric 4: Temporal Representativeness Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Medium × 1 2 Some statistics provided, others unknown Domain 4: Variability and Uncertainty Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	-								
Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Metric 3: Medium × 1 2 Europe In scope Metric 4: Temporal Representative Metric 5: Sample Size Medium × 2 4 2001 Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	EVALUATION								
Domain 1: Reliability Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Europe Metric 3: Applicability High × 2 2 In scope Metric 4: Temporal Representativeness Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Metric 1: Methodology High × 1 1 Information is from trusted sources Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 Europe Metric 3: Applicability High × 2 2 In scope Metric 4: Temporal Representativeness Medium × 2 4 2001 Metric 5: Sample Size Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	Domain 1. Beliability								
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Me	etric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2. Representative Metric 2: Geographic Scope Medium × 1 2 Europe Metric 3: Applicability High × 2 2 In scope Metric 4: Temporal Representativeness Medium × 2 4 2001 Metric 5: Sample Size Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	Domain 2: Ronrosonte	otivo							
Metric 2. Occgraphic Scope Metrium × 1 2 Entope Metric 3: Applicability High × 2 2 In scope Metric 4: Temporal Representativeness Medium × 2 4 2001 Metric 5: Sample Size Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	Main 2. Representa	atric 2.	Geographic Scope	Medium	× 1	2	Furene		
Metric 6: Mephadamty Ingat × 2 2 Inteope Metric 4: Temporal Representativeness Medium × 2 4 2001 Metric 5: Sample Size Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	Me	etric 3	Applicability	High	$\times 2$	2	In scope		
Metric 5: Sample Size Medium × 1 2 Some statistics provided, others unknown Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	Me	etric 4:	Temporal Representativeness	Medium	$\times 2$	4	2001		
Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	Me	etric 5:	Sample Size	Medium	$\times 1$	2	Some statistics provided, others unknown		
Domain 5. Accessionity/ Clarity Metric 6: Metadata Completeness High × 1 1 Assessment or report clearly documents its data sources, assessment methods, results, and assumptions. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	Domain 3: Accessibili	ity/Clari	ity						
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	Me	etric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4. variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. Continued on next page	Domain 4. Variability	and Ur	agentainte						
Continued on next page	Me	etric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
		-	Con	tinued on 1	next page	9			

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Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 9970747							
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Overall Quality Determination [†] High 1.4								

Source Citation:EType of Data SourceCHero ID3	Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970747							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Descriptio Physical Form: Route of Exposure: Exposure Concentra Number of Samples: Type of Measuremen Worker Activity: Type of Sampling: Exposure Duration:	on (Subca ation (Uni : nt or Met	ategory of Use): t): hod:	Processin, XPS mast powder Inhalation Range: 0. 30 unknown mixer ope personal 8-hr	g terbatch 1 0002-0.00 erator	009Mea	n: 0.0005 Median: 0.0005 mg/m3		
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliabilit	ty Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Represen M M M Domain 3: Accessibi	ntative Metric 2: Metric 3: Metric 4: Metric 5: illity/Clari	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High Medium Medium	$\begin{array}{c} \times 1 \\ \times 2 \\ \times 2 \\ \times 1 \end{array}$	2 2 4 2	Europe In scope 2007 unknown if TWA, unknown worker activities		
N	Metric 6:	Metadata Completeness	Hìgh	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variabilit M	ty and Ur Metric 7:	ncertainty Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
		Con	tinued on r	next page	•			

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Source Citation: Type of Data Source Hero ID	2cha,. 2008. Risk assessment: hexabromocyclododecane. 2ccupational Exposure; Completed Exposure or Risk Assessments; 970747				
EVALUATION					
Domain	Metric	Rating MWF	* Score	Comments	
Overall Quality D	$etermination^{\dagger}$	High	1.4		

Source Citation:Echa,. 200Type of Data SourceOccupationHero ID3970747	8. Risk assessment: hexabromo- nal Exposure; Completed Expos	cyclododeca ure or Risk	ane. Assessm	ients;		
EXTRACTION		D /				
Parameter		Data				
Life Cycle Stage:		Processin	g			
Life Cycle Description (Subca	ategory of Use):	XPS mas	terbatch			
Physical Form:		granules				
Route of Exposure:		Inhalation	1			
Exposure Concentration (Uni	t):	Range 0.0 ples)	005-0.9M	ean: 0.2	2490th percentile: 0.47(excluding 16 ND sam-	
Number of Samples:		43 (16 NI)	D)			
Type of Measurement or Met	hod:	varies, 60	-2435 m	inutes		
Worker Activity:		Feed deck	near typ	pical op	erator positions	
Type of Sampling:		Mostly ar	ea and s	ome per	rsonal breathing zone	
Exposure Duration:		60 1435 minutes				
EVALUATION						
Domain	Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliability						
Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
Domain 2: Representative						
Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe	
Metric 3:	Applicability	High	$\times 2$	2	In scope	
Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2001	
Metric 5:	Sample Size	Medium	$\times 1$	2	unknown if TWA, unknown worker activities	
Domain 3: Accessibility/Clar	ity					
Metric 6:	Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as sessment methods, results, and assumptions.	
Domain 4: Variability and U	ncertainty					
Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
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Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 9970747					
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Overall Quality D	$\operatorname{Petermination}^\dagger$		High		1.4	

Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970747						
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Descrip Physical Form: Route of Exposure Exposure Concent Number of Sample Type of Measuren Worker Activity: Type of Sampling Exposure Duration	otion (Subca e: cration (Uni es: nent or Met : n:	ategory of Use): t): hod:	Processin XPS mas granules Inhalation Mean: 0.0 12 8-hr TWA Logistics, Area 8-hr TWA	g terbatch 0000390th A extrudin	h percer ng, and	ntile: 0.00004 laboratory	
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources	
Domain 2: Repres	Metric 2: Metric 2: Metric 3: Metric 4: Metric 5: ibility/Clar Metric 6:	Geographic Scope Applicability Temporal Representativeness Sample Size ity Metadata Completeness	Medium High Medium Medium	$ \begin{array}{c} \times 1 \\ \times 2 \\ \times 2 \\ \times 1 \end{array} $	2 2 4 2	Norway In scope 2005 unknown if TWA, unknown worker activities	
Domain 4: Variab	ility and Ur Metric 7:	ncertainty Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
		Con	tinued on r	next page	<u>}</u>		

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Source Citation: Type of Data Source Hero ID	2cha,. 2008. Risk assessment: hexabromocyclododecane. 2ccupational Exposure; Completed Exposure or Risk Assessments; 970747				
EVALUATION					
Domain	Metric	Rating MWF	* Score	Comments	
Overall Quality D	$etermination^{\dagger}$	High	1.4		

Source Citation: H Type of Data Source	Echa,. 200 Occupation	8. Risk assessment: hexabromoonal Exposure; Completed Expos	cyclododeca ure or Risk	ane. Assessm	ients;	
Hero ID 3	3970747					
EXTRACTION Parameter			Data			
Life Cycle Stage:			Processin	g		
Life Cycle Descripti	ion (Subca	tegory of Use):	Manufact	ure of El	PS resin	beads
Physical Form:			Respirabl	e DustIn	halable	Dust
Route of Exposure:			Inhalatio	n		
Exposure Concentra	ation (Uni	t):	Respirabl HBCD	e dust: «	<0.5 To	tal Inhalable dust: 2.0 mg/m3Not specific to
Number of Samples	:		5			
Type of Measureme	ent or Met	hod:	8-hr TWA	ł		
Worker Activity:			Addition	of HBCI	DD to re	eactor or the supervising of the addition.
Type of Sampling:			personal			
Exposure Duration:			8-hr TWA	ł		
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliabili	tv					
N	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources
Domain 2: Represe	ntative					
1	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe
1	Metric 3:	Applicability	Medium	$\times 2$	4	Condition of use is out of scope, but data may be applicable to other conditions of use
ľ	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	Original data from 1999
l	Metric 5:	Sample Size	Medium	$\times 1$	2	Some statistics provided, others unknown
Domain 3: Accessib	vility/Clari	tv				
1 Domain 9. Precessio	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4: Variabili	ity and Ur	ncertainty				
		Cor	ntinued on r	next page	9	

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Source Citation: Type of Data Source Hero ID	Echa,. 200 Occupation 3970747	8. Risk assessment: hexabromo nal Exposure; Completed Expos	cyclododeca sure or Risk	ane. Assessm	ents;	
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
	Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality D	Determination	\mathbf{n}^{\dagger}	Medium		1.7	

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Source Citation:Echa,. 200Type of Data SourceOccupationUp and the second	Irce Citation:Echa,. 2008. Risk assessment: hexabromocyclododecane.pe of Data SourceOccupational Exposure; Completed Exposure or Risk Assessments;						
Hero ID 3970747							
EXTRACTION		_					
Parameter		Data					
Life Cycle Stage:		Processin	a.				
Life Cycle Description (Subca	tegory of Use).	XPS mas	g terbatch				
Physical Form:	legory of ese).	granule	ici batcii				
Route of Exposure:		Inhalatio	ı				
Exposure Concentration (Unit	t):	ND to 0.8	38 mg/m	3			
Number of Samples:	,	32	0,				
Number of Sites:		6					
Type of Measurement or Met	hod:	unknown					
Worker Activity:		unknown					
Type of Sampling:		area and	personal				
Exposure Duration:		40-1435 n	nin				
EVALUATION							
Domain	Metric	Rating	MWF^*	Score	Comments		
Domain 1: Reliability							
Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Representative							
Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
Metric 3:	Applicability	High	$\times 2$	2	In scope		
Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2001		
Metric 5:	Sample Size	Medium	$\times 1$	2	unknown if TWA, unknown worker activities		
Domain 3: Accessibility/Clari	tv						
Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability and Un	certainty						
Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
	Con	tinued on r	next page				

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Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 9970747					
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Overall Quality D	$\operatorname{Petermination}^\dagger$		High		1.4	

Source Citation: Type of Data Source	Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 20270747						
Hero ID	3970747						
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Descrip Physical Form: Route of Exposur Exposure Concent Number of Sampl Number of Sites: Type of Measuren Worker Activity: Type of Sampling	otion (Subca e: tration (Uni es: nent or Met :	ttegory of Use): t): hod:	Processing cutting of solid Inhalation 0.22 mg/n 42 3 unknown unknown area?	g XPS bo n n3 (90th	ards		
EVALUATION							
Domain		Metric	Rating	MWF^*	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
Damain 9. Dama							
Domain 2: Repres	Metric 2.	Geographic Scope	Medium	× 1	2	Europe	
	Metric 3:	Applicability	High	$\times 2$	2	In scope	
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2005	
	Metric 5:	Sample Size	Medium	$\times 1$	2	unknown if TWA, unknown worker activities	
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4. Vh	ilitar and Th						
Domain 4: variab	Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
		Con	tinued on r	next page			

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Source Citation: Type of Data Source Hero ID	2cha,. 2008. Risk assessment: hexabromocyclododecane. 2ccupational Exposure; Completed Exposure or Risk Assessments; 970747				
EVALUATION					
Domain	Metric	Rating MWF	* Score	Comments	
Overall Quality D	$etermination^{\dagger}$	High	1.4		

Source Citation: Type of Data Source	Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments;							
Hero ID	3970747							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Descrip Physical Form: Route of Exposure Exposure Concent Number of Sample Type of Measurem Worker Activity: Type of Sampling: Exposure Duration	tion (Subca e: tration (Uni es: nent or Met : n:	ttegory of Use): t): hod:	Processin, XPS mast powder Inhalation mean 15 (30 unknown reactor op personal 8-hr	g terbatch ?g/m3, m perator	uedian 2	2.7 ?g/m3		
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliabi	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Damain & Damas								
Domain 2: Repres	Metric 2.	Geographic Scope	Medium	$\times 1$	2	Norway		
	Metric 3:	Applicability	High	$\times 2$	2	In scope		
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2007		
	Metric 5:	Sample Size	Medium	$\times 1$	2	unknown if TWA, unknown worker activities		
Domain 3: Access	ibility/Clari Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
	:1:41 TT							
Domain 4: Variab	Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
		Con	tinued on r	ext page				
- continued from previous page								
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Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970747							
EVALUATION								
Domain	Metric	Rating MWF	* Score	Comments				
Overall Quality D	$etermination^{\dagger}$	High	1.4					

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970747								
EXTRACTION Parameter									
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity: Type of Sampling: PPE:			Processing EPS Resin production powder Inhalation Mean: 1.290 percent -ile: 1.1 mg/m3 8-hr TWA adding to vessel personal Most workers were reported to use gloves, overall, eye protection, and disposable respirator.						
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments			
Domain 1: Reliabil	lity Metric 1:	Methodology	High	× 1	1	Information is from trusted sources			
Domain 2: Represe	entative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium × 1 2 Europe Medium × 2 4 Manufacturing EPS is not in scope, but some information r be applicable to other scenarios that are in scope s Medium × 2 4 2005 High × 1 1 Fully characterized			Europe Manufacturing EPS is not in scope, but some information may be applicable to other scenarios that are in scope 2005 Fully characterized			
Domain 3: Accessi	bility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness				× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
Continued on next page									

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Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970747								
	Metric	Rating	MWF^{\star}	Score	Comments			
Overall Quality Determination [†] High 1.6								
	Echa,. 2008. Risk asso Occupational Exposur 3970747 Determination [†]	– continu Echa,. 2008. Risk assessment: hexabromod Occupational Exposure; Completed Exposu 3970747 Metric	- continued from p Echa,. 2008. Risk assessment: hexabromocyclododeca Occupational Exposure; Completed Exposure or Risk 3970747 Metric Rating Determination [†]	 – continued from previous Echa,. 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessme 3970747 Metric Rating MWF* Determination[†] High 	- continued from previous page Echa,. 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970747 Metric Rating Metric Rating Metric 1.6			

Source Citation:EchaType of Data SourceOccuHero ID3970	.,. 2008. Risk assessment: hexabromo pational Exposure; Completed Expo 747	ocyclododeca sure or Risk	ane. Assessm	ients;			
EXTRACTION Parameter		Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity: Type of Sampling: PPE:			Processing EPS Resin production powder Inhalation Mean: 7.290 percent -ile: 10.6 mg/m3 8-hr TWA Weighing HBCD powder before addition personal Most workers were reported to use gloves, overall, eye protection, and disposable respirator.				
EVALUATION Domain	Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliability Metr	ic 1: Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Representati Metr Metr Metr Metr	ve ic 2: Geographic Scope ic 3: Applicability ic 4: Temporal Representativeness ic 5: Sample Size	Medium × 1 2 Europe Medium × 2 4 Manufacturing EPS is not in scope, but some information r be applicable to other scenarios that are in scope s Medium × 2 4 2005 High × 1 Fully characterized 1			Europe Manufacturing EPS is not in scope, but some information may be applicable to other scenarios that are in scope 2005 Fully characterized		
Domain 3: Accessibility Metr	/Clarity ic 6: Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness			$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
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Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970747								
	Metric	Rating	MWF^{\star}	Score	Comments			
Overall Quality Determination [†] High 1.6								
	Echa,. 2008. Risk asso Occupational Exposur 3970747 Determination [†]	– continu Echa,. 2008. Risk assessment: hexabromod Occupational Exposure; Completed Exposu 3970747 Metric	- continued from p Echa,. 2008. Risk assessment: hexabromocyclododeca Occupational Exposure; Completed Exposure or Risk 3970747 Metric Rating Determination [†]	 – continued from previous Echa,. 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessme 3970747 Metric Rating MWF* Determination[†] High 	- continued from previous page Echa,. 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970747 Metric Rating Metric Rating Metric 1.6			

Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970747							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method:		Processing XPS compounding powder Dermal 0-0.1 mg/cm2/day Modelled by EASE						
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Repres	sentative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High Medium	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 2	Europe In scope 2008 characterized by a range uncertain statistics		
Domain 3: Access	ibility/Clari Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness		High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.2			

Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.							
Type of Data Source Hero ID	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 3809277							
EXTRACTION								
Parameter			Data					
Life Cycle Stage:			All					
Number of Worke	ers:		<2100					
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility							
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Repres	sentative							
Domain - , roopro	Metric 2:	Geographic Scope	High	$\times 1$	1	US		
	Metric 3:	Applicability	Medium	$\times 2$	4	Captures releases from all possible stages, some of which are not in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012		
	Metric 5:	Sample Size	Medium	$\times 1$	2	characterized by a range with uncertain statistics		
Domain 3: Access	sibility/Clar	ity						
Domain 5. Access	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4. Variah	ilitar and U	a conta inter						
Domain 4: Variat	Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality D	Determinatio	\mathbf{n}^{\dagger}	High		1.3			

* MWF = Metric Weighting Factor

Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.							
Type of Data Source Hero ID	Occupational Exposure; Monitoring Data; 3809277							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity:			Manufacture or Processing Manufacture, Processing EPS or XPS dust Inhalation 0.1 to 2.5 mg/m3 taken from 2008 EU assessment (HERO 3970747) handling standard grade HBCD powder at sites for the manufacture or processing					
EVALUATION		Metric	Bating	MWF*	Score	Comments		
Domani		Metric	Rating	IVI VV F	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	Low	$\times 1$	3	Sampling or analytical methodology is not specified.		
Domain 9. Donno	aantatiwa							
Domain 2: Repre	Metric 2:	Geographic Scope	Medium	× 1	2	Furope		
	Metric 3:	Applicability	Medium	$\times 2$	4	EPS compounding and MFG not in scope, but other scenarios are		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008		
	Metric 5:	Sample Size	Medium	$\times 1$	2	characterized by a range with uncertain statistics		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Medium	$\times 1$	2	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata, such		
						as sample durations, exposure durations, exposure frequency		
Domain 4: Varial	oility and U	ncertainty						
	Metric 7:	Metadata Completeness	$\begin{array}{llllllllllllllllllllllllllllllllllll$					
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Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants.							
Type of Data Source	Occupational Exposure; Monitoring Dat	a;						
Hero ID	3809277							
EVALUATION								
Domain	Metric	Rating	$\rm MWF^{\star}$	Score		Comments		
Overall Quality D	$\operatorname{etermination}^\dagger$	Medium		1.8				

Source Citation:	U.S, E. P. A 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants							
Type of Data Source Hero ID	Occupational Exposure; Monitoring Data; 3809277							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity:			Manufacture or Processing Manufacture, Processing EPS or XPS solid Dermal 84 to 840 mg/day taken from 2008 EU assessment (HERO 3970747) handling standard grade HBCD powder at sites for the manufacture or processing					
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliab	oility Metric 1:	Methodology	Low	× 1	3	Sampling or analytical methodology is not specified.		
Domain 2: Repre	sentative							
	Metric 2: Metric 3:	Geographic Scope Applicability	Medium Medium	$\times 1 \times 2$	$\frac{2}{4}$	Europe EPS compounding and MFG not in scope, but other scenarios are		
	Metric 4: Metric 5:	Temporal Representativeness Sample Size	High Medium	$\begin{array}{c} \times \ 2 \\ \times \ 1 \end{array}$	$2 \\ 2$	2008 characterized by a range with uncertain statistics		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Medium	× 1	2	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata, such as sample durations, exposure durations, exposure frequency		
Domain 4: Variab	bility and U	ncertainty	II:l.	v 1	1			
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
				4				
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Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide flame retardants.							
Type of Data Source	Occupational Exposure; Monitoring Dat	a;						
Hero ID	3809277							
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score		Comments		
Overall Quality D	$\operatorname{etermination}^\dagger$	Medium		1.8				

Source Citation:200Type of Data SourceOcHero ID39'	08. Sum cupation 70756	amary risk assessment report: He nal Exposure; Completed Expos	exabromocy ure or Risk	clododec Assessm	ane. ents;		
EXTRACTION Parameter							
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity: Bulk and Dust Particle Size Distribution:			Manufacture Manufacture Fine powder (via micronisation) Inhalation Worst case = 10 mg/m3; typical = 5 mg/m3 from monitoring data or modelled Filling of bags at the production of HBCDD micronised typically 3 to 4 ?m, powder typically 50 to 250 ?m; granulates typically > 500 ?m				
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliability Me	etric 1:	Methodology	High	× 1	1	Information is from trusted sources	
Domain 2: Represent Me Me	ative etric 2: etric 3:	Geographic Scope Applicability	Medium Medium	$\times 1 \times 2$	$\frac{2}{4}$	Europe Manufacture is not in scope but filling of bags can be applied to Import	
Me	etric 4: etric 5:	Temporal Representativeness Sample Size	High Medium	$\times 2 \times 1$	$2 \\ 2$	2008 characterized by a range with uncertain statistics	
Domain 3: Accessibili Me	ty/Clar etric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variability Me	and Ur etric 7:	ncertainty Metadata Completeness	Medium	× 1	2	limited discussion	
Overall Quality Deter	minatio	n [†]	High	out no m	1.6		
Continued on next page							

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Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment Occupational Exposure; Complet 3970756	report: Hexabromocy ted Exposure or Risk	vclododecane. Assessments;	
EVALUATION				
Domain	Metric	Rating	MWF* Score	Comments

Type of Data Source Occupational Exposure, Completed Exposure c	of filsk I		mta.				
Hero ID 3970756	3970756						
EXTRACTION Parameter Da	ata						
Life Cycle Stage Ma	anufactu	ro					
Life Cycle Description (Subcategory of Use):	anufactu	re					
Physical Form: Fin	ne powd	er (via n	nicronis	ation)			
Route of Exposure: Der	ermal						
Exposure Concentration (Unit): 420	00 mg/d	ay					
Type of Measurement or Method: from	om monit	toring da	ata or n	nodelled			
Worker Activity: Fill	lling of b	bags at t	he prod	uction of HBCDD			
Bulk and Dust Particle Size Distribution: mice typ	cronised pically >	typically 500 ?m	y 3 to 4	?m, powder typically 50 to 250 ?m; granulates			
EVALUATION							
Domain Matria Be	oting		Secre	Commonto			
	ating	IVI VV F	Score	Comments			
Domain 1. Roliability							
Metric 1: Methodology Hig	$_{\mathrm{gh}}$	$\times 1$	1	Information is from trusted sources			
	0						
Domain 2: Representative							
Metric 2: Geographic Scope Me	edium	$\times 1$	2	Europe			
Metric 3: Applicability Me	edium	$\times 2$	4	Manufacture is not in scope but filling of bags can be applied to Import			
Metric 4: Temporal Representativeness Hig	$_{\mathrm{gh}}$	$\times 2$	2	2008			
Metric 5: Sample Size Me	edium	$\times 1$	2	characterized by a range with uncertain statistics			
Domain 3: Accessibility/Clarity	l.	1	1				
Metric 6: Metadata Completeness Hig	gn	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Variability and Uncertainty							
Metric 7: Metadata Completeness Me	edium	× 1	2	limited discussion			
	- arum	·· •	-				
Overall Quality Determination [†] Hig	$_{\mathrm{gh}}$		1.6				
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Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment report Occupational Exposure; Completed Ex 3970756	: Hexabromocyclododecane. posure or Risk Assessments;	
EVALUATION			
Domain	Metric	Rating MWF* Score Comments	

Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment report: Hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970756						
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity: Bulk and Dust Particle Size Distribution:			Manufacture Manufacture powder Inhalation Worst case = 1.9 mg/m3; typical = 0.95 mg/m3 from monitoring data or modelled Filling of bags at the production of HBCDD micronised typically 3 to 4 ?m, powder typically 50 to 250 ?m; granulates typically > 500 ?m				
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources	
Domain 2: Repres	sentative Metric 2: Metric 3:	Geographic Scope Applicability	Medium Medium	$\begin{array}{c} \times \ 1 \\ \times \ 2 \end{array}$	$\frac{2}{4}$	Europe Manufacture is not in scope but filling of bags can be applied to Import	
	Metric 4: Metric 5:	Temporal Representativeness Sample Size	High Medium	$\times 2 \times 1$	$\frac{2}{2}$	2008 characterized by a range with uncertain statistics	
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variab	ility and Ur Metric 7:	ncertainty Metadata Completeness	Medium	× 1	2	limited discussion	
Overall Quality D	eterminatio	n [†]	High		1.6		
	Continued on next page						

	- cor	tinued from previous page	
Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment report Occupational Exposure; Completed Ex 3970756	: Hexabromocyclododecane. posure or Risk Assessments;	
EVALUATION			
Domain	Metric	Rating MWF* Score Comments	

Source Citation:2008. SType of Data SourceOccupaUU	Summary risk assessment report: H attional Exposure; Completed Expos	exabromocy sure or Risk	clododec Assessm	ane. ents;			
EXTRACTION	0	Data					
1 al allietel		Data					
Life Cycle Stage:		Manufact	ure				
Life Cycle Description (Su	bcategory of Use):	Manufact	ure				
Physical Form:		granule					
Route of Exposure:		Inhalation	1				
Exposure Concentration (Unit):	Worst cas	e = 0.19	mg/m3	B; typical = 0.1 mg/m3		
Type of Measurement or 1	Method:	from mon	itoring d	ata or r	nodelled		
Worker Activity:		Filling of	bags at t	he proc	luction of HBCDD		
Bulk and Dust Particle Si	ze Distribution:	typically	d typicall > 500 ?n	y 3 to 4 1	?m, powder typically 50 to 250 ?m; granulates		
EVALUATION							
Domain	Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliability Metric	1: Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Representative							
Metric	2: Geographic Scope	Medium	$\times 1$	2	Europe		
Metric	3: Applicability	Medium	$\times 2$	4	Manufacture is not in scope but filling of bags can be applied to Import		
Metric	4: Temporal Representativeness	High	$\times 2$	2	2008		
Metric	5: Sample Size	Medium	$\times 1$	2	characterized by a range with uncertain statistics		
Domain 3: Accessibility/O	larity						
Metric	6: Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4. Variability and	Uncertainty						
Metric	7: Metadata Completeness	Medium	$\times 1$	2	limited discussion		
	L						
Overall Quality Determin	ation [†]	High		1.6			
	Continued on next page						

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Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment Occupational Exposure; Complet 3970756	report: Hexabromocy ted Exposure or Risk	vclododecane. Assessments;	
EVALUATION				
Domain	Metric	Rating	MWF* Score	Comments

Source Citation:200Type of Data SourceOcc	2008. Summary risk assessment report: Hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments;					
Hero ID 397	0756					
EXTRACTION Parameter			Data			
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity: Bulk and Dust Particle Size Distribution:			Manufacture Manufacture powder Dermal 840 mg/day from monitoring data or modelled Filling of bags at the production of HBCDD micronised typically 3 to 4 ?m, powder typically 50 to 250 ?m; granulates typically > 500 ?m			
EVALUATION		Metric	Bating	MWF*	Score	Comments
		WIGHT	rtaung	TAT AA T.	SCOLE	Commento
Domain 1: Reliability Met	tric 1:	Methodology	High	× 1	1	Information is from trusted sources
Domain 2: Representa	tive	Coorrenhia Second	Madium	× 1	0	
Met	tric 3:	Applicability	Medium	$\times 1 \times 2$	$\frac{2}{4}$	Europe Manufacture is not in scope but filling of bags can be applied to Import
Met	tric 4:	Temporal Representativeness	High	$\times 2$	2	2008
Met	tric 5:	Sample Size	Medium	$\times 1$	2	characterized by a range with uncertain statistics
Domain 3: Accessibilit Met	y/Clar tric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4: Variability Met	and Ui tric 7:	ncertainty Metadata Completeness	Medium	× 1	2	limited discussion
		Metadata Completeness	munuili	~ 1	4	
Overall Quality Determ	ninatio	\mathbf{n}^{\dagger}	High		1.6	
Continued on next page						

		- continued from p	previous page	
Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment Occupational Exposure; Complet 3970756	report: Hexabromocy ted Exposure or Risk	vclododecane. Assessments;	
EVALUATION				
Domain	Metric	Rating	MWF* Score	Comments

Source Citation: Type of Data Source	2008. Summary risk assessment report: Hexabromocyclododecane. Occupational Exposure: Completed Exposure or Risk Assessments:						
Hero ID	3970756						
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity: Bulk and Dust Particle Size Distribution:			Manufacture Manufacture granule Dermal 84 mg/day from monitoring data or modelled Filling of bags at the production of HBCDD micronised typically 3 to 4 ?m, powder typically 50 to 250 ?m; granulates typically > 500 ?m				
EVALUATION			D .:		a		
Domain		Metric	Rating	MWF'*	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources	
Domain 2: Repres	sentative Metric 2: Metric 3:	Geographic Scope Applicability	Medium Medium	$\begin{array}{c} \times \ 1 \\ \times \ 2 \end{array}$	$\frac{2}{4}$	Europe Manufacture is not in scope but filling of bags can be applied	
	Metric 4: Metric 5:	Temporal Representativeness Sample Size	High Medium	$\times 2 \times 1$	$\frac{2}{2}$	to Import 2008 characterized by a range with uncertain statistics	
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variab	ility and U Metric 7:	ncertainty Metadata Completeness	Medium	× 1	2	limited discussion	
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.6		
Continued on next page							

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Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment Occupational Exposure; Complet 3970756	report: Hexabromocy ted Exposure or Risk	vclododecane. Assessments;	
EVALUATION				
Domain	Metric	Rating	MWF* Score	Comments

Source Citation: Type of Data Source Hero ID	2008. Sum Occupation 3970756	mary risk assessment report: He nal Exposure; Completed Expos	exabromocy ure or Risk	clododec Assessm	ane. ents;	
EXTRACTION Parameter			Data			
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity: Bulk and Dust Particle Size Distribution:			Processing Formulation of XPS Fine powder (via micronisation) Inhalation Worst case = 3.1 mg/m3; typical = 1.55 mg/m3 from monitoring data or modelled Adding HBCD to process micronised typically 3 to 4 ?m, powder typically 50 to 250 ?m; granulates typically > 500 ?m			
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments
Domain 1: Reliabi	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources
Domain 2: Repres	entative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High Medium	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 2	Europe In scope 2008 characterized by a range with uncertain statistics
Domain 3: Access	ibility/Clari Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Medium $\times 1$ 2 limited discussion					limited discussion	
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.3	
Continued on next page						

	- contin	ued from	previous	page	
Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment report: H Occupational Exposure; Completed Expos 3970756	exabromoc sure or Risl	yclododeca x Assessme	ane. ents;	
EVALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	on: 2008. Summary risk assessment report: Hexabromocyclododecane. Source Occupational Exposure; Completed Exposure or Risk Assessments; 3970756							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity: Bulk and Dust Particle Size Distribution:			Processing Formulation of XPS Fine powder (via micronisation) Dermal 120 mg/day from monitoring data or modelled Adding HBCD to process micronised typically 3 to 4 ?m, powder typically 50 to 250 ?m; granulates typically > 500 ?m					
EVALUATION Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Repres	Metric 2: Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High Medium	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 2	Europe In scope 2008 characterized by a range with uncertain statistics		
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness M				× 1	2	limited discussion		
Overall Quality Determination ^{\dagger}		High		1.3				
Continued on next page								

	- contin	ued from	previous	page	
Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment report: H Occupational Exposure; Completed Expos 3970756	exabromoc sure or Risl	yclododeca x Assessme	ane. ents;	
EVALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment report: Hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970756						
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity: Bulk and Dust Particle Size Distribution:			Processing Formulation of XPS powder Inhalation Worst case = 2.5 mg/m3; typical = 1.25 mg/m3 from monitoring data or modelled Adding HBCD to process micronised typically 3 to 4 ?m, powder typically 50 to 250 ?m; granulates typically > 500 ?m				
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources	
Domain 2: Repres	Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High Medium	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 2	Europe In scope 2008 characterized by a range with uncertain statistics	
Domain 3: Access	ibility/Clari Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variab	Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness				2	limited discussion	
Overall Quality Determination ^{\dagger}		High		1.3			
Continued on next page							

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Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment report: H Occupational Exposure; Completed Expos 3970756	exabromoc sure or Risl	yclododeca x Assessme	ane. ents;	
EVALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	tion: 2008. Summary risk assessment report: Hexabromocyclododecane. ta Source Occupational Exposure; Completed Exposure or Risk Assessments; 3970756							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity: Bulk and Dust Particle Size Distribution:				Processing Formulation of XPS granule Inhalation Worst case = 0.22 mg/m3; typical = 0.11 mg/m3 from monitoring data or modelled Adding HBCD to process micronised typically 3 to 4 ?m, powder typically 50 to 250 ?m; granulates typically > 500 ?m				
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Repres	Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High Medium	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 2	Europe In scope 2008 characterized by a range with uncertain statistics		
Domain 3: Access	ibility/Clari Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness				× 1	2	limited discussion		
Overall Quality Determination ^{\dagger}			High		1.3			
Continued on next page								

	- contin	ued from	previous	page	
Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment report: H Occupational Exposure; Completed Expos 3970756	exabromoc sure or Risl	yclododeca x Assessme	ane. ents;	
EVALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment report: Hexabromocyclododecane. e Occupational Exposure; Completed Exposure or Risk Assessments; 3970756							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity: Bulk and Dust Particle Size Distribution:			Processing Formulation of XPS powder Dermal 84 mg/day from monitoring data or modelled Adding HBCD to process micronised typically 3 to 4 ?m, powder typically 50 to 250 ?m; granulates typically > 500 ?m					
EVALUATION Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Repres	entative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High Medium	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 2	Europe In scope 2008 characterized by a range with uncertain statistics		
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness				× 1	2	limited discussion		
Overall Quality Determination ^{\dagger}		High		1.3				
Continued on next page								

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Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment report: H Occupational Exposure; Completed Expos 3970756	exabromoc sure or Risl	yclododeca x Assessme	ane. ents;	
EVALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment report: Hexabromocyclododecane. Occupational Exposure; Completed Exposure or Risk Assessments; 3970756							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity: Bulk and Dust Particle Size Distribution:			Processing Formulation of XPS granule Dermal 8.4 mg/day from monitoring data or modelled Adding HBCD to process micronised typically 3 to 4 ?m, powder typically 50 to 250 ?m; granulates typically > 500 ?m					
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Repres	Metric 2: Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High Medium	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 2	Europe In scope 2008 characterized by a range with uncertain statistics		
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness				× 1	2	limited discussion		
Overall Quality Determination ^{\dagger}		High		1.3				
Continued on next page								

	- contin	ued from	previous	page	
Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment report: H Occupational Exposure; Completed Expos 3970756	exabromoc sure or Risl	yclododeca x Assessme	ane. ents;	
EVALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Echa,. 200 Occupation 3970759	9. Prioritisation and Annex XIV nal Exposure; Monitoring Data;	/ background inf	formation	ı: hexbı	romocyclododecane.	
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit):			Manufacture Manufacture powder Inhalation 0.18 mg/m3 of HBCD in dust (respirable); 1.23 mg/m3 HBCD in dust (total)				
Type of Measurement or Method: Worker Activity:			measured Packaging of p	owders			
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	Low	$\times 1$	3	Sampling or analytical methodology is not specified.	
Domain 2: Bepres	sentative						
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe	
	Metric 3:	Applicability	Medium	$\times 2$	4	Manufacture is not in scope but filling of bags can be applied to Import	
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008	
	Metric 5:	Sample Size	Medium	$\times 1$	2	characterized by a range with uncertain statistics	
Domain 3: Access	sibility/Clar	ity					
	Metric 6:	Metadata Completeness	Unacceptable	$\times 1$	4	Monitoring data do not include any needed metadata to un- derstand what the data represent and are not usable in the risk evaluation	
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Medium	× 1	2	limited discussion	
Overall Quality F)eterminatio	^ n [†]	Unacceptable		4	Metric Mean Score: 2.1	
			ontinued on nev	t pago	1	North Neuri 50010. 2.1.	
		C	John mueu on nex	i page			
– continued from previous page							
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Source Citation: Type of Data Source Hero ID	Echa, 2009. Prioritisation and Annex 2 Occupational Exposure; Monitoring Da 3970759	XIV background inf .ta;	formation	: hexbrome	cyclododecane.		
EVALUATION							
Domain	Metric	Rating	MWF^{\star}	Score	Comments		

** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Echa,. 200 Occupation 3970759	9. Prioritisation and Annex XIV nal Exposure; Monitoring Data;	/ backgrour	nd inform	nation: 1	hexbromocyclododecane.
EXTRACTION Parameter			Data			
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity:			Manufacture Manufacture powder Dermal 170 mg/day modelled with EASE Packaging of powders			
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments
Domain 1: Reliabi	lity Metric 1:	Methodology	High	× 1	1	approved modelling approach
Domain 2: Represe	entative Matria 2	Caamankia Saana	Madium	× 1	0	D.
	Metric 2: Metric 3:	Applicability	Medium	$\times 1 \times 2$	$\frac{2}{4}$	Europe Manufacture is not in scope but filling of bags can be applied to Import
	Metric 4: Metric 5:	Temporal Representativeness Sample Size	High Medium	$\times 2 \times 1$	$\frac{2}{2}$	2008 characterized by a range with uncertain statistics
Domain 3: Accessi	ibility/Clari Metric 6:	ty Metadata Completeness	Low	× 1	3	Enough metadata to be used
Domain 4: Variabi	ility and Ur Metric 7:	acertainty Metadata Completeness	Medium	$\times 1$	2	limited discussion
Overall Quality De	eterminatio	n†	Medium		1.8	

Source Citation: Type of Data Source Hero ID	Echa,. 200 Occupation 3970759	9. Prioritisation and Annex XIV nal Exposure; Monitoring Data;	/ backgrour	nd inform	nation:	hexbromocyclododecane.
EXTRACTION Parameter			Data			
Life Cycle Stage:			Manufact	ure		
Life Cycle Descrip	otion (Subca	ategory of Use):	Manufact	ure		
Physical Form: Bouto of Exposure	· ·		Dormal			
Exposure Concent	e. Tration (Uni	+).	17 mg/da	V		
Type of Measuren	ent or Met	hod:	modelled	with EA	SE	
Worker Activity:	10110 01 10100		Packaging	g of powe	lers	
v			0.0			
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1. Daliah	:1:4					
Domain 1. Renad	Metric 1:	Methodology	High	$\times 1$	1	approved modelling approach
Domain 2: Repres	entative	aa				
	Metric 2:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	Medium	× 2	4	Manufacture is not in scope but filling of bags can be applied to Import
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008
	Metric 5:	Sample Size	Medium	$\times 1$	2	characterized by a range with uncertain statistics
Domain 3: Access	ibility/Clar	ity	т	1	0	
	Metric 6:	Metadata Completeness	Low	× 1	3	Enough metadata to be used
Domain 4: Variab	ility and Ur	ncertainty				
	Metric 7:	Metadata Completeness	Medium	$\times 1$	2	limited discussion
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Medium		1.8	

Source Citation: Echa, Type of Data Source Occup Hero ID 39707	2009. Prioritisation and Annex XI pational Exposure; Monitoring Data; 59	V background in	formation	1: hexbr	omocyclododecane.
EXTRACTION Parameter		Data			
Life Cycle Stage: Life Cycle Description (S Physical Form: Route of Exposure: Exposure Concentration Type of Measurement or	Processing XPS formulation Dust Inhalation mean 0.01 mg/m3 (respirable), 0.03 mg/m3 (total) measured				
EVALUATION					
Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability Metric	c 1: Methodology	Low	× 1	3	Sampling or analytical methodology is not specified.
Domain 2: Representativ	e				
Metrie	2: Geographic Scope	Medium	$\times 1$	2	Europe
Metrie	e 3: Applicability	High	$\times 2$	2	In scope
Metrie	e 4: Temporal Representativeness	High	$\times 2$	2	2008
Metrie	e 5: Sample Size	Medium	$\times 1$	2	characterized by a range with uncertain statistics
Domain 3: Accessibility/ Metric	Clarity c 6: Metadata Completeness	Unacceptable	× 1	4	Monitoring data do not include any needed metadata to un- derstand what the data represent and are not usable in the risk evaluation
Domain 4: Variability an Metric	d Uncertainty c 7: Metadata Completeness	Medium	× 1	2	limited discussion
Overall Quality Determin	nation [†]	Unacceptable		4	Metric Mean Score: 1.9.
	(Continued on nex	t page		

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on: Echa,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane. Source Occupational Exposure; Monitoring Data; 3970759								
		EVALUATION						
ng MWF* Score Comments	Metric	Domain						
ng MWF* Score Comments	Ecna, 2009. Prioritisation and Annex XIV Occupational Exposure; Monitoring Data; 3970759 Metric	Source Citation: Type of Data Source Hero ID EVALUATION Domain						

** Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation:Echa., 200Type of Data SourceOccupatioHero ID3970759	09. Prioritisation and Annex XIV nal Exposure; Monitoring Data;	√ background inf	formation	ı: hexbr	omocyclododecane.
EXTRACTION		Data			
Life Cycle Stage: Life Cycle Description (Subca Physical Form: Route of Exposure:	Processing EPS, HIPS, production of textile coating Dust Inhalation				
Type of Measurement or Met	mean total dus mg/m3 measured	st 1.10 tu	1.09 11	g/m3, mean respirable dust 0.12 to 0.35	
EVALUATION Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability Metric 1:	Methodology	Low	× 1	3	Sampling or analytical methodology is not specified.
Domain 2: Representative					
Metric 2: Metric 3:	Geographic Scope Applicability	Medium Medium	$\times 1 \times 2$	$\frac{2}{4}$	Europe These compounding processes are not in scope but may provide baseline for other scenarios
Metric 4: Metric 5:	Temporal Representativeness Sample Size	High Medium	$\times 2 \times 1$	$\frac{2}{2}$	2008 characterized by a range with uncertain statistics
Domain 3: Accessibility/Clar Metric 6:	ity Metadata Completeness	Unacceptable	× 1	4	Monitoring data do not include any needed metadata to un- derstand what the data represent and are not usable in the risk evaluation
Domain 4: Variability and Ur Metric 7:	ncertainty Metadata Completeness	Medium	× 1	2	limited discussion
Overall Quality Determination	n^\dagger	Unacceptable		4	Metric Mean Score: 2.1.
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on: Echa,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane. Source Occupational Exposure; Monitoring Data; 3970759								
		EVALUATION						
ng MWF* Score Comments	Metric	Domain						
ng MWF* Score Comments	Ecna, 2009. Prioritisation and Annex XIV Occupational Exposure; Monitoring Data; 3970759 Metric	Source Citation: Type of Data Source Hero ID EVALUATION Domain						

** Consistent with our *Application of Systematic Review in TSCARisk Evaluations* document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation:EchType of Data SourceOccHero ID397	1a,. 200 cupation 70759	9. Prioritisation and Annex XIV nal Exposure; Monitoring Data;	/ backgrour	id inform	ation:	hexbromocyclododecane.	
EXTRACTION							
Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method:			Processing HBCDD use for XPS, EPS andHIPS Solid Dermal 17 mg/day modelled				
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliability Me	tric 1:	Methodology	High	× 1	1	approved modelling approach	
Domain 2: Representa	tive						
Met	tric 2:	Geographic Scope	Medium	$\times 1$	2	Europe	
Met	tric 3:	Applicability	Medium	$\times 2$	4	XPS in scope but others are not	
Met	tric 4:	Temporal Representativeness	High	$\times 2$	2	2008	
Me	tric 5:	Sample Size	Medium	× 1	2	characterized by a range with uncertain statistics	
Domain 3: Accessibilit Mer	ty/Clari tric 6:	ty Metadata Completeness	Low	$\times 1$	3	Enough metadata to be used	
Domain 4: Variability Me	and Ur tric 7:	ncertainty Metadata Completeness	Medium	× 1	2	limited discussion	
Overall Quality Detern	minatio	\mathbf{n}^{\dagger}	Medium		1.8		

* MWF = Metric Weighting Factor

Source Citation:	Ni, H. G.,Zeng, H. 2013. HBCD and TBBPA in particulate phase of indoor air in Shenzhen, China. Science of the Total							
Type of Data Source Hero ID	Occupation 1927552	nal Exposure; Monitoring Data;						
EXTRACTION Parameter			Data					
			a .	1.77				
Life Cycle Stage:	tion (Coller		Commerie	cal Use		9		
Dhusical Format	ption (Subca	itegory of Use):	Insulation	1 product	s in on	ices		
Physical Form: Doute of Function			Inholotion	urea on i	indoor a	air inters		
Fyposure Concor	e: tration (Uni	+).	11111a1atio	11 74. pg/m'	2 (moor	1.001 pg/m^{2}		
Number of Sampl			27.3 - 2.2	r4 pg/m) (mean	1 - 1,001 pg/m3)		
Number of Sites			56 (1 per	site)				
Type of Measurer	ment or Met	hod	TWA					
Worker Activity:			Modeled	data bas	ed on i	HBCD concentration in dust. No associated		
			worker ac	tivity.				
Type of Sampling	;:		Cenral air	r conditio	oner filt	er dusts were collected as particulate phase of		
Sampling Locatio	n·							
Bulk and Dust Pa	article Size I	Distribution:	PM2.5 (Paricle Size 0.4 - 2.2 um)					
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	oility							
	Metric 1:	Methodology	Medium	$\times 1$	2	Describes how the data was modeled from the HBCD dust con- centrations		
Domain 2. Panna	contativo							
Domain 2. Repres	Motric 2	Geographic Scope	Low	~ 1	3	China (non OECD country)		
	Metric 2.	Applicability	Low	$^{\wedge 1}$	5	The data are for a new accupational scenario (consumer supe		
	Metric 5.	Applicability	LOW	~ 2	0	sure) that is similar to an occupational scenario (consumer expo- sure) that is similar to an occupational scenario (service life) within the scope of the risk evaluation		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2013		
	Metric 5:	Sample Size	High	$\times 1$	1	Indicates number of locations and provides several statistics of the sample size.		
		Cor	ntinued on 1	next page				

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Source Citation:	Ni, H. G., Environme	Ni, H. G., Zeng, H 2013. HBCD and TBBPA in particulate phase of indoor air in Shenzhen, China. Science of the Total Environment.						
Type of Data Source	Occupation	Occupational Exposure: Monitoring Data:						
Hero ID	1927552	1 / U	,					
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Monitoring data include all associated metadata.		
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty		
Overall Quality D	Determinatio	\mathbf{n}^{\dagger}	Medium		2.0			

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Source Citation:	Ni, H. G., Zeng, H. 2013. HBCD and TBBPA in particulate phase of indoor air in Shenzhen, China. Science of the Total								
Type of Data Source	Occupatio								
Hero ID	1927552	I (1997) (1997)							
EXTRACTION									
Parameter			Data						
				1 7 7					
Life Cycle Stage:	4: (C		Commerie	cal Use		9			
Dire Cycle Descrip	tion (Subca	ategory of Use):	Insulation	1 product	s in on	ices			
Route of Exposure	. .		Inhalation	n n n n n n n n n n n n n n n n n n n		all inters			
Exposure Concent	ration (Uni	t).	13.5 - 1.0	99 ng/m	R (mear	n = 235 mg/m3			
Number of Sample	es:		56 (1 per)	site)) (mear	1 200 pg/110)			
Number of Sites:			56 (1 por	5100)					
Type of Measurem	nent or Met	hod:	TWA						
Worker Activity:			Modeled	data bas	ed on H	IBCD concentration in dust			
Type of Sampling:	Type of Sampling:			Cenral air conditioner filter dusts were collected as particulate phase of					
			indoor air (PPIA)						
Sampling Location	1:		Offices						
Bulk and Dust Pa	rticle Size I	Distribution:	PM10 (Paricle Size 2.5 - 8.9 um)						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1. Beliabi	lity								
	Metric 1:	Methodology	Medium	$\times 1$	2	Describes how the data was modeled from the HBCD dust con- centrations			
Domain 2: Bonros	ontativo								
Domain 2. Repres	Metric 2 ·	Geographic Scope	Low	× 1	3	China (non-OECD country)			
	Metric 3:	Applicability	Low	$\times 2$	6	The data are for a non-occupational scenario (consumer expo-			
		1.ppncosmy	2011	~ _	Ũ	sure) that is similar to an occupational scenario (service life) within the scope of the risk evaluation			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2013			
	Metric 5:	Sample Size	High	$\times 1$	1	Indicates number of locations and provides several statistics of the sample size.			
Domain 3: Accessi	ibility/Clar	ity							

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Source Citation:	Ni, H. G., Environme	Ni, H. G.,Zeng, H 2013. HBCD and TBBPA in particulate phase of indoor air in Shenzhen, China. Science of the Total						
Type of Data Source Hero ID	Occupation 1927552	Occupational Exposure; Monitoring Data; 1927552						
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Monitoring data include all associated metadata.		
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty		
Overall Quality D	eterminatio	n^\dagger	Medium		2.0			

Source Citation:	Ni, H. G., Environme	Ni, H. G., Zeng, H 2013. HBCD and TBBPA in particulate phase of indoor air in Shenzhen, China. Science of the Total						
Type of Data Source Hero ID	Occupatio 1927552	Occupational Exposure; Monitoring Data; 1927552						
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Number of Sites: Type of Measurement or Method: Worker Activity:			Consume Insulation settled du Inhalation 90 ng/g - 97 Concentra HBCDs f associated	Consumer Use Insulation products in indoor public microenvironments settled dust Inhalation 90 ng/g - 140,000 ng/g (mean - 8,300 ng/g) 97 Concentration in dust HBCDs found from several products used in indoor environments. No associated worker activity.				
EVALUATION Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	oility Metric 1:	Methodology	Low	× 1	3	Does not specify releases since mostly measure dust concentra- tion for exposure modeling		
Domain 2: Repres	Domain 2: Representative Metric 2: Geographic Scope Medium × 1 2 UK Metric 3: Applicability Low × 2 6 The data are for a non-occupational scenario (consumer sure) that is similar to an occupational scenario (service within the scope of the risk evaluation Metric 4: Temporal Representativeness Medium × 2 4 Published in 2008 (10 years ago) Metric 5: Sample Size High × 1 1 Indicates number of locations but does not specify num samples at each location. However, provides several star of the sample size.							
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	$\times 1$	3	Release data include release media but no other metadata.		
Domain 4: Variability and Uncertainty								
Continued on next page								

		- conti	mueu nom p	nevious	page			
Source Citation:	Ni, H. G., Environme	Ni, H. G.,Zeng, H 2013. HBCD and TBBPA in particulate phase of indoor air in Shenzhen, China. Science of the Total Environment.						
Type of Data Source	Occupation	nal Exposure; Monitoring Dat	a;					
Hero ID	1927552							
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality D	etermination	\mathbf{n}^{\dagger}	Low		2.4			

continued from previous page

$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Source Citation:	Allen, J. G., Stapleton, H. M., Vallarino, J., McNeely, E., McClean, M. D., Harrad, S. J., Rauert, C. B., Spengler, J. D 2013. Exposure to flame retardant chemicals on commercial airplanes. Environmental Health: A Global Access Science Source							
Data Data Life Cycle Stage: Commerical Use Life Cycle Description (Subcategory of Use): Insulation products in airplanes settled dust Route of Exposure: Inhalation Route of Exposure: Concentration (Unit): Route of Exposure: 100 .000 ong/g HBCD in dust collected on airplanes on floor and in vents. No associated worker activity: Worker Activity: HBCD in dust collected on airplanes on floor and in vents. No associated worker activity. EVALUATION Eventorical Use Comments Domain 1: Reliability Metric 1: Methodology Low × 1 3 Does not specify releases, only dust concentrations with the scope of the risk evaluation Domain 2: Representative Route risk Y 1 US Metric 1: Methodology Keith 1 US Metric 3 Applicability Low × 1 3 Does not specify releases, only dust concentrations with the scope of the risk evaluation D	Type of Data Source Hero ID	Occupation 1597662	Occupational Exposure; Monitoring Data; 1597662						
Life Cycle Stage: Commerical Use Life Cycle Description (Subcategory of Use): Insulation products in airplanes Physical Form: settled dust Route of Exposure: Inhalation Exposure Concentration (Unit): 180 - 1,100,000 ng/g HBCD in dust Number of Sites: 40 Type of Measurement or Method: Concentration in dust Worker Activity: HBCD in dust collected on airplanes on floor and in vents. No associated worker activity. EVALUATION Domain Domain 1: Reliability Metric 1: Metric 2: Geographic Scope Metric 2: Geographic Scope Metric 3: Applicability Metric 4: Temporal Representative Metric 5: Sample Size Metric 5: Sample Size Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low × 1 3 Only includes amount in dust (essentially an HBCD concentration) Metric 7: Sample Size Metric 7: Metric 8: Metric 6: Metric 8: Domain 3: Accessibility/Clarity <	EXTRACTION Parameter			Data					
Life Cycle Description (Subcategory of Use): Insulation products in airplanes Physical Form: settled dust Insulation products in airplanes Route of Exposure: Inhalation Exposure Concentration (Unit): IISO - 1,100,000 ng/g IIBCD in dust Number of Sites: 40 Type of Measurement or Method: 40 Type of Measurement or Method: HBCD in dust collected on airplanes on floor and in vents. No associated worker Activity: HBCD in dust collected on airplanes on floor and in vents. No associated worker activity. EVALUATION Domain 1: Reliability Metric 1: Methodology Low × 1 3 Does not specify releases, only dust concentrations Domain 2: Representative Metric 3: Applicability Metric 5: Sample Size Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty				a .	1.77				
Determine Concentration products in an planes Physical Form: settled dust Route of Exposure: Inhalation Exposure Concentration (Unit): 180 - 1,100,000 ng/g HBCD in dust Mumber of Sites: 40 Type of Measurement or Method: Concentration in dust Worker Activity: HBCD in dust collected on airplanes on floor and in vents. No associated worker activity. EVALUATION Domain Domain 1: Reliability Metric 1: Metric 1: Methodology Low × 1 3 Domain 2: Representative High × 1 1 Metric 3: Applicability Low × 2 6 Metric 4: Temporal Representativeness High × 2 2 8 Metric 5: Sample Size Medium 2 Provides number of samples but little statistical bases Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low × 1 3 Only includes amount in dust (essentially an HBCD concentration) Domain 4: Variability and Uncertainty Low × 1 3 No discussion of variability or uncertainty Metric 7: <td>Life Cycle Stage:</td> <td>tion (Sube</td> <td>atogory of Uso).</td> <td>Commerie</td> <td>cal Use v product</td> <td>e in sir</td> <td>planoe</td>	Life Cycle Stage:	tion (Sube	atogory of Uso).	Commerie	cal Use v product	e in sir	planoe		
Route of Exposure: Inhalation Exposure: Inhalation Exposure: 180 - 1,100,000 ng/g HBCD in dust Number of Sites: 180 - 1,100,000 ng/g HBCD in dust Type of Measurement or Method: Concentration in dust Worker Activity: HBCD in dust collected on airplanes on floor and in vents. No associated worker activity. EVALUATION Number of Sites: Domain 1: Reliability Metric Metric 1: Methodology Low × 1 Domain 2: Representative Ketric 3: Metric 4: Temporal Representativeness Metric 5: Sample Size Metric 5: Sample Size Metric 6: Ketadata Completeness Low × 1 3 Onmain 3: Accessibility/Clarity Low × 1 2 Metric 6: Metric 6: Low × 1 3 Domain 3: Accessibility/Clarity Low × 1 3 Only includes amount in dust (essentially an HBCD concentration) Metric 7: Metric 6: Metadata Completeness Low × 1 3 Only includes amount in dust (essentially an HBCD concentration) <	Physical Form:		ategory of Ose).	settled du	ist	s in an	plaites		
Exposure Concentration (Unit): Number of Sites: Type of Measurement or Method: Worker Activity:180 - 1,100,000 ng/g HBCD in dust 40Type of Measurement or Method: Worker Activity:Concentration in dust HBCD in dust collected on airplanes on floor and in vents. No associated worker activity.EVALUATION Domain 1: Reliability Metric 1:MetricRatingMWF*ScoreCommentsDomain 2: Representative Metric 2:Geographic Scope ApplicabilityLow $\times 1$ 3Does not specify releases, only dust concentrationsDomain 3: Representative Metric 5:Geographic Scope ApplicabilityHigh $\times 1$ 1USMetric 4:Temporal Representativeness Metric 5:High $\times 2$ 2Samples were collected in 2010 within the scope of the risk valuationDomain 3: Accessibility/Clarity Metric 6:Metadata CompletenessLow $\times 1$ 3Only includes amount in dust (essentially an HBCD concentration)Domain 4: Variability and Uncertainty Metric 7:Metadata CompletenessLow $\times 1$ 3No discussion of variability or uncertaintyDomain 4: Variability and Uncertainty Metric 7:Metadata CompletenessLow $\times 1$ 3No discussion of variability or uncertainty	Route of Exposur	e:		Inhalation	1				
Number of Sites: 40 Type of Measurement or Method: Concentration in dust Worker Activity: HBCD in dust collected on airplanes on floor and in vents. No associated worker activity. EVALUATION Netric Domain Metric Rating MWF* Score Concentration Comments Domain 1: Reliability Low × 1 3 Domain 2: Representative Low × 1 1 US Metric 2: Geographic Scope High × 1 1 US Metric 3: Applicability Low × 2 6 The data are for a non-occupational scenario (consumer exposure) that is similar to an occupational scenario (service life) within the scope of the risk evaluation Metric 4: Temporal Representativeness High × 2 2 Samples were collected in 2010 Metric 5: Sample Size High × 1 3 Only includes amount in dust (essentially an HBCD concentration) Domain 4: Variability and Urcertainty Low × 1 3 No discussion of variability or uncertainty Metric 7: Metadata Completeness Low × 1 3 No discussion of var	Exposure Concent	tration (Uni	it):	180 - 1,10	00,000 ng	/g HBC	CD in dust		
Type of Measurement or Method: Concentration in dust Worker Activity: HBCD in dust collected on airplanes on floor and in vents. No associated worker activity. EVALUATION Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology Low × 1 3 Does not specify releases, only dust concentrations Domain 2: Representative Metric 3: Applicability Low × 2 6 The data are for a non-occupational scenario (consumer exposure) within the scope of the risk evaluation Metric 3: Applicability Low × 2 6 The data are for a non-occupational scenario (consumer exposure) within the scope of the risk evaluation Metric 4: Temporal Representativeness High × 2 2 Samples were collected in 2010 Metric 5: Sample Size Medium × 1 2 Provides number of samples but little statistical bases Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low × 1 3 Only includes amount in dust (essentially an HBCD concentration) Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Low × 1 3	Number of Sites:		, ,	40					
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EVALUATION Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology Low × 1 3 Does not specify releases, only dust concentrations Domain 2: Representative Metric 2: Geographic Scope High × 1 1 US Domain 2: Representative Metric 3: Applicability Low × 2 6 The data are for a non-occupational scenario (consumer exposure) that is similar to an occupational scenario (service life) within the scope of the risk evaluation Metric 4: Temporal Representativeness High × 2 2 Samples were collected in 2010 Metric 5: Sample Size Medium × 1 2 Provides number of samples but little statistical bases Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low × 1 3 Only includes amount in dust (essentially an HBCD concentration) Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty </td <td>worker Activity.</td> <td></td> <td></td> <td>worker ac</td> <td>tivity</td> <td>ected of</td> <td>amplanes on noor and in vents. No associated</td>	worker Activity.			worker ac	tivity	ected of	amplanes on noor and in vents. No associated		
EVALUATION Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology Low × 1 3 Does not specify releases, only dust concentrations Domain 2: Representative Metric 2: Geographic Scope High × 1 1 US Metric 3: Applicability Low × 2 6 The data are for a non-occupational scenario (consumer exposure) that is similar to an occupational scenario (service life) within the scope of the risk evaluation Metric 4: Temporal Representativeness High × 2 2 Samples were collected in 2010 Metric 5: Sample Size Medium × 1 2 Provides number of samples but little statistical bases Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low × 1 3 Only includes amount in dust (essentially an HBCD concentration) Domain 4: Variability and Uncertainty Low × 1 3 No discussion of variability or uncertainty Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty				worner ac					
Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology Low × 1 3 Does not specify releases, only dust concentrations Domain 2: Representative Metric 2: Geographic Scope High × 1 1 US Metric 3: Applicability Low × 2 6 The data are for a non-occupational scenario (consumer exposure) that is similar to an occupational scenario (service life) within the scope of the risk evaluation Metric 4: Temporal Representativeness High × 2 2 Samples were collected in 2010 Metric 5: Sample Size Medium × 1 2 Provides number of samples but little statistical bases Domain 3: Accessibility/Clarity- Metric 6: Metadata Completeness Low × 1 3 Only includes amount in dust (essentially an HBCD concentration) Domain 4: Variability and Uncertainty- Metric 7: Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty Metric 7: Metric 6: Low × 1 3 No discussion of variability or uncertainty Metric 7: Metric 8	EVALUATION								
Domain 1: Reliability Metric 1: Methodology Low × 1 3 Does not specify releases, only dust concentrations Domain 2: Representative Metric 2: Geographic Scope Metric 3: High × 1 1 US Metric 3: Applicability Low × 2 6 The data are for a non-occupational scenario (consumer expo- sure) that is similar to an occupational scenario (service life) within the scope of the risk evaluation Metric 4: Temporal Representativeness Metric 5: High × 2 2 Samples were collected in 2010 Metric 5: Sample Size Hedium × 1 2 Provides number of samples but little statistical bases Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low × 1 3 Only includes amount in dust (essentially an HBCD concen- tration) Domain 4: Variability and Uncertainty Metric 7: Ketadata Completeness Low × 1 3 No discussion of variability or uncertainty Metric 7: Metric 7: Metric 4: Low × 1 3 No discussion of variability or uncertainty	Domain		Metric	Rating	MWF^{\star}	Score	Comments		
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Domain 2: Representative Metric 2: Geographic Scope High × 1 1 US Metric 3: Applicability Low × 2 6 The data are for a non-occupational scenario (consumer exposure) that is similar to an occupational scenario (service life) within the scope of the risk evaluation Metric 4: Temporal Representativeness High × 2 2 Samples were collected in 2010 Metric 5: Sample Size Medium × 1 2 Provides number of samples but little statistical bases Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low × 1 3 Only includes amount in dust (essentially an HBCD concentration) Domain 4: Variability and Uncertainty Low × 1 3 No discussion of variability or uncertainty Continued on next page Low × 1 3 No discussion of variability or uncertainty	Domain 1: Reliad	Metric 1:	Methodology	Low	$\times 1$	3	Does not specify releases, only dust concentrations		
Domain 2: Representative Metric 2: Geographic Scope High × 1 1 US Metric 3: Applicability Low × 2 6 The data are for a non-occupational scenario (consumer expo- sure) that is similar to an occupational scenario (service life) within the scope of the risk evaluation Metric 4: Temporal Representativeness High × 2 2 Samples were collected in 2010 Metric 5: Sample Size Medium × 1 2 Provides number of samples but little statistical bases Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low × 1 3 Only includes amount in dust (essentially an HBCD concen- tration) Domain 4: Variability and Uncertainty Metric 7: Low × 1 3 No discussion of variability or uncertainty Continued on next page Continued on next page X 1 3 No discussion of variability or uncertainty		, . .							
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Metric 4: Temporal Representativeness High × 2 2 Samples were collected in 2010 Metric 5: Sample Size Medium × 1 2 Provides number of samples but little statistical bases Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low × 1 3 Only includes amount in dust (essentially an HBCD concentration) Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty Continued on next page Continued on next page Sample Sample Sample Sample Size		Metric 3:	Applicability	Low	$\times 2$	6	The data are for a non-occupational scenario (consumer expo-		
Metric 4: Temporal Representativeness High × 2 2 Samples were collected in 2010 Metric 5: Sample Size Medium × 1 2 Provides number of samples but little statistical bases Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low × 1 3 Only includes amount in dust (essentially an HBCD concentration) Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty Continued on next page Continued on next page Metric 5: Metric 5: Metric 5: Metric 5:						Ū	sure) that is similar to an occupational scenario (service life) within the scope of the risk evaluation		
Metric 5: Sample Size Medium × 1 2 Provides number of samples but little statistical bases Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low × 1 3 Only includes amount in dust (essentially an HBCD concentration) Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty Continued on next page		Metric 4:	Temporal Representativeness	High	$\times 2$	2	Samples were collected in 2010		
Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low × 1 3 Only includes amount in dust (essentially an HBCD concentration) Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty		Metric 5:	Sample Size	Medium	$\times 1$	2	Provides number of samples but little statistical bases		
Domain 6: Recessionly/ Charley Metric 6: Metadata Completeness Low × 1 3 Only includes amount in dust (essentially an HBCD concentration) Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty Continued on next page Continued on next page Continued on next page Continued on next page	Domain 3: Access	ibility/Clar	ity						
Domain 4: Variability and Uncertainty Low × 1 3 No discussion of variability or uncertainty Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty		$\begin{array}{ccc} \text{Metric 6: Metadata Completeness} & \text{Low} & \times 1 & 3 & \text{Only includes amount in dust (essentially an HBCD conc} \\ & \text{tration} \end{array}$					Only includes amount in dust (essentially an HBCD concentration)		
Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty Continued on next page	Domain 4: Variah	ility and U	ncertainty						
Continued on next page	Domain I. Variab	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Continued on none page			Con	tinued on r	next page)			

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Source Citation:	Allen, J. G., Stapleton, H. M., Vallarino, J., McNeely, E., McClean, M. D., Harrad, S. J., Rauert, C. B., Spengler, J. D 2013.							
Type of Data Source Hero ID	Exposure to flame retardant chemicals on commercial airplanes. Environmental Health: A Global Access Science Source. Decupational Exposure; Monitoring Data; 1597662							
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score	Comments			
Overall Quality Determination [†] Medium 2.2								

* MWF = Metric Weighting Factor

Source Citation:	Allen, J. G., Stapleton, H. M., Vallarino, J., McNeely, E., McClean, M. D., Harrad, S. J., Rauert, C. B., Spengler, J. D 2013.							
Type of Data Source Hero ID	Occupation 1597662	Occupational Exposure; Monitoring Data; 1597662						
EXTRACTION			Data					
			Data					
Life Cycle Stage:			Consume	r Use				
Life Cycle Descrip	otion (Subca	ategory of Use):	Insulation	1 product	ts in hoi	mes		
Physical Form:	•	/	settled du	ıst				
Route of Exposur	e:		Inhalation	n				
Exposure Concent	tration (Uni	t):	2 - 2,800	ng/g HB	CD in c	lust		
Number of Sites:			13					
Type of Measurer	ment or Met	hod:	Concentra	ation in o	lust			
Worker Activity:			HBCD in	dust col	lected fi	rom homes. No associated worker activity.		
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility							
	Metric 1:	Methodology	Low	$\times 1$	3	Does not specify releases, only dust concentrations		
Domain 2: Repres	sentative							
Domain 2. Ropro.	Metric 2:	Geographic Scope	High	× 1	1	US		
	Metric 3:	Applicability	Low	$\times 2$	6	The data are for a non-occupational scenario (consumer expo-		
						sure) that is similar to an occupational scenario (service life) within the scope of the risk evaluation		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	Samples were collected in 2010		
	Metric 5:	Sample Size	Medium	$\times 1$	2	Provides number of samples but little statistical bases		
Domain 3: Access	Matrie C	Ity Matadata Completence-	Low	× 1	2			
	Metric 6:	Metadata Completeness	Low	× 1	3	Only includes amount in dust (essentially an HBCD concen- tration)		
Domain 4. Variah	vility and Ur	ocertainty						
Domain 4. Vallar	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
		1			-	a ser an		
Continued on next page								

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Source Citation:	Allen, J. G., Stapleton, H. M., Vallarino, J., McNeely, E., McClean, M. D., Harrad, S. J., Rauert, C. B., Spengler, J. D 2013. Exposure to flame retardant chemicals on commercial airplanes. Environmental Health: A Global Access Science Source.								
Type of Data Source	Occupational Exposure; Monitoring	Data;							
Hero ID	1597662								
EVALUATION									
Domain	Metric	Rating MWF*	Score	Comments					
Overall Quality D	$\operatorname{Petermination}^\dagger$	Medium	2.2						

Source Citation:	Harrad, S., Ibarra, C., Abdallah, M. A. E., Boon, R., Neels, H., Covaci, A 2008. Concentrations of brominated flame retardants in dust from United Kingdom cars, homes, and offices: causes of variability and implications for human exposure. Environment International.								
Hero ID	1005148	1005148							
EXTRACTION									
Parameter			Data						
Life Cycle Stage: Life Cycle Descrip Physical Form: Route of Exposure Exposure Concent Type of Measuren Worker Activity:	Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity:			Commerical Use Insulation products in offices settled dust Inhalation 31,000 ?PBDEs/g Concentration in dust Average concentrations of polybrominated diphenyl ethers (PBDEs) in dust in 18 offices. No associated worker activities.					
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments			
			1000008		50010				
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Methodology is well described			
Domain 2. Bepres	entative								
Domain _ Topros	Metric 2:	Geographic Scope	Medium	$\times 1$	2	UK			
	Metric 3:	Applicability	Low	$\times 2$	6	The data are for a non-occupational scenario (consumer expo- sure) that is similar to an occupational scenario (service life) within the scope of the risk evaluation			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008			
	Metric 5:	Sample Size	High	$\times 1$	1	Indicates number of locations and provides several statistics of the sample size.			
Domain 3: Accord	ibility/Clar	i+.,							
Domain 5. Access	Metric 6:	Metadata Completeness	High	$\times 1$	1	Include necessary metadata			
Domain 4: Variab	ility and Ur Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
Continued on next page									

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Source Citation:	Harrad, S.,Ibarra, C.,Abdallah, M. A. E.,Boon, R.,Neels, H.,Covaci, A 2008. Concentrations of brominated flame retardants in dust from United Kingdom cars, homes, and offices: causes of variability and implications for human exposure. Environment International.						
Type of Data Source	Occupational Exposure; Monitoring Da	ita;					
Hero ID	1005148	,					
EVALUATION							
Domain	Metric	Rating	MWF^{\star}	Score	Comments		
Overall Quality Determination [†] High 1.6							

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Source Citation: Type of Data Source Hero ID	Nicnas, 2001. Polybrominated flame reta Occupational Exposure; Reports for Data 1443962	rdants (PBFRs): Priority existing chemical assessment report no. 20. or Information Other than Exposure or Release Data;
EXTRACTION		
Parameter		Data
Life Cycle Stage: Life Cycle Descri Worker Activity:	ption (Subcategory of Use):	Processing Formulation of XPS and converting of XPS Workers in the formulation industry, that is those involved in the formu- lation of flame retarded resins, have the greatest risk of exposure since they weigh, transfer and mix the solid powder or liquid resins contain- ing pure/concentrated PBFRs. Downstream fabricators who handle the formulated resins, emulsions and/or polymers are also expected to be exposed to the PBFRs. Dermal contact is the main route of exposure resulting from contact with these solutions. Given that the PBFRs are non-volatile, exposure by inhalation is expected to be minimal when handling liquid resins. However, potential for exposure by inhalation of dust generated while handling powder compounds is high. Some release of volatile, thermal degradation products of some PBFRs may occur during moulding of polymer at processing temperatures.

EVALUATION								
Domain	Metric	Rating	MWF^{\star}	\mathbf{Score}	Comments			
Domain 1: Reliability								
Metric 1:	Methodology	High	$\times 1$	1	Information from trusted sources			
Domain 2: Representative								
Metric 2:	Geographic Scope	Medium	$\times 1$	2	Australia			
Metric 3:	Applicability	High	$\times 2$	2	In-scope			
Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2001			
Metric 5:	Sample Size	N/A		N/A	This metric is not applicable to this data type			
Domain 3: Accessibility/Clar	Domain 3: Accessibility/Clarity							
Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
	Continued on next page							

Source Citation: Type of Data Source Hero ID	Nicnas, 20 Occupation 1443962	Nicnas, 2001. Polybrominated flame retardants (PBFRs): Priority existing chemical assessment report no. 20. Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 1443962					
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 4: Variab	ility and Un Metric 7:	certainty Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality D	etermination	'nţ	High		1.4		

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* MWF = Metric Weighting Factor

Source Citation:	Allen, J. G., Stapleton, H. M., Vallarino, J., McNeely, E., McClean, M. D., Harrad, S. J., Rauert, C. B., Spengler, J. D 2013. Exposure to flame retardant chemicals on commercial airplanes. Environmental Health: A Global Access Science Source.								
Type of Data Source Hero ID	Occupation 1597662	Occupational Exposure; Monitoring Data; 1597662							
EXTRACTION									
Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Type of Measurement or Method: Worker Activity:		Consumer Use Insulation products in homes settled dust Inhalation 6 - 2000 ng HBCD/g dust Concentration in dust Average concentrations of HBCD in homes. No associated worker activ- ity.							
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Methodology is well described			
			0			<u></u>			
Domain 2: Repres	entative		TT: 1						
	Metric 2:	Geographic Scope	High	$\times 1$	1	US			
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Non-occupational scenario (settled dust in homes). No associ- ated worker activites.			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2017			
	Metric 5:	Sample Size	High	$\times 1$	1	Indicates number of locations and provides several statistics			
Domain 3: Access	ibility/Clari Metric 6:	ty Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness High × 1 1 The assessment addresses variability and uncertainty results. Uncertainty is well characterized.						The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
	Continued on next page								

		F	r	0				
Source Citation:	Allen, J. G., Stapleton, H. M., Vallarino, J., McNeely, E., McClean, M. D., Harrad, S. J., Rauert, C. B., Spengler, J. D 2013. Exposure to flame retardant chemicals on commercial airplanes. Environmental Health: A Global Access Science Source.							
Type of Data Source	Occupational Exposure; Monitoring Data;							
II ID	1507669							
Hero ID	1597062							
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score	Comments			
Overall Quality D	$\operatorname{Determination}^{\dagger}$	Unacceptable		4	Metric Mean Score: 1.7.			

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** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation:	Zhang, H. microparti	Zhang, H.,Kuo, Y. Y.,Gerecke, A. C.,Wang, J. 2012. Co-release of hexabromocyclododecane (HBCD) and Nano- and microparticles from thermal cutting of polystyrene foams. Environmental Science and Technology.						
Type of Data Source Hero ID	Occupation 1927576	Occupational Exposure; Completed Exposure or Risk Assessments; 1927576						
EXTRACTION								
Parameter			Data					
			D :					
Life Cycle Stage:	tion (Suba	storowy of Use).	VDS The	g mal Cut	ting			
Physical Form:	otion (Subca	ategory of Use):	Duet	rmai Cut	ung			
Route of Exposur	e.		Inhalatio	n				
Exposure Concent	tration (Uni	it):	89.0 ug/n	n3				
Worker Activity:			Modeled	personal	area bre	athing zone based on closed glovebox sampling		
· ·			system					
Number of Worke	rs:		1					
Type of Sampling	:		personal					
Sampling Location	n:		Thermal	cutting o	peration	n		
Exposure Duratio	n:		1 hour					
EVALUATION								
Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliab	ility							
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 9. Donno	ontotivo							
Domain 2: Repres	Metric 2.	Geographic Scope	Medium	× 1	2	Switzerland		
	Metric 3:	Applicability	High	$\times 2$	$\frac{2}{2}$	in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Access	sibility/Clar	ity	**. 1	_	_			
	Metric 6:	Metadata Completeness	High	× 1	1	Information is all clearly cited		
Domain 4: Variab	ility and U	ncortainty						
Domain 4. Vallau	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
			tinued or -	ort nem	-	· · · · · · · · · · · · · · · · · · ·		
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Source Citation:	Zhang, H.,Kuo, Y. Y.,Gerecke, A. C.,Wang, J 2012. Co-release of hexabromocyclododecane (HBCD) and Nano- and microparticles from thermal cutting of polystyrene foams. Environmental Science and Technology.							
Type of Data Source Hero ID	Decupational Exposure; Completed Exposure or Risk Assessments; 1927576							
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score	Comments			
Overall Quality Determination [†] High 1.6								

* MWF = Metric Weighting Factor

Source Citation:	Zhang, H. microparti	Zhang, H.,Kuo, Y. Y.,Gerecke, A. C.,Wang, J. 2012. Co-release of hexabromocyclododecane (HBCD) and Nano- and microparticles from thermal cutting of polystyrene foams. Environmental Science and Technology.							
Type of Data Source Hero ID	Occupation 1927576	Occupational Exposure; Completed Exposure or Risk Assessments; 1927576							
EXTRACTION									
Parameter			Data						
			D :						
Life Cycle Stage:	tion (Suba	storowy of Use).	FDS The	g maal Cut	ting				
Physical Form:	Stion (Subea	ategory of Use).	Duet	imai Out	ung				
Route of Exposur	e.		Inhalatio	n					
Exposure Concent	tration (Uni	it):	57.3 ug/m	n3					
Worker Activity:			Modeled	personal	area bre	athing zone based on closed glovebox sampling			
· ·			system						
Number of Worke	rs:		1						
Type of Sampling	:		personal						
Sampling Location	n:		Thermal cutting operation						
Exposure Duratio	n:		1 hour						
EVALUATION			D		a	a			
Domain		Metric	Rating	MWF'*	Score	Comments			
Domain 1: Reliab	ility								
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources			
Domain 2: Bopros	contativo								
Domain 2. Repres	Metric 2.	Geographic Scope	Medium	× 1	2	Switzerland			
	Metric 3:	Applicability	High	$\times 2$	2	in scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012			
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.			
Domain 3: Access	sibility/Clar	ity	TT: 1	1	1				
	Metric 6:	Metadata Completeness	High	× 1	1	Information is all clearly cited			
Domain 4: Variah	ility and U	ncertainty							
Domain 4. vallau	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty			
		Cor	tinued on r	ovt per	-	· · · · · · · · · · · · · · · · · · ·			
Continued on next page									

- continued from previous page								
Source Citation:	Zhang, H.,Kuo, Y. Y.,Gerecke, A. C.,Wang, J 2012. Co-release of hexabromocyclododecane (HBCD) and Nano- and microparticles from thermal cutting of polystyrene foams. Environmental Science and Technology.							
Type of Data Source Hero ID	Decupational Exposure; Completed Exposure or Risk Assessments; 1927576							
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score	Comments			
Overall Quality Determination [†] High 1.6								

* MWF = Metric Weighting Factor

Source Citation:	Rosenberg, C.,Hämeilä, M.,Tornaeus, J.,Säkkinen, K.,Puttonen, K.,Korpi, A.,Kiilunen, M.,Linnainmaa, M.,Hesso, A. 2011. Exposure to flame retardants in electronics recycling sites. Annals of Occupational Hygiene.								
Type of Data Source Hero ID	Occupational Exposure; Monitoring Data; 1927633								
EXTRACTION Parameter		Data							
Life Cycle Stage:		Disposal /Recycling							
Life Cycle Descrip	otion (Subcategory of Use):	Disposal of Waste of Electric and Electronic Equipment (WEEE)							
Physical Form:	· /	Dust							
Route of Exposur	e:	Inhalation							
Exposure Concent	tration (Unit):	Mean at 4 sites $= 8-50$ ng HBCD/m3 (before exposure control improve- ments); Mean at 4 sites $= LOQ$ to 23 (after improvements)							
Number of Sampl	es:	45							
Number of Sites:		4							
Worker Activity:		The workers were either sorters or dismantlers, or both, or process con- trollers. Manual disassembly and sorting. Some mechanical separa- tions. Samples were taken before and after improvements to exposure controls (LEV addition to sorting areas, better cleaning of work areas).							
Number of Worke	rs:	34							
Type of Sampling		personal							
Exposure Duratio	n:	listed as full-shift with sample time of 191 to 408 min.							
PPE:		The workers at Sites A and B used 3M 9322 Protective Respirators (Berkshire, UK) during particularly dusty operations. At Site C, none							
Analytic Method:		of the workers used respirators, whereas four of the six workers at Site D used Clean-air Basic 2000 respirators (dual flow with HEPA P3 filter and full face mask; Birmingham, UK). Occupational Health and Safety Administration (OSHA) versatile sampler; GC-MS							
EVALUATION									
Domain	Metric	Rating MWF [*] Score Comments							
Domain 1: Reliab	ility								
	Metric 1: Methodology	$ \begin{array}{ccc} {\rm High} & \times \ 1 & 1 & {\rm Methodology \ is \ well \ described \ and \ appears \ to \ be \ similar \ to} \\ {\rm OSHA \ or \ NIOSH \ methods.} \end{array} $							
Continued on next page									

Source Citation:	n: Rosenberg, C.,Hämeilä, M.,Tornaeus, J.,Säkkinen, K.,Puttonen, K.,Korpi, A.,Kiilunen, M.,Linnainmaa, M.,Hesso, A. 2011. Exposure to flame retardants in electronics recycling sites. Annals of Occupational Hygiene.									
Type of Data Source	Occupatio	Occupational Exposure: Monitoring Data:								
	1007000	nai Exposuro, monitoring Bata,								
Hero ID	1927033									
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
Domain 2: Repres	sentative									
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Finland				
	Metric 3:	Applicability	High	$\times 2$	2	Worker exposure during electronics recycling is in scope				
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2011				
	Metric 5:	Sample Size	Medium	$\times 1$	2	Indicates number of samples and provides ranges of arithmetic means, but discrete values are not provided				
Domain 3: Access	sibility/Clar	ity								
	Metric 6:	Metadata Completeness	Low	$\times 1$	3	Article provides sample type but lacks sample times (provided as a range for all samples), work activities (generally described but unknown for the individual samples)				
Domain 4: Variability and Uncertainty										
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.				
Overall Quality Determination [†]			High		1.4					

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* MWF = Metric Weighting Factor

Source Citation: Rosenberg Exposure Type of Data Source Occupatio	Rosenberg, C.,Hämeilä, M.,Tornaeus, J.,Säkkinen, K.,Puttonen, K.,Korpi, A.,Kiilunen, M.,Linnainmaa, M.,Hesso, A. 201 Exposure to flame retardants in electronics recycling sites. Annals of Occupational Hygiene. Occupational Exposure; Monitoring Data;								
Hero ID 1927633	1927633								
EXTRACTION Parameter		Data							
Life Cycle Stage:		Disposal	/Recyclin	g					
Life Cycle Description (Subc	ategory of Use):	Disposal	of Waste	of Elec	tric and Electronic Equipment (WEEE)				
Physical Form:		Dust							
Route of Exposure:		Inhalation	1						
Exposure Concentration (Uni	Site A: 20 2009 = N available mean, and	08 = 14 - D - 8.5, for Sites d median	47 ng H 1.3 (m B, C, a	IBCD/m3, 27 (median), 29 (arithmetic mean); edian), 2.9 (arith. mean). Additional results and D in the same format (range, arethmetic					
Number of Samples:		45							
Number of Sites:		4							
Worker Activity:		same as r	ow $87 (su$	ppleme	ental file to 1927633)				
Number of Workers:		34	34						
Type of Sampling:		personal	personal						
Exposure Duration:		listed as I	ull-snift v	vith sai	mple time of 191 to 408 min.				
FFE:		(Borkshir	The workers at Sites A and B used 3M 9322 Protective Respirators						
Analytic Method:	of the wo D used C and full fa Occupation pler; GC-	rkers used lean-air E ace mask; onal Heal ⁻ MS	l respin asic 20 Birmin th and	eators, whereas four of the six workers at Site 00 respirators (dual flow with HEPA P3 filter ngham, UK). Safety Administration (OSHA) versatile sam-					
EVALUATION									
Domain	Metric	Rating	MWF^{\star}	\mathbf{Score}	Comments				
Domain 1: Reliability Metric 1:	Methodology	High	× 1	1	Methodology is well described and appears to be similar to OSHA or NIOSH methods.				
Domain 2: Representative									
		Continued on r	ext page						

Source Citation: Type of Data Source	Rosenberg, C.,Hämeilä, M.,Tornaeus, J.,Säkkinen, K.,Puttonen, K.,Korpi, A.,Kiilunen, M.,Linnainmaa, M.,Hesso, A. 2011. Exposure to flame retardants in electronics recycling sites. Annals of Occupational Hygiene.							
Hero ID	1927633	nai Enposaro, nomoring Eala,						
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
	Metric 2:	Geographic Scope	Medium	× 1	2	Finland		
	Metric 3:	Applicability	High	$\times 2$	2	Worker exposure during electronics recycling is in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2011		
	Metric 5:	Sample Size	Medium	$\times 1$	2	Indicates number of samples and provides ranges of arithmetic means, but discrete values are not provided		
Domain 3: Access	sibility/Clar	ity						
	Metric 6:	Metadata Completeness	Low	$\times 1$	3	Article provides sample type but lacks sample times (provided as a range for all samples), work activities (generally described but unknown for the individual samples)		
Domain 4: Variability and Uncertainty								
	Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality Determination [†]			High		1.4			

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Source Citation:Saito, I.Type of Data SourceOccupatHero ID1927779	Source Citation:Saito, I.,Onuki, A.,Seto, H. 2007. Indoor organophosphate and polybrominated flame retardants in Tokyo. Indoor Air.Gype of Data SourceOccupational Exposure; Monitoring Data; 1927779					
EXTRACTION Parameter		Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Number of Samples: Type of Measurement or Method: Worker Activity:		Consumer Use Insulation prod settled dust Inhalation up to 24 ng/m 18 Concentration HBCD in dust	Consumer Use Insulation products in homes settled dust Inhalation up to 24 ng/m3 18 Concentration in dust HBCD in dust collected from homes. No associated worker activity.			
EVALUATION Domain	Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliability Metric 1	: Methodology	High	$\times 1$	1	Methodology is well described	
Domain 2: Representative Metric 2 Metric 3 Metric 4 Metric 5 Domain 3: Accessibility/Cl Metric 6	Medium Unacceptable Medium Medium	$ \begin{array}{c} \times 1 \\ \times 2 \\ \times 2 \\ \times 1 \end{array} $	2 8 4 2	Japan Non-occupational scenario (settled dust in homes). No associ- ated worker activites. 2006 Indicates number of samples and provides several statistics; discrete samples not available		
Domain 4: Variability and Metric 7	Medium	× 1	2	limited discussion		
Overall Quality Determination ^{\dagger}		Unacceptable		4	Metric Mean Score: 2.4.	
Continued on next page						

		P	P					
Source Citation: Type of Data Source Hero ID	Saito, I.,Onuki, A.,Seto, H 2007. Indoor organophosphate and polybrominated flame retardants in Tokyo. Indoor Air. Occupational Exposure; Monitoring Data; 1927779							
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score	Comments			

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** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation:SaiType of Data SourceOccHero ID192	ito, I.,O cupation 27779	nuki, A.,Seto, H 2007. Indoor nal Exposure; Monitoring Data;	organophosphate	e and pol	ybromiı	nated flame retardants in Tokyo. Indoor Air.
EXTRACTION			Data			
Parameter			Data			
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Number of Samples: Type of Measurement or Method: Worker Activity:			Commerical Use Insulation products in offices settled dust Inhalation up to 29.5 ng/m3 14 Concentration in dust HBCD in dust collected from offices. No associated worker activities.			
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliability Me	etric 1:	Methodology	High	$\times 1$	1	Methodology is well described
Domain 2: Representa	ative				2	
Me	etric 2: etric 3:	Geographic Scope Applicability	Unacceptable	$\times 1 \times 2$	2 8	Japan Occupational scenario (use of insulation in offices). No associ- ated worker activities.
Me	etric 4:	Temporal Representativeness	Medium	$\times 2$	4	2006
Me	etric 5:	Sample Size	Medium	$\times 1$	2	Indicates number of samples and provides several statistics; discrete samples not available
Domain 3: Accessibili Me	ty/Clar etric 6:	ity Metadata Completeness	Low	× 1	3	Does not provide worker activites, sample time
Domain 4: Variability Me	and Ur	ncertainty Metadata Completeness	Medium	× 1	2	limited discussion
Overall Quality Determination [†]		Unacceptable	~ 1	4	Metric Mean Score: 2.4.	
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Source Citation: Type of Data Source Hero ID	Saito, I.,Onuki, A.,Seto, H. 2007. Indoor organophosphate and polybrominated flame retardants in Tokyo. Indoor Air. Occupational Exposure; Monitoring Data; 1927779				
EVALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments

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** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor
| Source Citation: Strid, A.,Smedje, G.,Athanassiadis, I.,Lind
dant exposure of aircraft personnel. Chem | Strid, A., Smedje, G., Athanassiadis, I., Lindgren, T., Lundgren, H., Jakobsson, K., Bergman, A. 2014. Brominated flame retar- | | | | | | |
|---|--|---------------|----------|--|--|--|--|
| Type of Data SourceOccupational Exposure; Monitoring Data;Hero ID2343686 | Occupational Exposure; Monitoring Data;
2343686 | | | | | | |
| EXTRACTION
Parameter | Data | | | | | | |
| Life Cycle Stage: | Commerie | cal Use | | | | | |
| Life Cycle Description (Subcategory of Use): | Insulation | n product | s in air | planes | | | |
| Physical Form: | dust | | | | | | |
| Route of Exposure: | Inhalation | 1 | | | | | |
| Exposure Concentration (Unit): | <lod td="" to<=""><td>1500 pm</td><td>nol/m3</td><td></td></lod> | 1500 pm | nol/m3 | | | | |
| Number of Samples: | 6 | , | 1 / | | | | |
| Type of Measurement or Method:
Worker Activity: | Concentra | ation in c | iust | neowork | | | |
| Type of Sampling: | personal | iuiing ina | annena | licework | | | |
| Type of Sampring. | personar | | | | | | |
| EVALUATION | | | | | | | |
| Domain Metric | Rating | MWF^{\star} | Score | Comments | | | |
| Domain 1: Reliability
Metric 1: Methodology | High | $\times 1$ | 1 | Methodology is well described | | | |
| | | | | | | | |
| Domain 2: Representative | A.C. 19 | 1 | 0 | | | | |
| Metric 2: Geographic Scope | Medium | $\times 1$ | 2 | Sweden | | | |
| Metric 5: Applicability | medium | × 2 | 4 | bata are for aircraft workers on planes with insulation, which
is similar to the in-scope use of insulation | | | |
| Metric 4: Temporal Representativeness | High | $\times 2$ | 2 | 2014 | | | |
| Metric 5: Sample Size | Medium | $\times 1$ | 2 | Indicates number of samples and provides several statistics;
discrete samples not available | | | |
| Domain 3: Accessibility/Clarity | | | | | | | |
| Metric 6: Metadata Completeness | Low | × 1 | 3 | Does not provide worker activities sample time | | | |
| | 101 | ~ 1 | 5 | Does not provide worker activities, sample time | | | |
| Domain 4: Variability and Uncertainty | | | | | | | |
| Metric 7: Metadata Completeness | High | $\times 1$ | 1 | The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized. | | | |
| Con | tinued on r | next page | ; | | | | |

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Source Citation:	Strid, A., Smedje, G., Athanassiadis, I., I dant exposure of aircraft personnel. Ch	Lindgren, T.,Lu nemosphere.	ndgren,	H.,Jakobss	on, K.,Bergman, A.: 2014. Brominated flame retar-			
Type of Data Source	Occupational Exposure; Monitoring Da	ata;						
Hero ID	2343686							
EVALUATION								
Domain	Metric	Rating	$\rm MWF^{\star}$	Score	Comments			
Overall Quality D	$\operatorname{Petermination}^\dagger$	Medium		1.7				

* MWF = Metric Weighting Factor

Source Citation: Strid, A., Smedje, G., Athanassiadis, I., Lind dant exposure of aircraft personnel. Chem	Strid, A., Smedje, G., Athanassiadis, I., Lindgren, T., Lundgren, H., Jakobsson, K., Bergman, A.: 2014. Brominated flame retar-						
Type of Data SourceOccupational Exposure; Monitoring Data;Hero ID2343686	Occupational Exposure; Monitoring Data; 2343686						
EXTRACTION Parameter	Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form:	Commerie Insulation dust	cal Use 1 product	s in air	planes			
Route of Exposure:	Inhalation	1					
Exposure Concentration (Unit):	0.49 to 49	00 pmol/s	m3				
Number of Samples:9Type of Measurement or Method:Concentration in dustWorker Activity:sampled during maintenancework - locations in Table 1Type of Sampling:area				ncework - locations in Table 1			
EVALUATION							
Domain Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliability Metric 1: Methodology	High	$\times 1$	1	Methodology is well described			
Dennein 9. Dennerschatige							
Metric 2: Geographic Scope	Medium	× 1	2	Sweden			
Metric 3: Applicability	Medium	$\times 2$	4	Data are for aircraft workers on planes with insulation, which is similar to the in-scope use of insulation			
Metric 4: Temporal Representativeness	High	$\times 2$	2	2014			
Metric 5: Sample Size	Medium	× 1	2	Indicates number of samples and provides several statistics; discrete samples not available			
Domain 3. Accessibility/Clarity							
Metric 6: Metadata Completeness	Low	$\times 1$	3	Does not provide worker activites, sample time			
Domain 4: Variability and Uncertainty							
Metric 7: Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
Cor	ntinued on r	next page)				

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Source Citation:	Strid, A., Smedje, G., Athanassiadis, I., I dant exposure of aircraft personnel. Ch	Lindgren, T.,Lu nemosphere.	ndgren,	H.,Jakobss	on, K.,Bergman, A.: 2014. Brominated flame retar-			
Type of Data Source	Occupational Exposure; Monitoring Da	ata;						
Hero ID	2343686							
EVALUATION								
Domain	Metric	Rating	$\rm MWF^{\star}$	Score	Comments			
Overall Quality D	$\operatorname{Petermination}^\dagger$	Medium		1.7				

* MWF = Metric Weighting Factor

Source Citation:	Strid, A.,S dant expos	Strid, A., Smedje, G., Athanassiadis, I., Lindgren, T., Lundgren, H., Jakobsson, K., Bergman, A. 2014. Brominated flame retar- dant exposure of aircraft personnel. Chemosphere.						
Type of Data Source Hero ID	Occupational Exposure; Monitoring Data; 2343686							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Worker Activity:			Consumer Use Insulation products in homes settled dust Inhalation median = 6 ng HBCD/g dust HBCD in dust collected from homes. No associated worker activity.					
EVALUATION		Mataia	Dating		Coone	Comments		
Domain		Metric	Rating	IVI VV F ^	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Methodology is well described		
Domain 2: Repres	Motria 2	Coographia Scope	Low	~ 1	2	Enunt		
	Metric 3:	Applicability	Unacceptable	$\times 1 \times 2$	8	Non-occupational scenario (settled dust in homes). No associ- ated worker activities.		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2015		
	Metric 5:	Sample Size	Medium	$\times 1$	2	Indicates number of samples and provides several statistics; discrete samples not available		
Domain 3: Access	ibility/Clar	ity	_					
	Metric 6:	Metadata Completeness	Low	$\times 1$	3	Does not provide worker activites, sample time		
Domain 4: Variab	ility and Un	ncertainty	II:	. 1	1			
	Metric 7:	Metadata Completeness	nign	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality D	Overall Quality Determination ^{\dagger}				4	Metric Mean Score: 2.2.		
		(Continued on nex	t page				

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Source Citation:	Strid, A., Smedje, G., Athanassiadis, I., Lindgredant exposure of aircraft personnel. Chemosp	en, T.,Lundgr bhere.	en, H.,Ja	kobsson,	K.,Bergman, A 2014. Brominated flame retar-			
Type of Data Source	Occupational Exposure; Monitoring Data;							
Hero ID	2343686							
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score	Comments			

* MWF = Metric Weighting Factor

Source Citation:	Strid, A.,S dant expos	Strid, A., Smedje, G., Athanassiadis, I., Lindgren, T., Lundgren, H., Jakobsson, K., Bergman, A. 2014. Brominated flame retar- dant exposure of aircraft personnel. Chemosphere.						
Type of Data Source Hero ID	Occupational Exposure; Monitoring Data; 2343686							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Worker Activity:			Commerical Use Insulation products in offices settled dust Inhalation median = 19 ng HBCD/g dust HBCD in dust collected from offices. No associated worker activities.					
EVALUATION		Matria	Dating	MWE*	Seene	Commonto		
Domain		Metric	Rating	IVI VV F ^	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Methodology is well described		
Domain 2: Repres	Motria 2	Coographia Scope	Low	\vee 1	2	Emint		
	Metric 3:	Applicability	Unacceptable	$\times 1 \times 2$	8	Occupational scenario (use of insulation in offices). No associ- ated worker activities.		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2015		
	Metric 5:	Sample Size	Medium	× 1	2	Indicates number of samples and provides several statistics; discrete samples not available		
Domain 3: Access	ibility/Clar	ity Mata lata Canalitanaa	T and	. 1	0			
	Metric 6:	Metadata Completeness	LOW	× 1	3	Does not provide worker activites, sample time		
Domain 4: Variab	ility and Ui	ncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality Determination ^{\dagger}			Unacceptable		4	Metric Mean Score: 2.2.		
		(Continued on nex	t page				

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Source Citation:	Strid, A., Smedje, G., Athanassiadis, I., Lindgredant exposure of aircraft personnel. Chemosp	en, T.,Lundgr bhere.	en, H.,Ja	kobsson,	K.,Bergman, A 2014. Brominated flame retar-			
Type of Data Source	Occupational Exposure; Monitoring Data;							
Hero ID	2343686							
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score	Comments			

* MWF = Metric Weighting Factor

Source Citation:	Strid, A.,S dant expos	Strid, A., Smedje, G., Athanassiadis, I., Lindgren, T., Lundgren, H., Jakobsson, K., Bergman, A. 2014. Brominated flame retar- dant exposure of aircraft personnel. Chemosphere.						
Type of Data Source Hero ID	Occupation 2343686	Occupational Exposure; Monitoring Data; 2343686						
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Worker Activity:			Consumer Use Insulation products in cars settled dust Inhalation median = 37 ng HBCD/g dust HBCD in dust collected from cars. No associated worker activities.					
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Methodology is well described		
Domain 2: Repres	sentative							
	Metric 2: Metric 3:	Geographic Scope Applicability	Low Unacceptable	$\begin{array}{c} \times 1 \\ \times 2 \end{array}$	$\frac{3}{8}$	Egypt Non-occupational scenario (settled dust in cars). No associated worker activities		
	Metric 4: Metric 5:	Temporal Representativeness Sample Size	High Medium	$\times 2 \times 1$	$\frac{2}{2}$	2015 Indicates number of samples and provides several statistics; discrete samples not available		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	× 1	3	Does not provide worker activites, sample time		
Domain 4: Variab	ility and Un Metric 7:	ncertainty Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality Determination [†]			Unacceptable		4	Metric Mean Score: 2.2.		
		(Continued on nex	t page				

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Source Citation:	Strid, A., Smedje, G., Athanassiadis, I., Lindgre dant exposure of aircraft personnel. Chemosp	n, T.,Lundgr here.	en, H.,Ja	kobsson,	K.,Bergman, A 2014. Brominated flame retar-
Type of Data Source	Occupational Exposure; Monitoring Data;				
Hero ID	2343686				
EVALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments

* MWF = Metric Weighting Factor

Source Citation:	Zeng, Y. H., Tang, B., Luo, X. J., Zheng, X. B., Peng, P. A., Mai, B. X 2016. Organohalogen pollutants in surface particulates from workshop floors of four major e-waste recycling sites in China and implications for emission lists. Science of the Total Environment								
Type of Data Source Hero ID	Occupational Exposure; Monitoring Data; 3350480								
EXTRACTION									
Parameter			Data						
Life Cruele Sterrey			Diamagal	/Deerselin					
Life Cycle Stage:	otion (Suba	togony of Use).	Disposal	/ necyciii of Wosto	ig of Floo	trie and Electronic Equipment (WEFE)			
Dire Cycle Descrip	puon (Subca	tregory of Use).	Disposar	JI Waste	or Elec	the and Electronic Equipment (WEEE)			
Route of Exposur	·••		N/A du	et takon	from fle	DORG			
Exposure Concon	tration (Uni	+).	555700 n	r HRCD	a dust	(mean concentration range): ND 57,000 ng			
Exposure Concen	tration (Om		HBCD/g	dust (rai	g uust	(mean concentration range), ND - 57,000 ng			
Number of Sampl	Number of Semples			uust (1a	igc)				
Number of Sites:	Number of Sites:								
Type of Messurement or Method:			HBCD in	dust col	lected f	rom floors of e-waste facilities			
Worker Activity	Worker Activity:			dismantling e-waste and renovating e-waste components					
Type of Sampling	r•		surface sampling						
Analytic Method:			scanning electron microscope (SEM)						
Ū			0						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Roliah	ilitar								
Domain 1. Renau	Metric 1:	Methodology	Medium	$\times 1$	2	Not an OSHA or NIOSH method, but methodology is well de- scribed and appears acceptable			
Domain 9. Donno	contotivo								
Domain 2. Repres	Motric 2	Geographic Scope	Low	$\vee 1$	3	China (non OECD country)			
	Metric 2.	Applicability	High	~ 1	ວ ຈ	Worker emerged during electronics recueling is in seens			
	Metric 4:	Tomporal Boprosontativonoss	High	$^{\land 2}$ $^{\lor 2}$	2	2016			
	Metric 5:	Sample Size	Medium	$\times 1$	2	Indicates number of samples and provides ranges and means:			
	Metric 9.		Wiedrum	~ 1	2	discrete samples not available			
Domain 3: Access	sibility/Clar	ity							
		Cor	tinued on r	next page					

					F0-	
Source Citation:	Zeng, Y. H from work Environme	I., Tang, B., Luo, X. J., Zheng, Z shop floors of four major e-wa ent.	X. B.,Peng, P aste recycling	. A.,Mai, sites in (B. X China a	2016. Organohalogen pollutants in surface particulates and implications for emission lists. Science of the Total
Type of Data Source	Occupation	nal Exposure; Monitoring Dat	a;			
Hero ID	3350480					
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
	Metric 6:	Metadata Completeness	Low	× 1	3	Study indicates surface sampling but does not provide worker activites associated with the sites from which the samples were taken
Domain 4: Variab	Dility and Un Metric 7:	ncertainty Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality D	Determinatio	n†	Medium		1.7	

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* MWF = Metric Weighting Factor

Source Citation:	Environme stracts Ser	ent Canada and Health Canada wice Registry Number 3194-55-6	. 2011. Screenir Ottawa Canad	ng assessi	ment re	port on hexabromocyclododecane. Chemical Ab-
Type of Data Source Hero ID	Occupation 1937209	nal Exposure; Completed Expos	ure or Risk Asse	ssments;		
EXTRACTION						
Parameter			Data			
			a u			
Life Cycle Stage:			Consumer Use			
Dhusical Farmer	ption (Subca	itegory of Use):	Insulation in n	omes		
Payto of Function			Inhelation			
Exposure Concon	e. tration (Uni	+).	$\sim 1.5 \text{ to } 130.20$	$0 n \sigma / \sigma d$	ust (roc	$m_{opn}(354)$
Number of Sampl			<pre>\4.0 t0 100,20 16</pre>	0 ng/g u	ust (get	inican 554)
Type of Measure	nent or Met	hod:	Measurements	- notes t	his RA	presents additional data that is already
Type of measurer			included in thi	s XLS for	r other	HERO IDs
Worker Activity:			HBCD in dust	collected	l from l	nomes. No associated worker activity.
U						U U
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliab	oility					
	Metric 1:	Methodology	High	$\times 1$	1	data or techniques that are high quality
Domain 2: Bapro	contativo					
Domain 2. Repre	Motric 2	Coographic Scope	High	~ 1	1	Canada
	Metric 3:	Applicability	Unaccentable	$\times 2$	8	Vanada
		rippiloubility	enacceptable	~ =	0	ated worker activites.
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2011
	Metric 5:	Sample Size	Medium	$\times 1$	2	Distribution of samples is characterized by a range with uncer- tain statistics. It is unclear if analysis is representative.
Domain 3: Access	sibility/Clar	ity				
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4: Varial	oility and Ur	ncertainty				
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
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			india on non	- P~80		

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Source Citation:	Environment Canada and Health Canada. 2011. Screening assessment report on hexabromocyclododecane. Chemical Abstracts Service Registry Number 3194-55-6. Ottawa, Canada.						
Type of Data Source Hero ID	Occupational Exposure; Completed Exposu 1937209	ccupational Exposure; Completed Exposure or Risk Assessments; 937209					
EVALUATION							
Domain	Metric	Rating	MWF^{\star}	Score	Comments		
Overall Quality I	$\operatorname{Petermination}^{\dagger}$	Unacceptable		4	Metric Mean Score: 1.8.		

* MWF = Metric Weighting Factor

Source Citation:	Environme stracts Ser	ent Canada and Health Canada wice Registry Number 3194-55-6	. 2011. Screenir Ottawa Canad	ng assessi	ment re	port on hexabromocyclododecane. Chemical Ab-
Type of Data Source Hero ID	Occupation 1937209	nal Exposure; Completed Expos	ure or Risk Asse	ssments;		
EXTRACTION						
Parameter			Data			
			a u			
Life Cycle Stage:			Consumer Use			
Dire Cycle Descri	ption (Subca	ategory of Use):	insulation in n	omes		
Physical Form: Pouto of Eurocuu			Inhelation			
Exposure Concon	e. tration (Uni	+).	110 to 4000 pg	/ a dust (moon 8	10)
Number of Sampl			110 to 4000 lig	/g uusi (inean e	10)
Type of Measure	ment or Met	hod	Measurements	- notes t	his BA	presents additional data that is already
Type of Measurer	inclue of whee	nou.	included in thi	s XLS for	r other	HERO IDs
Worker Activity:			HBCD in dust	collected	from h	nomes. No associated worker activity.
						· · · · · · · · · · · · · · · · · · ·
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliab	oility					
	Metric 1:	Methodology	High	$\times 1$	1	data or techniques that are high quality
Domain 2. Popro	contativo					
Domain 2. Repre	Motric 2	Coographic Scope	High	~ 1	1	Canada
	Metric 3:	Applicability	Unaccentable	$\times 2$	8	Non-occupational scenario (settled dust in homes). No associ-
	Metric 0.	rippicability	enacceptable	<u> </u>	0	ated worker activites.
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2011
	Metric 5:	Sample Size	Medium	$\times 1$	2	Distribution of samples is characterized by a range with uncer- tain statistics. It is unclear if analysis is representative.
Domain 3: Access	sibility/Clar	ity				
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4: Varial	oility and Ur	ncertainty				
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
		(Continued on nex	t page		

	– conti	nued from pre	evious p	age			
Source Citation:	Environment Canada and Health Canada. 2011. Screening assessment report on hexabromocyclododecane. Chemical Abstracts Service Registry Number 3194-55-6. Ottawa, Canada.						
Type of Data Source Hero ID	Occupational Exposure; Completed Exposu 1937209	ccupational Exposure; Completed Exposure or Risk Assessments; 937209					
EVALUATION							
Domain	Metric	Rating	MWF^{\star}	Score	Comments		
Overall Quality I	$\operatorname{Petermination}^{\dagger}$	Unacceptable		4	Metric Mean Score: 1.8.		

* MWF = Metric Weighting Factor

Source Citation:	Environment Canada and Health Canada. 2011. Screening assessment report on hexa stracts Service Registry Number 3194-55-6. Ottawa Canada					port on hexabromocyclododecane. Chemical Ab-		
Type of Data Source Hero ID	Occupation 1937209	Occupational Exposure; Completed Exposure or Risk Assessments; 1937209						
EXTRACTION								
Parameter			Data					
			a u					
Life Cycle Stage:	stion (Subo	tomore of Lap).	Consumer Use	0.000				
Physical Form:	puon (Subca	tregory of Use).	sottlod dust	omes				
Bouto of Exposur	·••		oral					
Exposure Concen	tration (Uni	t):	2.5 mg/day					
Type of Measurer	nent or Met	hod:	taken from 200)8 EU ass	sessmen	t (HEBO 3970747)		
Worker Activity:			Assume 10 kg	child eat	ing all o	lust generated from 2 sofas, 4 m2 textile		
v			area, pica beha	aviour, th	nus 2.5 i	mg/day. No associated worker activities.		
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ollity		TT: 1	1	1			
	Metric 1:	Methodology	High	× 1	1	data or techniques that are high quality		
Domain 2: Repres	sentative							
Domain 2. Ropro.	Metric 2:	Geographic Scope	High	× 1	1	Canada		
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Non-occupational scenario (settled dust in homes). No associ-		
						ated worker activites.		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2011		
	Metric 5:	Sample Size	Medium	$\times 1$	2	Distribution of samples is characterized by a range with uncer- tain statistics. It is unclear if analysis is representative.		
Domain 2. Access	::::::::::::::::::::::::::::::::::::::							
Domain 5: Access	Motrie 6	Motadata Completeness	High	\vee 1	1	Assessment on moment clearly desumants its data survey as		
	Metric 0.	Metadata Completeness	Iligii	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
	.1., 1.7.							
Domain 4: Variat	Metric 7	Metadata Completeness	II: mh	v 1	1			
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
		(Continued on nex	t page				

		maca nom pro	prioas p	<u>~8°</u>		
Source Citation:	Environment Canada and Health Canada. 2011. Screening assessment report on hexabromocyclododecane. Chemical Ab- stracts Service Registry Number 3194-55-6. Ottawa, Canada.					
Type of Data Source	Occupational Exposure; Completed Expos	ure or Risk Asse	ssments;			
Hero ID	1937209					
EVALUATION						
Domain	Metric	Rating	MWF^{\star}	Score	Comments	
Overall Quality D	$\operatorname{Determination}^\dagger$	Unacceptable		4	Metric Mean Score: 1.8.	

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** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation:	Velsicol Chem, Corp. 1978. Industrial hygiene survey, Velsicol Chemical Corporation, El Dorado, Ark Plant, Fire Master 680							
Type of Data Source Hero ID	Occupation 1928232	Occupational Exposure; Monitoring Data; 1928232						
EXTRACTION			5.					
Parameter			Data					
Life Cycle Stage:			Manufact	uring				
Life Cycle Descrip	ption (Subca	ategory of Use):	HBCD m	anufactu	re			
Physical Form:			Dust					
Route of Exposur	e:		Inhalation	n				
Exposure Concen	tration (Uni	it):	1.9 mg/m	13				
Number of Sites:		h - 1.	I I. J			1-		
Worker Activity:	nent or Met	snod:	Transfor	f nygiene of the HE	Survey	sample the hammer mill to 28 drums		
Number of Worke	arg.		1	or the fit		the nammer-min to 28 drums		
Exposure Duratic	n:		300 minu	tes (5 ho	urs)			
PPE:			Respirato	ry protec	ction bu	t no other dermal and eye protection (such as		
			goggles or	r gloves)	were wo	orn		
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	Motrie 1.	Mathadalam	II: mh	~ 1	1			
	Metric 1:	Methodology	підіі	× 1	1	data or techniques that are high quality		
Domain 2. Bepre	sentative							
Bomani 2. Ropio	Metric 2:	Geographic Scope	High	$\times 1$	1	US		
	Metric 3:	Applicability	Medium	$\times 2$	4	Manufacturing is out of scope, but this information may be applicable to import		
	Metric 4:	Temporal Representativeness	Low	$\times 2$	6	1978		
	Metric 5:	Sample Size	Low	× 1	3	Sample statistics not discussed, however, since this is an IH survey it can be assumed that this was considered.		
		•.						
Domain 3: Access	Sibility/Clar	Mata data Gammalatan an	II:l.	1	1			
	Metric 6:	Metadata Completeness	nıgn	× 1	1	Metadata provided		
		Con	tinued on 1	next page	9			

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Source Citation:	Velsicol Ch Unit and s	Yelsicol Chem, Corp. 1978. Industrial hygiene survey, Velsicol Chemical Corporation, El Dorado, Ark Plant, Fire Master 680 Unit and semi-works summary with attachments and cover letter dated 071978.					
Type of Data Source	Occupation	nal Exposure; Monitoring Data	a;				
Hero ID	1928232						
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 4: Variak	oility and Ur Metric 7:	certainty Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty	
Overall Quality D	Determination	\mathbf{n}^{\dagger}	Medium		2.1		

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^{*} MWF = Metric Weighting Factor
[†] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation: Yi, S (HB	Yi, S.,Liu, J. G.,Jin, J.,Zhu, J. 2016. Assessment of the occupational and environmental risks of hexabromocyclododecane (HBCD) in China. Chemosphere					
Type of Data SourceOccuHero ID3350	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 3350493					
EXTRACTION						
Parameter			Data			
Life Cycle Stage:			Manufact	ure		
Life Cycle Description	Subc	ategory of Use):	HBCD P	roductior	ı	
Physical Form:			Dust			
Route of Exposure:			Inhalation	n		
Exposure Concentration	(Un	it):	10.2 ug/m	n3 to 28.3	3 ug/m^3	3
Number of Sites:			14			
Number of Workers:			23 to 37			
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliability	. 1.	Matha dalar	TT:l.	1	1	
Met	IC 1:	Methodology	High	× 1	1	Information is from trusted sources
Domain 2. Bepresentat	ve					
Met	ic 2:	Geographic Scope	Low	× 1	3	China
Metr	ic 3:	Applicability	Medium	$\times 2$	4	Manufacturing is out of scope, but this information may be applicable to import
Met	ic 4:	Temporal Representativeness	High	$\times 2$	2	2016
Met	ic 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.
Domain 3: Accessibility	/Clai	ity				
Metr	ic 6:	Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
	1 7 7					
Domain 4: Variability a	nd U	ncertainty	т	1	9	
Met	ic <i>(</i> :	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determ	inatio	on^{\dagger}	Medium		2.1	
	Continued on next page					

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Source Citation:	Yi, S.,Liu, J. G.,Jin, J.,Zhu, J 2016. Assessment of the occupational and environmental risks of hexabromocyclododecane (HBCD) in China. Chemosphere.					
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;					
Hero ID	3350493					
EVALUATION						
Domain	Metric Rating MWF* Score Comments					

Source Citation:	Yi, S.,Liu, J. G.,Jin, J.,Zhu, J. 2016. Assessment of the occupational and environmental risks of hexabromocyclododecane (HBCD) in China. Chemosphere.					
Type of Data Source Hero ID	ce Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 3350493					
EXTRACTION						
Parameter			Data			
			ъ .			
Life Cycle Stage:	tion (Color	f f I	Processin VDC famili	1g		
Diffe Cycle Descrip	otion (Subca	itegory of Use):	Duct	nulation		
Routo of Exposur	0.		Inhalatio	n		
Exposure Concert	e. tration (Uni	t).	3.62.110/r	n3 to 35 !	5 110/m	3
Number of Sites:			520	10 10 00.0	5 ug/ III	5
Number of Worke	rs:		520 to 1.0	040		
			,			
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Damain 1. Daliah	:1:4					
Domain 1: Reliad	Motric 1.	Mathadalagy	High	~ 1	1	Information is from trusted courses
	MEULIC 1.	Wethodology	IIIgii	~ 1	1	information is from trusted sources
Domain 2: Repres	sentative					
	Metric 2:	Geographic Scope	Low	$\times 1$	3	China
	Metric 3:	Applicability	High	$\times 2$	2	in scope
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2016
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.
Domain 3: Access	sibility/Clar	ity		_	-	
	Metric 6:	Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.
Domain 4: Variat	oility and Ur	ncertainty	T	-		
	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination ^{\dagger}		Medium		1.9		
	Continued on next page					
			,	1.0.		

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Source Citation:	Yi, S.,Liu, J. G.,Jin, J.,Zhu, J 2016. Assessment of the occupational and environmental risks of hexabromocyclododecane (HBCD) in China. Chemosphere.				
Type of Data Source Hero ID	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;				
EVALUATION					
Domain	Metric Rating MWF* Score Comments				

^{*} MWF = Metric Weighting Factor
[†] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation: Y	Yi, S.,Liu, J. G.,Jin, J.,Zhu, J 2016. Assessment of the occupational and environmental risks of hexabromocyclododecane (HBCD) in China. Chemosphere						
Type of Data Source O Hero ID 33	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 3350493						
EXTRACTION							
Parameter			Data				
Life Cycle Stage: Life Cycle Descriptio Physical Form: Route of Exposure: Exposure Concentrat Number of Sites: Number of Workers:	Processing EPS formulation Dust Inhalation 16 ug/m3 to 26.7 ug/m3 65 71 to 136						
EVALUATION							
Domain		Metric	Rating	MWF^*	Score	Comments	
Domain 1: Reliability M	y Ietric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
Demeir 9 Demession	4 - 4						
Domain 2: Represent	tative Intric 2:	Goographic Scope	Low	~ 1	3	China	
M	letric 3:	Applicability	Medium	$\times 1 \times 2$	4	Manufacturing EPS is not in scope, but some information may be applicable to other scenarios that are in scope or may be used as surrogate data	
Μ	letric 4:	Temporal Representativeness	High	$\times 2$	2	2016	
М	letric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.	
Domain 3: Accessibil M	lity/Clari Ietric 6:	ty Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.	
Domain 4: Variabilit	v and Un	ocertainty					
M	$\begin{array}{c} \text{for a final of } \\ \ for a final o$	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty	
Overall Quality Dete	erminatio	n†	Medium		2.1		
Continued on next page							

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Source Citation:	Yi, S.,Liu, J. G.,Jin, J.,Zhu, J 2016. Assessment of the occupational and environmental (HBCD) in China. Chemosphere.	risks of hexabromocyclododecane					
Type of Data Source	e of Data Source Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;						
Hero ID	3350493						
EVALUATION							
Domain	Metric Rating MWF [*] Score	Comments					

Source Citation: Type of Data Source Hero ID	ToxNet Ha Occupation 3970278	ToxNet Hazardous Substances Data, Bank. 2017. HSDB: 1,2,5,6,9,10-Hexabromocyclododecane. Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 3970278							
EXTRACTION									
Parameter			Data						
Life Cycle Stage:			All						
Life Cycle Descrip	otion (Subca	ategory of Use):	HBCD						
Worker Activity:	· •	,	Provides toxici	ty data o	on HBC	D. No information extracted.			
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility Motrie 1	Mathadalam	High	× 1	1				
	Metric 1:	Methodology	High	× 1	1	Information is from trusted sources			
Domain 2: Repres	sentative								
*	Metric 2:	Geographic Scope	High	$\times 1$	1	US			
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Toxicity information is relevant to the Risk Assessment, but is not utilized by the engineering assessors			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2017			
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type			
Domain 3: Access	sibility/Clar	ity							
	Metric 6:	Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.			
Domain 4. Variah	vility and Ur	acortainty							
Domain 4. Vallat	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty			
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.2.			

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Echa,. 201 Occupation 3970760	Echa, 2017. Hexabromocyclododecane, Part 2. Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 3970760						
EXTRACTION			D .					
Parameter			Data					
Life Cycle Stage:			All					
Life Cycle Descrip	otion (Subca	ategory of Use):	HBCD					
Worker Activity:			Provides toxici	ty data o	on HBC	D. No information extracted.		
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
			8					
Domain 2: Repres	sentative							
	Metric 2:	Geographic Scope	High	$\times 1$	1	US		
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Toxicity information is relevant to the Risk Assessment, but is not utilized by the engineering assessors		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2016		
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type		
Domain 3: Access	sibility/Clar	ity						
	Metric 6:	Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.		
Domain 4: Variah	vility and Ur	ocertainty						
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.2.		

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	NIOSH, 2 Occupation 3978153	NIOSH, 2014. International chemical safety cards (ICSC): Hexabromocyclododecane (mixture of isomers). Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 3978153							
EXTRACTION									
Parameter			Data						
Life Cycle Stage: Life Cycle Descrip Worker Activity:	ption (Subca	ategory of Use):	All HBCD Provides toxici tracted.	ity and o	other SI	OS data on HBCD. No information ex-			
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	oility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources			
Domain 2: Repres	sentative	G 1: 0	TT: 1		-				
	Metric 2:	Geographic Scope	High	$\times 1$	1				
	Metric 5: Metric 4:	Applicability Temporal Representativeness	High	$\times 2$ $\times 2$	0 2	No information regarding HBCD exposure			
	Metric 5:	Sample Size	N/A	A 4	N/A	This metric does not relate to this data type			
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.			
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty			
Overall Quality D	Determinatio	n^\dagger	Unacceptable		4	Metric Mean Score: 2.2.			

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Echa, 2017. Guidance on safe use: hexabromocyclododecane. Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 3970743							
EXTRACTION								
Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Worker Activity:			All HBCD Provides toxicity and other SDS data on HBCD. No information ex- tracted.					
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Repres	sentative							
Domain 2. Roprox	Metric 2:	Geographic Scope	High	$\times 1$	1	US		
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Toxicity information is relevant to the Risk Assessment, but is not utilized by the engineering assessors		
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	No Date (cites a soucce from 2006)		
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type		
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.		
Domain 4: Variab	ility and Ur Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.5.		

* MWF = Metric Weighting Factor

Source Citation:	Echa, 2009. Data on manufacture, import, export, uses and releases of HBCDD as well as information on potential alternatives to its use							
Type of Data Source Hero ID	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 3809166							
EXTRACTION								
Parameter			Data					
Life Cycle Stage:			A 11					
Life Cycle Descrit	otion (Subca	ategory of Use):	All					
Type of Measurer	nent or Met	hod:	Presents e	exposure	data tha	at is presented in EURAR (HERO ID 3970747)		
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility		TT· 1	1	1			
	Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Repres	sentative							
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Multiple European countries		
	Metric 3:	Applicability	Medium	$\times 2$	4	Provides information on both in-scope and out of scope uses.		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2009		
	Metric 5:	Sample Size	Medium	$\times 1$	2	Distribution of samples is characterized by a range with uncer- tain statistics. It is unclear if analysis is representative.		
Domain 2. Access	ihiliter/Clam	:						
Domain 5: Access	Metric 6	Metadata Completeness	High	× 1	1	fully transport		
	Metric 0.	Metadata Completeness	IIIgII	~ 1	1	Tuny transparent.		
Domain 4: Variab	oility and U	ncertainty						
	Metric 7:	Metadata Completeness	High	$\times 1$	1	discussion of variability or uncertainty		
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.4			

Source Citation:	Echa, 200 to its use.	Echa, 2009. Data on manufacture, import, export, uses and releases of HBCDD as well as information on potential alternatives to its use							
Type of Data Source Hero ID	Occupation 3809166	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 3809166							
EXTRACTION Parameter	Data								
Life Cycle Stage:			Processin MEC of N	g VDC faan		ZDC Masterilatel			
Errosura Concent	tration (Juni	tegory of Use):		$\frac{1}{2} \frac{1}{ma}$	1 from 2	APS Masterbatch			
Number of Sampl	es.		0.02 - 0.2 42	2 mg/3					
Number of Sites:			4						
Type of Measurer	ment or Met	hod:	see Table	2.15					
Worker Activity:			Potential	exposure	e to HE	SCDD during XPS manufacture occurs when			
			it is adde	ed to a h	opper t	hat feeds into the polystyrene melt. Further			
			also occur	exposure r during s	e to HE	ry processing of XPS and during the shredding			
			and repro	cessing c	of proces	ss waste.			
				0	I				
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility								
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources			
Domain 2: Repres	sentative								
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Multiple European countries			
	Metric 3:	Applicability	Medium	$\times 2$	4	Provides information on both in-scope and out of scope uses.			
	Metric 4: Motrie 5:	Temporal Representativeness	Hign Medium	$\times 2$ $\times 1$	2	2009 Distribution of some logic characterized by a some of the source of			
	Metric 5:	Sample Size	medium	× 1	Z	Distribution of samples is characterized by a range with uncer- tain statistics. It is unclear if analysis is representative.			
Domain 3: Access	Matrie 6	Ity Matadata Completeness	II: mh	~ 1	1				
	Metric 6:	Metadata Completeness	High	× 1	1	fully transparent.			
Domain 4. Variah	ulity and U	ocertainty							
Domain F. Vallar	Metric 7:	Metadata Completeness	High	$\times 1$	1	discussion of variability or uncertainty			
			tinued on a	ourt nem		an a			
Continued on next page									

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Source Citation:	Echa, 2009. Data on manufacture, import, export, uses and releases of HBCDD as well as information on potential alternatives to its use.							
Type of Data Source Hero ID	Occupational Exposure; Reports f 3809166	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 3809166						
EVALUATION								
Domain	Metric	Rating MW	F [*] Score	Comments				
Overall Quality Determination [†] High 1.4								

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* MWF = Metric Weighting Factor

Source Citation:	National Institute for Occupational Safety and Health. 2013. Reducing hazardous dust exposure when cutting fiber-cement siding. NIOSH Publication Number 2013-128.							
Type of Data Source Hero ID	Occupation 6388404	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 6388404						
EXTRACTION								
Parameter			Data					
Life Cycle Stage:			Use					
Life Cycle Descri	ption (Subca	ategory of Use):	Demolition/Di	sposal				
Route of Exposur	re:		Inhalation					
Exposure Concen	tration (Uni	t):	crystalline silic	ea: 0.02 -	$0.17 m_{\odot}$	g/m3		
Worker Activity:			Cutting Fiber-	Cement	Siding			
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	oility							
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Repre	sentative							
Domain = Teopro	Metric 2:	Geographic Scope	High	$\times 1$	1	US		
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	No information regarding HBCD; information cannot be used as surrogate		
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	Cites source from 2004		
	Metric 5:	Sample Size	Medium	$\times 1$	2	Distribution of samples is characterized by a range with uncer- tain statistics. It is unclear if analysis is representative.		
Domain 2. Agaag	aibility /Clar	:+						
Domain 5: Access	Metric 6:	Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent. (may be stated in original source)		
Domain 4: Variat	ality and U	acortainty						
Domain 4. variat	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality Determination [†]			Unacceptable		4	Metric Mean Score: 2.4.		
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Source Citation:	National Institute for Occupational Safet siding. NIOSH Publication Number 2013	y and Health. 20 -128.	013. Reduc	cing haz	ardous dust exposure when cutting fiber-cement		
Type of Data Source Here ID	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;						
Hero ID	0300404						
EVALUATION							
Domain	Metric	Rating	MWF^{\star}	Score	Comments		

* MWF = Metric Weighting Factor

Source Citation: National Institute for Occupational Safet hexavalent chromium.	National Institute for Occupational Safety and Health. 2013. Criteria for a recommended standard occupational exposure to								
Type of Data SourceOccupational Exposure; Reports for DataHero ID6388406	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 6388406								
EXTRACTION	ON								
Parameter	Data								
Life Cycle Stage:	Use								
Life Cycle Description (Subcategory of Use):	Construction								
Route of Exposure:	Inhalation								
Exposure Concentration (Unit):	hexavalent chr	omium: (0.04-0.4	2 ?g/m3					
Number of Samples:	7			5,					
Worker Activity: Stick, MIG welding on steel, galvani struction)				galvanized piping and sheet metal (con-					
EVALUATION									
Domain Metric	Rating	MWF^{\star}	Score	Comments					
Domain 1. Reliability									
Metric 1: Methodology	High	$\times 1$	1	Information is from trusted sources					
Domain 2: Representative									
Metric 2: Geographic Scope	High	× 1	1	US					
Metric 3: Applicability	Unacceptable	$\times 2$	8	No information regarding HBCD; information cannot be used					
Metric 4: Temporal Representativeness	s Medium	× 2	4	Cites source from 2007					
Metric 5: Sample Size	Medium	$\times 1 \times 1$	2	Distribution of samples is characterized by a range with uncer-					
				tain statistics. It is unclear if analysis is representative.					
Domain 3: Accessibility/Clarity									
Metric 6: Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent. (may be stated in original source)					
Densis 4. Weichilder and Weichild									
Domain 4: Variability and Uncertainty	Low	~ 1	9						
metric <i>i</i> : metadata Completeness	LOW	× 1	3	No discussion of variability or uncertainty					
Overall Quality Determination ^{\dagger}	Unacceptable		4	Metric Mean Score: 2.4.					
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- continued from previous page									
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Source Citation:	National Institute for Occupational Safety a hexavalent chromium.	and Health. 20	13. Criter	ia for a re	ecommended standard occupational exposure to				
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;								
Hero ID	6388406								
EVALUATION									
Domain	Metric Rating MWF [*] Score Comments								

** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation:	National Institute for Occupational Safety and Health. 2013. Criteria for a recommended standard occupational exposure to hexavalent chromium.								
Type of Data Source Hero ID	Occupation 6388406	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 6388406							
EXTRACTION									
Parameter			Data						
Life Cycle Stage:			Uso						
Life Cycle Descrir	tion (Subc	ategory of Use).	Demolition/Di	sposal					
Route of Exposur	e:	acceptly of obc).	Inhalation	врова					
Exposure Concent	tration (Uni	t):	hexavalent chr	omium: •	< 0.02-0).03 ?g/m3			
Number of Sampl	es:		4						
Worker Activity:			Crushing and	recycling	of conc	rete from demolition			
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Roliah	ilitar								
Domain 1. Renad	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources			
			8						
Domain 2: Repres	sentative								
•	Metric 2:	Geographic Scope	High	$\times 1$	1	US			
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	No information regarding HBCD; information cannot be used as surrogate			
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	Cites source from 2007			
	Metric 5:	Sample Size	Medium	$\times 1$	2	Distribution of samples is characterized by a range with uncer- tain statistics. It is unclear if analysis is representative.			
Demain 9. Access	:1::1:+ / <i>C</i> 1	•							
Domain 3: Access	Motrie 6.	Ity Matadata Completeness	Low	× 1	9	A			
	Metric 6:	Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent. (may be stated in original source)			
D									
Domain 4: Variab	\mathcal{O} and \mathcal{O}	ncertainty	т	1	9				
	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty			
Overall Quality D	Unacceptable		4	Metric Mean Score: 2.4.					
		(Continued on nex	t page					

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Source Citation:	National Institute for Occupational Safety an hexavalent chromium.	nd Health. 201	13. Criter	ria for a r	ecommended standard occupational exposure to	
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;					
Hero ID	6388406					
EVALUATION						
Domain	Metric	Rating	MWF^{\star}	Score	Comments	

** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation:	National Institute for Occupational Safety and Health. 2013. Criteria for a recommended standard occupational exposure to hexavalent chromium.								
Type of Data Source Hero ID	Occupation 6388406	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 6388406							
EXTRACTION									
Parameter			Data						
Life Cycle Stage:			Uso						
Life Cycle Descrit	otion (Subca	ategory of Use):	Construction						
Route of Exposur	e:		Inhalation						
Exposure Concent	tration (Uni	t):	hexavalent chr	omium: ().10-1.3	?g/m3			
Number of Sampl	es:	,	2			0,			
Worker Activity:			Remove Chron	nate-cont	aining p	paint by abrasive blasting			
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility								
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources			
Domain 2: Repres	sentative		TT: 1	1	1				
	Metric 2:	Geographic Scope	High	× 1	1	US			
	Metric 3:	Applicability	Unacceptable	× 2	8	No information regarding HBCD; information cannot be used as surrogate			
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	Cites source from 2007			
	Metric 5:	Sample Size	Medium	$\times 1$	2	Distribution of samples is characterized by a range with uncer- tain statistics. It is unclear if analysis is representative.			
Domain 3: Access	sibility/Clar	ity							
Domain 9. recest	Metric 6:	Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent. (may be stated in original source)			
Domain 4: Variab	bility and Ui	ncertainty			_				
	Metric 7:	Metadata Completeness	Medium	× 1	2	Limited discussion on variability (provides mean for dataset)			
Overall Quality Determination ^{\dagger}			Unacceptable		4	Metric Mean Score: 2.3.			
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Source Citation:	National Institute for Occupational Safety an hexavalent chromium.	nd Health. 201	13. Criter	ria for a r	ecommended standard occupational exposure to	
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;					
Hero ID	6388406					
EVALUATION						
Domain	Metric	Rating	MWF^{\star}	Score	Comments	

** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation:	National Institute for Occupational Safety and Health. 2012. A story of impact: NIOSH-funded research helps reduce occupational exposure to PCBs when renovating schools. NIOSH Publication Number 2012-170.						
Type of Data Source Hero ID	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 6388407						
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Descrip Route of Exposur Exposure Concen Worker Activity:	Use Construction (Renovation) Inhalation PCBs: 81 ppm Dust inside ventilation systems (renovating schools)						
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliab	oility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources	
Domain 2: Banra	contativo						
Domain 2. Repre	Metric 2.	Geographic Scope	High	× 1	1	US	
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	No information regarding HBCD; information cannot be used as surrogate	
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	Cites source from 1998	
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.	
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent. (may be stated in original source)	
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty	
Overall Quality Determination ^{\dagger}			Unacceptable		4	Metric Mean Score: 2.6.	
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Source Citation:	National Institute for Occupational Safe occupational exposure to PCBs when rem	ety and Health. lovating schools.	2012. A NIOSH P	story of imp ublication Nu	pact: NIOSH-funded research helps reduce mber 2012-170.		
Type of Data Source	Occupational Exposure; Reports for Data	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;					
Hero ID	6388407						
EVALUATION							
Domain	Metric	Rating	MWF^{\star}	Score	Comments		

** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation:	Marquart,	H; Warren, ND; Laitinen, J; Va	an Hemmer	n, JJ. 200	06. Defa	ault values for assessment of potential dermal exposure		
Type of Data Source Hero ID	Occupational Exposure; Monitoring Data; 498521							
EXTRACTION			Data					
1 al allietei			Data					
Life Cycle Stage:			Processin	Q				
Life Cycle Descrip	otion (Subca	ategory of Use):	All	0				
Physical Form:	× ×		Powder					
Route of Exposure	e:		Dermal					
Exposure Concent	tration (Uni	t):	Typical c	ase expo	sure: 90	0 mg		
Number of Sample	es:		19					
Type of Measuren	nent or Met	hod:	Cotton gl	oves				
Worker Activity:			Loading r	nixer wit	th powd	er		
Exposure Duratio	n:		2-20 min					
Engineering Contr	rol & percer	t Exposure Reduction:	local exhaust ventilation					
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility							
	Metric 1:	Methodology	High	$\times 1$	1	Information from peer-reviewed journal		
Domain 2: Repres	sentative							
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
	Metric 3:	Applicability	High	$\times 2$	2	Exposure data can relate to multiple scenarios that involve loading of solids		
	Metric 4:	Temporal Representativeness	Low	$\times 2$	6	source states data is from 1996		
	Metric 5:	Sample Size	Medium	$\times 1$	2	Some statistics provided, others unknown		
Domain 3: Access	ibility/Clar	itv						
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Monitoring data include all associated metadata.		
Domain 4. Variab	ility and Ur	ncertainty						
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
		*				· ·		
		Con	tinued on r	next page	e			

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Source Citation:	Marquart, H; Warren, ND; Laitinen, of the hands to industrial chemicals i	J; Van Hemmen, JJ. 20 in the scope of regulatory	06. Defau risk asse	Ilt values for assessment of potential dermal exposure essments. Annals of Occupational Hygiene.
Type of Data Source	Occupational Exposure; Monitoring l	Data;		
Hero ID	498521			
EVALUATION				
Domain	Metric	Rating MWF*	Score	Comments
Overall Quality D	$\operatorname{Petermination}^\dagger$	Medium	1.9	

Source Citation: Man of t	Marquart, H; Warren, ND; Laitinen, J; Van Hemmen, JJ. 2006. Default values for assessment of potential dermal exposure of the hands to industrial chemicals in the scope of regulatory risk assessments. Annals of Occupational Hygiene							
Type of Data SourceOccHero ID498	Occupational Exposure; Monitoring Data; 498521							
EXTRACTION								
Parameter	Data							
Life Cycle Stage:			Processin	ō.				
Life Cycle Description	(Subca	ategory of Use):	All	0				
Physical Form:	`		Powder					
Route of Exposure:			Dermal					
Exposure Concentratio	n (Uni	t):	Typical ca	ase expos	sure: 45	50 mg		
Number of Samples:			12					
Type of Measurement	or Met	hod:	Cotton gl	oves				
Worker Activity:			Gathering	g closed b	pags of	powder		
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domoin 1. Doliobility								
Domain 1: Reliability	mia 1.	Mathadalagy	Uich	× 1	1			
		Methodology	Ingn	× 1	1	Information from peer-reviewed journal		
Domain 2: Representat	ive							
Met	ric 2 :	Geographic Scope	Medium	× 1	2	Europe		
Met	ric 3:	Applicability	High	$\times 2$	2	Exposure data can relate to multiple scenarios that involve		
Met	ric 1.	Temporal Representativeness	Low	× 2	6	source states data is from 1006		
Met	ric 5	Sample Size	Medium	$\times 1$	2	Some statistics provided others unknown		
		Sample Size	mourum	<u> </u>		Some statistics provided, others anknown		
Domain 3: Accessibilit	/Clar	ity						
Met	ric 6:	Metadata Completeness	High	$\times 1$	1	Monitoring data include all associated metadata.		
Domain 4: Variability	and U	ncertainty						
Met	ric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty		
Overall Quality Determination ^{\dagger}			Medium		1.9			
Continued on next page								

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Source Citation:	Marquart, H; Warren, ND; Laitinen, J; Van of the hands to industrial chemicals in the sco	Hemmen, ope of reg	JJ. 200 gulatory	6. Defaul risk asses	t values for assessment of potential dermal exposure sments. Annals of Occupational Hygiene.	
Type of Data Source	Occupational Exposure; Monitoring Data;	Occupational Exposure; Monitoring Data;				
Hero ID	498521					
EVALUATION						
Domain	Metric	Rating	MWF^{\star}	Score	Comments	

Source Citation: Type of Data Source Hero ID	Kenneth V Occupation 6766298	Kenneth W. Fent; GPH; Sean DeCrane. 2015. Firefighters" Perspective on Flame Retardants. Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 6766298						
EXTRACTION Parameter								
Life Cycle Stage: Life Cycle Descrip Physical Form: Route of Exposur Worker Activity:	otion (Subca	ategory of Use):	End Use Firefighti Vapor, pa Dermal, i Exterior o PPE ense and then ins, and ft time and absorbed particulat meate the skin. Stu vulnerabl	ng articulate nhalation operation embles co transfer urans are transfer or inges to and va e protecti dies have e to this	e n s (deplo buld also red to th e highly to the sl ted. Ar pors pro ve barrie e demor exposur	bying hose, forcible entry), overhaul operations, become contaminated with these compounds ne skin. Because some flame retardants, diox- persistent, they could accumulate on gear over kin of firefighters where they may be dermally nother possible exposure pathway is from the oduced during a fire that may penetrate or per- ers of the turnout gear and directly contact the instrated that neck and hands are particularly re pathway		
PPE:			Firefighte but do n hose, forc	ers genera ot alway bible entr	ally wear 's wear y, outsic	a self-contained breathing apparatus (SCBA), SCBA during exterior operations (deploying le vent) or during overhaul operations		
EVALUATION						_		
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	Medium	× 1	2	Information is generally from frequently used sources (NIOSH studies, peer reviewed articles), but not always.		
Domain 2: Bepres	sentative							
Domain 2. nopro.	Metric 2:	Geographic Scope	High	$\times 1$	1	U.S.		
	Metric 3:	Applicability	High	$\times 2$	2	Exposure scenario is in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2015		
	Metric 5:	Sample Size	N/A		N/A	Not applicable to this data type		
		0						

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Source Citation: Type of Data Source Hero ID	Kenneth W. Fent; GPH; Sean DeCrane. 2015. Firefighters" Perspective on Flame Retardants. Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 6766298							
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 3: Access	ibility/Clari Metric 6:	ity Metadata Completeness	Medium	× 1	2	Data sources are generally described but not fully transparent.		
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty		
Overall Quality Determination ^{\dagger}			High		1.5			

Source Citation:	Kenneth W. Fent; DEE; Kelsey Babik; Susan D. Shaw; MLB; Jennifer H. Harris. 2013. Persistent organic pollutants
	including polychlorinated and polybrominated dibenzo-p-dioxins and dibenzofurans in firefighters from Northern California.
	Chemosphere.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	6766301

EXTRACTION

Parameter	Data										
Life Cycle Stage:	End Use										
Life Cycle Description (Subcategory of Use):	Firefighting										
Physical Form:	Vapor, particulate										
Route of Exposure:	Dermal, inhalation										
Exposure Concentration (Unit):	Serum concentrations of various compounds (dibenzo-p-dioxins, diben- zofurans, polybrominated diphenyl ethers) available in Table 1. Mea- sured levels of PBDEs were 2 to 3 times the levels detected in the general US population.										
Type of Measurement or Method:	serum concentrations (blood samples)										
Worker Activity: Number of Workers: Type of Sampling:	Of major concern during fires is the potential formation of large amounts of by-products such as chlorinated and brominated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs and PBDD/Fs)In industrial countries, PBDD/Fs are released from uncontrolled burning of BFR-containing wastes and the resulting emissions contribute substantially to total dioxin-like toxicityTentative TEQs calculated for PBDD/Fs suggested that these compounds may contribute substantially to dioxin-like tox- icity in individual firefighters. The elevated concentrations of PBDEs in the California firefighters relative to US population concentrations and the distinctive PBDE and PFC congener patterns in serum are sug- gestive of significant occupational exposure to these compounds during firefighting. 12 serum concentrations										
Analytic Method:	high resolution gas chromatography-high resolution mass spectrometry (HRGC-HRMS)										
VALUATION											
Domain Metric	Rating MWF* Score Comments										
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Source Citation:	Kenneth W. Fent; DEE; Kelsey Babik; Susan D. Shaw; MLB; Jennifer H. Harris. 2013. Persistent organic pollutants including polychlorinated and polybrominated dibenzo-p-dioxins and dibenzofurans in firefighters from Northern California.									
	Chemosphere.									
Type of Data Source	Occupational Exposure; Monitoring Data;									
Hero ID	6766301									
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
Domain 1. Reliah	vility									
	Metric 1:	Methodology	High	$\times 1$	1	Methods are well described and appear to be equivalent to approved OSHA or NIOSH method				
Domain 2: Repres	sentative									
	Metric 2:	Geographic Scope	High	$\times 1$	1	U.S.				
	Metric 3:	Applicability	Medium	$\times 2$	4	Data is not for HBCD but is for similar flame retardants. The occupational scenario is firefighting.				
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2013				
	Metric 5:	Sample Size	Medium	$\times 1$	2	Characterized by mean, median, standard deviation, and range. Other statistics are uncertain.				
Domain 3: Access	sibility/Clar	ity								
	Metric 6:	Metadata Completeness	Low	× 1	3	Data are serum concentrations - metadata include sample type but associated exposure information (duration, frequency, route are unknown)				
Domain 4: Variab	oility and Ui	ncertainty								
	Metric 7:	Metadata Completeness	High	× 1	1	Variability addressed in standard deviation and through sam- pling of multiple firefighters of differing demographics. Uncer- tainty discussed in results and conclusions.				
Overall Quality D	Determinatio	\mathbf{n}^{\intercal}	High		1.6					

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Alexander health risk Occupatio 3463474	, BM; Baxter, CS. 2016. a for firefighters. Journal of nal Exposure; Monitoring 2	Flame-retardant f Occupational ar Data;	contamin d Enviro	nation c onmenta	of firefighter personal protective clothing - A potentia al Hygiene.				
EXTRACTION Parameter			Data							
Life Cycle Stage:			End Use							
Life Cycle Descri	ption (Subca	ategory of Use):	Firefightin	ng						
Physical Form:			Solid	0						
Route of Exposur	re:		Dermal							
Exposure Concen	tration (Uni	it):	See table all three l least one	2 - 4 - E ayers of a PBDE.	Every clo an unus	othing sample, including an unused hood and ed glove, held a detectable concentration of at				
Number of Samp!	les:		4 hoods, 1	4 hoods, 1 coat, and 3 glove samples						
Type of Measurer	ment or Met	Samples a	Samples approximately 10 cm square were cut from the clothing and one							
			half was v	half was weighed and then sent to the analytical laboratory for analysis.						
Worker Activity:			Samples v	Samples were taken from used and unused firefighter protective clothing,						
			including	including gloves, hoods and a coat wristlet surface sampling						
Type of Sampling	g:		surface sa							
Sampling Locatio	on:		PPE							
PPE:			gloves, ho	ods and	a coat v	wristlet				
Analytic Method:	:		were extr 8270D Sp (PBDEs)	acted wi ecific Io	th meth n Methc	ylene chloride and analyzed by EPA method od (SIM) for polybrominated diphenyl ethers				
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
Domain 1: Reliat	oility									
	Metric 1:	Methodology	High	$\times 1$	1	Methods are well described and appear to be equivalent to approved OSHA or NIOSH method				
Domain 2: Repre	sentative									
*	Metric 2:	Geographic Scope	High	$\times 1$	1	U.S.				
	Metric 3:	Applicability	Medium	$\times 2$	4	Data is not for HBCD but is for similar flame retardants. The occupational scenario is firefighting				
						occupational scenario is mengining.				

Source Citation: Type of Data Source Hero ID	Alexander health risk Occupatio 3463474	Alexander, BM; Baxter, CS. 2016. Flame-retardant contamination of firefighter personal protective clothing - A potential health risk for firefighters. Journal of Occupational and Environmental Hygiene. Occupational Exposure; Monitoring Data; 3463474								
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
	Metric 4: Metric 5:	Temporal Representativeness Sample Size	High High	$\begin{array}{c} \times \ 2 \\ \times \ 1 \end{array}$	21	2016 All sample results are provided such that statistics can be cal- culated.				
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	× 1	3	Data are surface samples - metadata include sample type but associated exposure information (duration, frequency, route are unknown)				
Domain 4: Variab	bility and Un Metric 7:	ncertainty Metadata Completeness	High	× 1	1	Variability addressed through sampling of multiple types of PPE, used and unused. Uncertainty discussed in discussion section.				
Overall Quality D	Determinatio	\mathbf{n}^{\dagger}	High		1.4					

* MWF = Metric Weighting Factor

Source Citation: I Type of Data Source G Hero ID G	Health, MDo. 2016. Flame Retardants and Firefighter Exposure and Health. Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data; 6766303							
EXTRACTION Parameter	EXTRACTION Parameter							
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Physical Form: Route of Exposure: Exposure Concentration (Unit): Worker Activity:			End Use Firefighting Vapor, particulate inhalation, dermal absorption, and ingestion Exposure through lungs, mouth, and skin may occur during contact with smoke and soot. Fumes, gases, and small inhaled particles reach deep into the lungs where flame retardants may be absorbed into blood. Some chemicals may move through layers of skin when soot is deposited on exposed skin. Firefighters may be exposed to flame retardants to a greater extent and in different ways than the general population. Firefighters may be exposed to chemicals, including flame retardants and combustion by- products, during a fire, during overhaul (searching for fire extending into building spaces), or cleaning firefighting equipment. Firefighters may be exposed through contact with contaminated vehicles, clothing and equipment, and firehouses. Source provides a description of how the combustion of halogenated flame retardants increases the potential for exposure to a variety of compounds.					
EVALUATION Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliabili	ty Metric 1:	Methodology	Medium	× 1	2	Information is generally from frequently used sources (NIOSH studies, peer reviewed articles), but not always.		
Domain 2: Represer	High High High N/A	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \end{array}$	1 2 2 N/A	U.S. Exposure scenario is in scope 2016 Not applicable to this data type				
		Con	tinued on 1	next page)	THE REPORT OF THE PARTY OF THE		

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Source Citation: Type of Data Source Hero ID	purce Citation:Health, MDo. 2016. Flame Retardants and Firefighter Exposure and Health.ype of Data SourceOccupational Exposure; Reports for Data or Information Other than Exposure or Release Data;ero ID6766303							
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Medium	$\times 1$	2	Data sources are generally described but not fully transparent.		
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Low × 1 3 No discussion of variability or uncertainty								
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.5			

Source Citation:	Kenneth V Chemical	Kenneth W. Fent; GPH; Sean DeCrane; Gavin P. Horn; SK; Kenneth W. Fent. 2016. Interim Report: Cardiovascular & Chemical Exposure Bicks in Modern Eirefighting							
Type of Data Source Hero ID	Occupational Exposure; Monitoring Data; 6766299								
EXTRACTION									
Parameter			Data						
Life Cycle Stage			End Use						
Life Cycle Descrit	otion (Subca	ategory of Use):	Firefighti	ng					
Physical Form:	(Vapor, pa	rticulate	è				
Route of Exposur	e:		Inhalation	n					
Exposure Concent	tration (Uni	it):	Table 7 co	ontains a	rea air c	concentraions, Table 12 has surface contamina-			
			tion levels	s on PPI	E (PBDI	Es, TBBPA, TPP, and other flame retardants)			
Number of Sampl	es:		12 area; 9	0 PPE v	vipe				
Number of Sites:			1						
Type of Measurer	nent or Met	hod:	generally	descibec	but me	ethods not mentioned			
Worker Activity:			Fire supre	ession ar	a overn	aui			
Sampling Locatio			area, wipe						
PPE.	11.		SCBA cloves						
111.			bobn, gi	0105					
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Roliah	ilitar								
	Metric 1:	Methodology	Medium	$\times 1$	2	Methods are generally described but not specific enough to determine if NIOSH or OSHA (or equivalent)			
Domain 2: Repres	sentative		TT: 1	-	-				
	Metric 2:	Geographic Scope	High	× 1	1	U.S.			
	Metric 3:	Applicability	Medium	$\times 2$	4	Data is not for HBCD but is for similar flame retardants. The occupational scenario is firefighting.			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2016			
	Metric 5:	Sample Size	Low	$\times 1$	3	Source provides single result per coumpound but does not in- dicate if this is the mean, median, or some other statistic.			
Domeir 2. A	:h:1:+ /01								
Domain 3: Access	Motrie 6	Motadata Completeness	Low	\vee 1	2	Monitoring data include completions but as other matched			
	metric 0:	metadata Completeness	LOW	× 1	ა	monitoring data include sample type but no other metadata.			
Continued on next page									

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Source Citation:	Kenneth W. F Chemical Exp	Fent; GPH; Sean DeCrane; osure Risks in Modern Fire	Gavin P. H fighting.	orn; SK;	Kenne	th W. Fent. 2016. Interim Report: Cardiovascular &
Type of Data Source	Occupational 1	Exposure; Monitoring Data	;			
Hero ID	6766299					
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 4: Variab	oility and Uncer Metric 7: M	tainty letadata Completeness	High	× 1	1	Variability addressed by sampling different locations of house during different actities. Uncertainty discussed throughout and in Next Steps section.
Overall Quality I	$Determination^{\dagger}$		Medium		1.8	

Source Citation:	Alexander and FRs".	C. Mayer; KWF; Stephen Journal of Occupational	Bertke. 2019. F and Environment	irefighter al Hygie	hood c ne.	ontamination: Efficiency of laundering to remove PAHs						
Type of Data Source Hero ID	Occupational Exposure; Monitoring Data; 6766304											
EXTRACTION Parameter			Data	Data								
Life Cycle Stage:			End Use									
Life Cycle Descri	ption (Subca	ategory of Use):	Firefighti	ng								
Physical Form:			Solid									
Route of Exposur	re:		Dermal									
Exposure Concen	tration (Uni	it):	Results a in any lav	re in Fig undered o	ure 1C or unlau	and 2C and Table 3. HBCD was not detected undered hoods.						
Number of Samp	les:		10									
Type of Measurer	ment or Met	hod:	Samples v for analys	were cut f sis.	rom the	e clothing then sent to the analytical laboratory						
Worker Activity:			Hoods we after fire search an	Hoods were sampled before fire event, after fire event unlaundered, and after fire event once laundered. Activites include attack and overhaul, search and overhaul, attack and vent, search and overhaul or vent, and								
Number of Worke	ers.		40	AO								
Type of Sampling	r:		surface sa	40 surface sampling								
Sampling Locatio	on:		PPE	PPF,								
PPE:			SCBA, h	SCBA, hoods								
Analytic Method	:		NIOSH M atmosphe try	NIOSH Method 5506; ultra-performance liquid chromatography (UPLC) atmospheric pressure photoionization (APPI) tandem mass spectrometry								
EVALUATION												
Domain		Metric	Rating	$\rm MWF^{\star}$	Score	Comments						
Domain 1: Reliab	oility Metric 1:	Methodology	High	$\times 1$	1	NIOSH methods were used						
Dami' 0 D												
Domain 2: Repre	Motrie 2	Coorrenhie Coore	II: mh	V 1	1	II G						
	Metric 2:	Applicability	High	× 1 × 9	1	U.S. Euroquine generations in general data is subjects for UDCD						
	menic 9:	Аррисаршту	111g11	Χ Δ	4	Exposure scenario is in scope and data is available for HBCD						
			Continued on a	next page)							

Source Citation: Type of Data Source Hero ID	Alexander and FRs". Occupation 6766304	Alexander C. Mayer; KWF; Stephen Bertke. 2019. Firefighter hood contamination: Efficiency of laundering to remove PAHs and FRs". Journal of Occupational and Environmental Hygiene. Occupational Exposure; Monitoring Data; 6766304								
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
	Metric 4: Metric 5:	Temporal Representativeness Sample Size	High Medium	$\times 2 \times 1$	$2 \\ 2$	2019 Results provided as mean and standard deviation. Other statistics are uncertain				
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	× 1	3	Data are surface samples - metadata include sample type but associated exposure information (duration, frequency, route are unknown)				
Domain 4: Variab	pility and Un Metric 7:	ncertainty Metadata Completeness	High	$\times 1$	1	Variability addressed in standard deviation and through sam- pling of hoods used for various activities and both laundered and unlaundered. Uncertainty discussed in the discussion.				
Overall Quality D	Determinatio	\mathbf{n}^{\dagger}	High		1.3					

* MWF = Metric Weighting Factor

Source Citation:	Beverly Shen, TPW. 2018. Organophosphate flame retardants in dust collected from United States fire Stations. Environment International.								
Type of Data Source Hero ID	Occupation 6766302	Occupational Exposure; Monitoring Data; 6766302							
EXTRACTION Parameter			Data						
Life Cycle Stage			End Use						
Life Cycle Descrir	tion (Subca	tegory of Use):	Firefighti	າອ					
Physical Form:	coubed	logory of esel.	particulat	e (dust)					
Route of Exposure	e:		inhalation	. dermal	absorpt	tion, and ingestion			
Exposure Concent	ration (Uni	t):	Results a	re in Tab	le 1 (sa	mples were for phosphorous-containing flame			
Number of Samples: Number of Sites: Type of Measurement or Method: Worker Activity: Analytic Method:			retardants dust are h 26 26 dust colle Firefighte retardants completin amount o high-resol tron impa	Results are in Table 1 (samples were for phosphorous-containing flame retardants (PFRs) and PBDEs) - PFR and PBDE levels in fire station dust are higher than in other occupational and residential settings. 26 26 dust collected from vacuum-cleaner bags Firefighters are exposed to a wide range of chemicals including flame retardants while they actively suppress fires or check for hidden fires after completing fire suppression. However, firefighters spend a considerable amount of on-shift downtime at their fire stations. high-resolution gas chromatographymassspectrometry operated in elec- tron impact ionization mode					
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Methods are well described and appear to be equivalent to approved OSHA or NIOSH method			
Domain 2: Repres	entative		· · · ·	-	-				
	Metric 2:	Geographic Scope	High	× 1	1	U.S.			
	Metric 3:	Applicability	Medium	× 2	4	Data is not for HBCD but is for similar flame retardants. The occupational scenario is firefighting.			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2018			
	Metric 5:	Sample Size	Medium	× 1	2	Results provided as min, median, mean, and max. Other statistics are uncertain.			
Continued on next page									

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Source Citation:	Beverly Sh Internation	Beverly Shen, TPW. 2018. Organophosphate flame retardants in dust collected from United States fire Stations. Environment International.							
Type of Data Source Hero ID	Occupation 6766302	Occupational Exposure; Monitoring Data; 6766302							
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 3: Access	sibility/Clari Metric 6:	ity Metadata Completeness	Medium	× 1	2	Data are dust samples - metadata include sample type but associated exposure. Study discusses potential ingestion rate (assumed) but not inhalation or dermal exposure potential.			
Domain 4: Variab	pility and Ur Metric 7:	ncertainty Metadata Completeness	High	× 1	1	Variability addressed by sampling different firestations in dif- ferent states. Uncertainties discussed in the Limitations sec- tion.			
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.4				

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Kenneth V tional and Occupation 6766300	V. Fent; DEE; Kelsey Babi Environmental Hygiene. nal Exposure; Monitoring I	ik. 2018. Airbor Data;	ne contar	ninants	s during controlled residential fires. Journal of Occupa-				
EXTRACTION	0100000		Data							
1 al allietel			Data							
Life Cycle Stage:			End Use							
Life Cycle Descript	tegory of Use):	Firefighti	ng							
Physical Form:		Vapor, pa	rticulate							
Route of Exposure	:		Inhalation	1						
Exposure Concentration (Unit): Number of Samples: Type of Measurement or Method: Worker Activity:			Results in Table 3 (personal) and Table 4 (area). Sampled compounds in- cluded polycyclic aromatic hydrocarbons (PAHs), volatile organic com- pounds (VOCs), hydrogen cyanide (HCN), acid gases (e.g., hydrogen bromide), and particulate (area air sampling only).							
			10 (HBr); 11 particulate Study performed with collaboration from NIOSH - methods in Table 1							
										Area air measurements were collected from the structure during active fire and overhaul (post suppression) and on the fireground where per- sonnel were operating without any respiratory protection. Personal air measurements were collected from firefighters assigned to fire attack, vic- tim search, overhaul, outside ventilation, and command/pump operator positions.
			Number of Worker	s:		12	12			
Analytic Method:			area and Table 1 (sonal - Ve	personal area), Ta OCs)	blee 2	(particulate), and NIOSH method 1501 (per-				
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
Domain 1: Reliabi	lity Motrie 1:	Mathadalam	High	× 1	1	NIOSII methodo mero mod				
	METIC 1:	methodology	111g11	~ 1	1	MIOSH methods were used				
Domain 2: Represe	entative Metric 2:	Geographic Scope	High	$\times 1$	1	U.S.				
			Continued on r	next page						

Source Citation: Type of Data Source Hero ID	Kenneth V tional and Occupation 6766300	V. Fent; DEE; Kelsey Babik. 20 Environmental Hygiene. nal Exposure; Monitoring Data;	18. Airbor	ne conta	minants	during controlled residential fires. Journal of Occupa-
EVALUATION						
Domain		Metric	Rating	MWF^*	Score	Comments
	Metric 3:	Applicability	High	$\times 2$	2	Exposure scenario is in scope and data for hydrogen bromide and particulates are directly applicable to HBCD
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2018
	Metric 5:	Sample Size	Medium	$\times 1$	2	Results provided as median and range. Other statistics are uncertain.
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Article provides sample type, sample duration, and worker ac- tivity or location.
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	High	× 1	1	Variability addressed by sampling different activities and loca- tions. Uncertainty discussed in the discussion.
Overall Quality D	Determinatio	\mathbf{n}^{\dagger}	High		1.1	

Facility

Source Citation:	Thomsen, C., Molander, P., Daae, H. L., JanÃ _i k, K., Froshaug, M., Liane, V. H., Thorud, S., Becher, G., Dybing, E. 2007. Occupational exposure to hexabromocyclododecane at an industrial plant. Environmental Science and Technology.								
Type of Data Source Hero ID	Facility; R 787728	eports for Data or Information (Other than	Exposur	e or Re	lease Data;			
EXTRACTION Parameter			Data						
Life Cycle Stage:			Processin	g					
Life Cycle Descrip	otion (Subca	ategory of Use):	Manufact	ure of El	PS cont	aining HBCD			
Process Description	on:	/	HBCD pa	articles (fi	rom 20 i	nm to 2 mm) are added to EPS batches. HBCD			
			containin	g produc	ts are p	oroduced in intermittent periods, 8 to 10 times			
			a year at	the plant	under	investigation, and a production period usually			
			lasts up 1	to 14 day	ys with	24-hr operation divided into three 8-h work			
			shifts a d	ay. Every	v produ	ction period is regularly followed by at least a			
Number of Sites.				lod wher	e produ	icts not containing HBCD are produced.			
Number of Siles: Operating Days per Vear and Batches per Day:		- 112 to 140 days/year (8-10 production periods; each production period							
• F	operating Days per rear and Datenes per Day.		lasts 14 d	lays)	(0 -	······································			
Possible Physical	Form:		Solid	0 /					
Chemical Concent	tration:		0.7 wt percent HBCD in EPS						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1, Paliah	:1:+								
Domain 1. Kenab	Metric 1	Methodology	High	× 1	1	Information is from a published journal article			
		methodolog,	111,511	<u> </u>	1	mornation is from a passisted journal attole			
Domain 2: Repres	sentative								
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	A Scandanavian Industrial Plant. Since all scandanavian coun- tries (Sweden, Denmark, Finland, Norway, Iceland) are in OECD, this score is a 2.			
	Metric 3:	Applicability	Medium	$\times 2$	4	EPS compounding not in scope but may provide insight into EPS particle size and wt frac			
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	The report was published in 2007 $(> 10 \text{ years ago})$			
Metric 5: Sample Size			N/A		N/A	Not applicable for this information			
Domain 3: Accessibility/Clarity									
Continued on next page									

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Source Citation:	Citation: Thomsen, C.,Molander, P.,Daae, H. L.,JanÃ _i k, K.,Froshaug, M.,Liane, V. H.,Thorud, S.,Becher, G.,Dybing, E. 2007. Occupational exposure to hexabromocyclododecane at an industrial plant. Environmental Science and Technology.							
Type of Data Source Hero ID	Facility; R 787728	Facility; Reports for Data or Information Other than Exposure or Release Data; 787728						
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Article clearly identifies data source and methods used for the study		
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Low $\times 1$ 3 No discussion of variability or uncertainty						No discussion of variability or uncertainty		
Overall Quality Determination ^{\dagger}					1.9			

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	ToxNet Hazardous Substances Data, Bank. 2017. HSDB: Hexabromocyclododecane. Facility; Reports for Data or Information Other than Exposure or Release Data; 3970277							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Total Annual U.S. Volume (and percent of PV): Number of Sites: Chemical Concentration:			 Import Manufacturing and importation of HBCD See pg 90 for manufacturing description. 10 -50 million pounds 3 - 2 import, 1 MFG (2012 CDR) 40 to 100 percent in manufactured or imported substance 					
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Representative Metric 2: Geographic Scope Metric 3: Applicability Metric 4: Temporal Representativeness Metric 5: Sample Size		High High High Medium	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	1 2 2 2	US Importation is in scope 2012 Information is from 3 CDR reporting sites, which represents only the sites exceeding the reporting threshold, so maybe not every possible site			
Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness			High	× 1	1	Information is all clearly cited		
Domain 4: Variab	ility and Ur Metric 7:	ncertainty Metadata Completeness	Medium	× 1	2	Report addresses CBI claims, but not much else		
Overall Quality Determination ^{\dagger}		High		1.2				

Source Citation:Nicnas,. 20Type of Data SourceFacility; CoHero ID3978355	112. Priority existing chemical a ompleted Exposure or Risk Asse	ssessments: essments;	Hyexab	romocy	clododecane (HBCD)- PEC34.		
EXTRACTION Parameter		Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description:		Import Importation of HBCD Liquid is imported in 200 kg drums or 20 kg steel drums to warehouse then to customers; No repackaging. Solid imported in 25 kg lined paper					
Total Annual U.S. Volume (and percent of PV): Possible Physical Form: Chemical Concentration:			bags. Same for imported resins. [pg 44] Australia = 0 for solid; 0.69 tonnes for liquid; 45 tonnes for EPS resin; 9.9 tonnes for XPS liquid; solid; EPS; XPS 15-30 percent or 30-60 percent (liquid); 96-99.96 percent (solid); <1 percent (EPS); <3 percent (XPS)				
EVALUATION Domain	Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliability Metric 1:	Methodology	High	× 1	1	Information collected from accepted sources		
Domain 2: Representative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High Medium	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 2	Australia Use in scope 2012 Infromation from limited number of outside sources		
Domain 3: Accessibility/Clari Metric 6:	ty Metadata Completeness	High	× 1	1	Information is all clearly cited		
Domain 4: Variability and Un Metric 7:	certainty Metadata Completeness	Medium	× 1	2	Limited discussion on uncertainty and variability		
Overall Quality Determination	1 [†] Con	High tinued on r	ext page	1.3			

				F0-	
Source Citation: Type of Data Source Hero ID	Nicnas,. 2012. Priority existing chemical as Facility; Completed Exposure or Risk Asses 3978355	sessments:	: Hyexab	romocyclod	lodecane (HBCD)- PEC34.
EVALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments

Source Citation: Type of Data Source Hero ID	Nicnas, 20 Facility; C 3978355	012. Priority existing chemical a ompleted Exposure or Risk Asse	ssessments: essments;	Hyexab	romocy	clododecane (HBCD)- PEC34.	
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Total Annual U.S. Volume (and percent of PV): Number of Sites:			Processing Production of EPS resin See section 4.6.1 for detailed process description >88 percent used for insulation (EPS and XPS) 1				
EVALUATION		Metric	Bating	MWF*	Score	Comments	
		Methe	Hatting	101 00 1	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information collected from accepted sources	
Domain 2: Bepres	sentative						
Domain 2. Ropros	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Australia	
	Metric 3:	Applicability	Medium	$\times 2$	4	EPS compounding not in scope but may provide insight into EPS use rate	
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012	
	Metric 5:	Sample Size	Medium	$\times 1$	2	Infromation from limited number of outside sources	
Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness		High	$\times 1$	1	Information is all clearly cited		
Domain 4: Variah	ility and U	agentainty					
Domain 4. Variab	Metric 7:	Metadata Completeness	Medium	$\times 1$	2	Limited discussion on uncertainty and variability	
Overall Quality D	eterminatio	n^\dagger	High		1.6		

Source Citation: Type of Data Source Hero ID	Nicnas,. 20 Facility; C 3978355	Nicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34. Facility; Completed Exposure or Risk Assessments; 3978355							
EXTRACTION									
Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description:		Processing Panels from EPS See section 4.6.1 for detailed process description. Moulded EPS blocks can be shaped at the building site, most often with a bandsaw, or they							
Total Annual U.S. Volume (and percent of PV):			can be sh >88 perce	aped in f ent used	actories for insu	s using hot wire cutting techniques. lation (EPS and XPS)			
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information collected from accepted sources			
Domain 2: Repres	sentative								
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Australia			
	Metric 3:	Applicability	High	$\times 2$	2	Use in scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012			
	Metric 5:	Sample Size	Medium	$\times 1$	2	Infromation from limited number of outside sources			
Domain 3: Access	sibility/Clari	ity							
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Information is all clearly cited			
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Medium	× 1	2	Limited discussion on uncertainty and variability			
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.3				

* MWF = Metric Weighting Factor

Source Citation:Nicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34.Type of Data SourceFacility; Completed Exposure or Risk Assessments;Hero ID3978355							
EXTRACTION Parameter		Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Total Annual U.S. Volume (and percent of PV):		Use XPS Foam board Board dimensions are approximately 600 mm by 300 mm by 2400 mm. Boards are fixed in place by contractors using mechanical fasteners or adhesives. Some boards may be hand-cut to size and shape on- site.Insulated panels are typically clad with steel or aluminium sheet, adhesively bonded to the foam. [pg 45]					
Total Annual U.S. Volume (and percent of PV): Possible Physical Form: Chemical Concentration:		>88 perce solid - foa <3 percer	ent used : um nt	for insu	lation (EPS and XPS)		
EVALUATION		D /:		q	0		
Domain	Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliability Metric 1:	Methodology	High	× 1	1	Information collected from accepted sources		
Domain 2: Representative Metric 2: Metric 3:	Geographic Scope Applicability	Medium High	$\begin{array}{c} \times \ 1 \\ \times \ 2 \end{array}$	$2 \\ 2$	Australia Use in scope		
Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012		
Metric 5:	Sample Size	Medium	$\times 1$	2	Infromation from limited number of outside sources		
Domain 3: Accessibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Information is all clearly cited		
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness		Medium	× 1	2	Limited discussion on uncertainty and variability		
Overall Quality Determination	\mathbf{n}^{\dagger}	High		1.3			
Continued on next page							

Source Citation: Type of Data Source Hero ID	Nicnas, 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34. Facility; Completed Exposure or Risk Assessments; 3978355					
EVALUATION						
Domain	Metric	Rating	MWF^{\star}	Score	Comments	
Source Citation: Type of Data Source Hero ID	Nicnas,. 20 Facility; C 3978355	012. Priority existing chemical a ompleted Exposure or Risk Asse	ssessments: essments;	Hyexab	romocy	clododecane (HBCD)- PEC34.
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EXTRACTION						
Parameter			Data			
Life Cycle Stage: Life Cycle Descrip Process Description Possible Physical Chemical Concen	ption (Subca on: Form: tration:	ategory of Use):	Recycling XPS Foar A small p building": solid - foa <3 percer	n Recycl percentag s life (est um nt	ing e (<5 p imated	percent) is recovered for reuse at the end of a at 20 years) [pg 45].
EVALUATION						
Domain		Metric	Rating	MWF^*	Score	Comments
Domain 1: Reliab	oility Metric 1:	Methodology	High	× 1	1	Information collected from accepted sources
Domain 2: Repres	sentative		0			
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Australia
	Metric 3:	Applicability	High	$\times 2$	2	Use in scope
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Information is all clearly cited
Domain 4: Variab	bility and Ur Matria 7:	ncertainty Matadata Completeness	Madium	× 1	9	
	Metric 7:	Metadata Completeness	Mealum	× 1	2	Limited discussion on uncertainty and variability
Overall Quality I	Determinatio	\mathbf{n}^{\dagger}	High		1.3	

Source Citation: E	Echa, 2014. Template for third party submission of information on alternatives for applications for authorisation HBCD use in EPS for building applications								
Type of Data Source F Hero ID 3	Facility; Reports for Data or Information Other than Exposure or Release Data; 3970749								
EXTRACTION									
Parameter			Data						
Life Cycle Stage: Life Cycle Description: Process Description:	on (Subca :	tegory of Use):	Processing EPS Resid HBCD is together v	g n added to vith othe	a 50/5 r additi	0 suspension of monomeric Styrene and water, ves (catalysts, nucleation agents, etc.). HBCD			
Total Annual U.S. V Chemical Concentra	Volume (anation:	nd percent of PV):	dissolves i beads. Du HBCD de 0.5 percer	in the sty iring poly mand (2 nt -1.0 pe	vrene wl ymeriza 015) = ercent	hich is polymerized into the small Polystyrene ition a blowing agent is added. 2,200 metric ton			
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliabilit	ty Metric 1:	Methodology	Medium	$\times 1$	2	Data from manufacturer, who is also the author of the report			
Domain 2: Represer	ntative								
N N	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe			
Ν	Metric 3:	Applicability	Medium	$\times 2$	4	EPS compounding not in scope but may provide insight into EPS wt frac and use rate			
Ν	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2014			
N	Metric 5:	Sample Size	Low	$\times 1$	3	Qualitative			
Domain 3: Accessib	ility/Clari	ty							
Ν	Metric 6:	Metadata Completeness	Medium	$\times 1$	2	Data sources are generally described but not fully transparent.			
Domain 4: Variabili	ty and Un Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	The report does not address variability or uncertainty.			
Overall Quality Det	erminatio	n [†]	Medium		2.0				
		Con	tinued on r	next page	;				

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Source Citation:	Echa, 2014. Template for third party submission of information on alternatives for applications for authorisation HBCD us in EPS for building applications.	;e					
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;						
Hero ID	3970749						
EVALUATION							
Domain	Metric Rating MWF [*] Score Comments						

Source Citation:	Echa, 2014. Template for third party submission of information on alternatives for applications for authorisation HBCD use in EPS for building applications.							
Type of Data Source Hero ID	Facility; Reports for Data or Information Other than Exposure or Release Data; 3970749							
EXTRACTION			Data					
			Data					
Life Cycle Stage:			Processin	g				
Life Cycle Descrip	otion (Subca	ategory of Use):	XPS Con	poundin	g /Mast	terbatch		
Process Description	on:		The XPS	$\operatorname{process}$	makes	use of a two-step extrusion process. It starts		
			from poly	styrene	which is	s blended with the flame retardant in a first		
			step and	the addit	tion of a	a blowing agent in a second step. Leaving the		
Chemical Concent	ration		15-25 n	ercent	ne prod	uct expands into sneets which are cut in snape.		
enoninour eonioun			110 - 10 p	0100110				
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Boliah	ilitar							
Domain 1. Renab	Metric 1:	Methodology	Medium	$\times 1$	2	Data from manufacturer, who is also the author of the report		
Domain 2. Benres	entative							
Domain 2. Repres	Metric 2:	Geographic Scope	Medium	× 1	2	Europe		
	Metric 3:	Applicability	High	$\times 2$	2	Use in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2014		
	Metric 5:	Sample Size	Low	$\times 1$	3	Qualitative		
Domain 3. Access	ibility/Clar	ity						
Domain 9. Meeess	Metric 6:	Metadata Completeness	Medium	$\times 1$	2	Data sources are generally described but not fully transparent.		
Domain 4: Variab	ility and Ui	ncertainty	Ŧ	-				
	Metric 7:	Metadata Completeness	Low	× 1	3	The report does not address variability or uncertainty.		
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Medium		1.8			
•								

Source Citation: Type of Data Source Hero ID	Echa,. 200 Facility; C 3970747	8. Risk assessment: hexabromoo ompleted Exposure or Risk Asse	cyclododeca essments;	ane.		
EXTRACTION						
Parameter			Data			
Life Cycle Stage: Life Cycle Descrip Process Descripti Total Annual U.S Number of Sites:	otion (Subca on: . Volume (a	ategory of Use): nd percent of PV):	Processin EPS Resi Section 2. See Table See Table	g n. 2.3.1 e 2-3 for I e 2-3 for I	Europea Europea	n Value n Value
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information collected from accepted sources
						*
Domain 2: Repre	sentative					
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe (Sweden)
	Metric 3:	Applicability	Medium	$\times 2$	4	EPS compounding not in scope but may provide insight into EPS use rate
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008
	Metric 5:	Sample Size	Low	$\times 1$	3	Distribution characterized by no statistics.
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4: Variat	ility and U	ncertainty	TT: 1			
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.6	

Source Citation:Echa,Type of Data SourceFacilityHero ID3970747	2008. Risk assessment: hexabromo Completed Exposure or Risk Ass	cyclododeca essments;	ane.					
EXTRACTION								
Parameter		Data						
Life Cycle Stage:		Processin	ıg					
Life Cycle Description (Su	bcategory of Use):	EPS Foar	m from R	esin				
Process Description:		Section 2	.2.3.2					
Total Annual U.S. Volume (and percent of PV):			See Table 2-3 for European Value					
Number of Sites:		See Table	e 2-3 for 1	Europea	an Value			
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliability Metric	I. Methodology	High	× 1	1	Information collected from acconted sources			
Metric	1. Methodology	IIIgii	~ 1	1	mormation conected from accepted sources			
Domain 2: Representative								
Metric	2: Geographic Scope	Medium	$\times 1$	2	Europe (Sweden)			
Metric	B: Applicability	High	$\times 2$	2	Use in scope			
Metric	4: Temporal Representativeness	High	$\times 2$	2	2008			
Metric	5: Sample Size	Low	$\times 1$	3	Distribution characterized by no statistics.			
Domain 3: Accessibility/C	arity							
Metric	6: Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Variability and	Uncertainty	TT: 1	-	-				
Metric	7: Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
Overall Quality Determina	$tion^{\dagger}$	High		1.3				

Source Citation:Echa,Type of Data SourceFaciliHero ID39707	2008. Risk assessment: hexabromo y; Completed Exposure or Risk Ass 47	ecyclododeca essments;	ane.				
EXTRACTION		Data					
Parameter		Data					
Life Cycle Stage:		Processin	ıg				
Life Cycle Description (S	ubcategory of Use):	XPS Con	npoundin	g /Mast	terbatch		
Process Description:		Section 2	.2.4.1				
Total Annual U.S. Volur	e (and percent of PV):	See Table	e 2-3 for l	Europea	an Value		
Number of Sites:		See Table	See Table 2-3 for European Value				
EVALUATION							
Domain	Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliability Metri	e 1: Methodology	High	$\times 1$	1	Information collected from accepted sources		
Domain 2: Representativ	e O Garmanhia Garma	M - J	1	0			
Metri	2: Geographic Scope	Medium	× 1	2	Europe (Sweden)		
Metri	A: Tomporal Representativeness	High	~ 2	2	Ose in scope		
Metri	5: Sample Size	Low	× 1	2	Distribution characterized by no statistics		
	5. Stample Size	How	× 1	0	Distribution characterized by no statistics.		
Domain 3: Accessibility	Clarity						
Metri	e 6: Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability ai	d Uncertainty	TT: 1	1	1			
Metri	e 7: Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality Determi	$\operatorname{nation}^\dagger$	High		1.3			

Source Citation:EchType of Data SourceFaciHero ID3970	a,. 2008. Risk assessment: hexabrome lity; Completed Exposure or Risk Ass 1747	ocyclododeca sessments;	ane.					
EXTRACTION								
Parameter		Data						
Life Cycle Stage:		Processin	ıg					
Life Cycle Description	(Subcategory of Use):	Productio	on of XPS	S article	25			
Process Description:		Section 2	.2.4.2					
Total Annual U.S. Volume (and percent of PV):			See Table 2-3 for European Value					
Number of Sites:		See Table	See Table 2-3 for European Value					
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliability	ria 1. Mathadology	High	× 1	1	Information collected from accorded courses			
Met	ne 1. Methodology	Ingn	× 1	1	Information collected from accepted sources			
Domain 2: Representat	ive							
Met	ric 2: Geographic Scope	Medium	$\times 1$	2	Europe (Sweden)			
Met	ric 3: Applicability	High	$\times 2$	2	Use in scope			
Met	ric 4: Temporal Representativeness	High	$\times 2$	2	2008			
Met	ric 5: Sample Size	Low	$\times 1$	3	Distribution characterized by no statistics.			
Domain 3. Accossibilit	(Clarity							
Met	ric 6: Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Variability	and Uncertainty	··· 1	_	_				
Met	ric 7: Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
Overall Quality Determ	$\mathrm{ination}^\dagger$	High		1.3				

Source Citation: Type of Data Source Hero ID	Echa, 2008. Risk assessment: hexabromocyclododecane. Facility; Completed Exposure or Risk Assessments; 3970747						
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Descrip Process Descriptio	otion (Subca on:	ttegory of Use):	Processin HIPS (pla HBCD is such as vir and video and use of assumed to	g /Use astics for used in 1 deo and s cassette f HIPS in to be grea	electron HIPS, v tereo eq e housin n Sectic ater tha	nic devices) which are used in electric and electronic parts uppment, distribution boxes for electrical lines, ngs. Process descriptions for the formulation on 2.2.5. The mobility of HBCDD in HIPS is an in XPS and EPS (pg. 375).	
Total Annual U.S. Volume (and percent of PV): Number of Sites: Chemical Concentration:		>210 ton: 3 HIPS fo 1-7 percen	nes (Euro ormulatio nt	ope) n sits a	nd unknown use /assembly sites in Europe		
EVALUATION							
Domain		Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information collected from accepted sources	
Domain 2: Repres	sentative						
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe (Sweden)	
	Metric 3:	Applicability	Medium	$\times 2$	4	The processing /use of HIPS is not in scope; however, infor- mation on concentrion of HBCD in HIPS may be useful for in-scope use (worker exposure during recycling of electronics)	
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008	
	Metric 5:	Sample Size	Low	$\times 1$	3	Concentration is provided in a range characterized by no statis- tics.	
Domain 3: Access	sibility/Clar	ity					
	Metric 6:	Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variab	oility and U	ncertainty					
		Con	tinued on r	next page	!		

		001101	maea nom j	provious	puge	
Source Citation: Type of Data Source Hero ID	Echa,. 200 Facility; C 3970747	8. Risk assessment: hexabron ompleted Exposure or Risk A	nocyclododeca ssessments;	ane.		
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
	Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality D	Determinatio	\mathbf{n}^{\dagger}	High		1.6	

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Parameter Life Cycle Stage: Life Cycle Description (Subcate Process Description: Total Annual U.S. Volume (an Operating Days per Year and Site Daily Throughput: Possible Physical Form: ALUATION Domain Domain 1: Reliability	tegory of Use):	Data Processin, EPS artic EPS pelle panded b lation boa of blowing	g eles from ets are co eads can ards). Tl x agent tl	beads onvertee then be	d to expanded beads using steam. The ex- e moulded into boards and shapes (e.g. insu-
Life Cycle Stage: Life Cycle Description (Subcat Process Description: Total Annual U.S. Volume (an Operating Days per Year and Site Daily Throughput: Possible Physical Form: ALUATION Domain Domain 1: Reliability	tegory of Use):	Processin, EPS artic EPS pelle panded be lation boa of blowing	g eles from ets are c eads can ards). Th a agent th	beads onvertee then be	d to expanded beads using steam. The ex- θ moulded into boards and shapes (e.g. insu-
Total Annual U.S. Volume (an Operating Days per Year and Site Daily Throughput: Possible Physical Form: ALUATION Domain Domain 1: Reliability	tegory of Use):	EPS artic EPS pelle panded be lation boa of blowing	s eles from ets are c eads can ards). Th a agent th	beads onvertee then be	d to expanded beads using steam. The ex- e moulded into boards and shapes (e.g. insu-
Total Annual U.S. Volume (an Operating Days per Year and Site Daily Throughput: Possible Physical Form: ALUATION Domain Domain 1: Reliability	ad normant of DV).	EPS pelle panded b lation box of blowing	ets are c eads can ards). Tl	onvertee then be	d to expanded beads using steam. The ex- e moulded into boards and shapes (e.g. insu-
Total Annual U.S. Volume (an Operating Days per Year and Site Daily Throughput: Possible Physical Form: ALUATION Domain Domain 1: Reliability	ad paragent of DV).	panded by lation bost of blowing	eads can ards). Tl	then be	e moulded into boards and shapes (e.g. insu-
Total Annual U.S. Volume (an Operating Days per Year and Site Daily Throughput: Possible Physical Form: ALUATION Domain Domain 1: Reliability	ad paragent of DV).	lation boa of blowing	ards). Tl x agent tl	o tom	
Total Annual U.S. Volume (an Operating Days per Year and Site Daily Throughput: Possible Physical Form: ALUATION Domain Domain 1: Reliability	ad powerst of BV).	of blowing	r agent tl	ie temp	perature softens the beads and the expansion
Total Annual U.S. Volume (an Operating Days per Year and Site Daily Throughput: Possible Physical Form: ALUATION Domain Domain 1: Reliability	ad porcept of DV).			ney cont	tain (i.e. pentane) causes the pellets/beads to
Operating Days per Year and Site Daily Throughput: Possible Physical Form: ALUATION Domain		expand up	p to 50 ti	mes the	ir original size. More details in Section 9.3.1.1
Site Daily Throughput: Possible Physical Form: ALUATION Domain Domain 1: Reliability	Batches per Day:	20 percen	t of EU t /vr	onnage	
Possible Physical Form: ALUATION Domain Domain 1: Reliability	Datenes per Day.	?391 kg/c	$\frac{1}{2}$	tonnes/	vr (of HBCDD, equivalent to approximately
Possible Physical Form: ALUATION Domain Domain 1: Reliability		13 000 to	nnes EPS	5)	J (
ALUATION Domain Domain 1: Reliability		Solid (wit	hin poly	ner ma	trix)
Domain Domain 1: Reliability					
Domain 1: Reliability	Metric	Rating	MWF^{\star}	Score	Comments
•/					
Metric 1:	Methodology	High	$\times 1$	1	Information collected from accepted sources
Domain 2: Representative					
Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe
Metric 3:	Applicability	High	$\times 2$	2	Use in scope
Metric 4:	Temporal Representativeness	High	$\times 2$	2	2009?
Metric 5:	Sample Size	Low	$\times 1$	3	Distribution characterized by no statistics.
Domain 3: Accessibility/Clarit	tv				
Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, a sessment methods, results, and assumptions.
Domain 4: Variability and Un	certainty				
	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~				

Source Citation: Type of Data Source Hero ID	Echa,. 201 Facility; Co 3970748	7. Chemical safety report: He ompleted Exposure or Risk A	exabromocyclo ssessments;	ododecan	e and a	ll major diastereoisomers identified.
EVALUATION						
Domain		Metric	Rating	$\rm MWF^{\star}$	Score	Comments
	Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality D	Determination	\mathbf{n}^{\dagger}	High		1.3	

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Source Citation: Type of Data Source Hero ID	Echa, 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified. Facility; Completed Exposure or Risk Assessments; 3970748					
EXTRACTION Parameter			Data			
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Total Annual U.S. Volume (and percent of PV): Operating Days per Year and Batches per Day: Site Daily Throughput: Possible Physical Form:		Processing use of flame-retarded expanded polystyrene articles. In construction applications, use of FR EPS reduces costs in transport, handling and overall construction time to insulate buildings. 20 percent of EU tonnage 250 3.2 kg/d; 0.8 t/a Solid (within polymer matrix)				
EVALUATION Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information collected from accepted sources
Domain 2: Repres	sentative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High Low	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 3	Europe Use in scope sources are 2009 - 2012 Distribution characterized by no statistics.
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4: Variab	ility and Un Metric 7:	ncertainty Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination [†]			High		1.3	
Continued on next page						

Source Citation: Type of Data Source Hero ID	Echa, 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified. Facility; Completed Exposure or Risk Assessments; 3970748					
EVALUATION Domain	Metric	Rating	MWF*	Score	Comments	

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Source Citation:Echa,. 201Type of Data SourceFacility; CHero ID3970753	17. Chemical safety report: Hexa Completed Exposure or Risk Asso	abromocycle essments;	ododecar	ne and a	Il major diastereoisomers identified, Part 2.		
EXTRACTION Parameter	Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Total Annual U.S. Volume (and percent of PV):		Processing formulation of EPS beads The reactor content is heated (and stirred) and during polymerisation, pentane (the expansion agent) is added to the reactor under pressure, where it is absorbed in the polymer droplets. The HBCDD is incorpo- rated as an integral and encapsulated component within the polymer matrix with uniform concentration throughout the bead. See additional detailed description in Section 9.2.					
Total Annual U.S. Volume (a Operating Days per Year and Site Daily Throughput: Chemical Concentration:	24 percen ?330 days ?2.91 t/d 0.70 perce	24 percent for EU ?330 days ?2.91 t/d; ?960 t/y 0.70 percent					
EVALUATION Domain	Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliability Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Representative Metric 2: Metric 3:	Geographic Scope Applicability	Medium Medium	$ \times 1 \ \times 2 $	$2 \\ 4$	Europe EPS compounding not in scope but may provide insight into		
Metric 4: Metric 5:	Temporal Representativeness Sample Size	High Low	$\times 2 \times 1$	$2 \\ 3$	EPS wt frac and use rate 2012 characterized by no statistics.		
Domain 3: Accessibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability and U	ncertainty						
Continued on next page							

Source Citation: Type of Data Source Hero ID	Echa,. 201 Facility; Co 3970753	Echa, 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified, Part 2. Facility; Completed Exposure or Risk Assessments; 3970753							
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
	Metric 7:	Metadata Completeness	High	$\times 1$	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.			
Overall Quality D	Determination	\mathbf{n}^{\dagger}	High		1.6				

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Source Citation: Type of Data Source Hero ID	Echa, 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified. Facility; Completed Exposure or Risk Assessments; 3970750						
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Total Annual U.S. Volume (and percent of PV): Number of Sites: Chemical Concentration:			Processing formulation of EPS beads 5,300 Tonnes/yr (EU) 22 0.70 percent				
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources	
Domain 2: Repres	sentative Metric 2:	Geographic Scope	Medium	× 1	2	Europe	
	Metric 3: Metric 4:	Applicability Temporal Representativeness	Medium	$\times 2$ $\times 2$	$\frac{4}{2}$	EPS compounding not in scope but may provide insight into EPS wt frac and use rate 2008	
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.	
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variab	ility and U Metric 7:	ncertainty Metadata Completeness	Medium	× 1	2	limited discussion	
Overall Quality D	eterminatio	n^\dagger	Medium		1.7		

Source Citation: Type of Data Source Hero ID	Echa,. 200 Facility; C 3970750	9. Background document for he ompleted Exposure or Risk Asse	xabromocy essments;	clododeca	ane and	all major diastereoisomers identified.
EXTRACTION Parameter			Data			
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Total Annual U.S. Volume (and percent of PV): Number of Sites: Chemical Concentration:		Processing formulation of XPS 5,900 Tonnes/yr (EU) 56 0.70 percent				
EVALUATION			D (:		q	
Domain		Metric	Rating	MWF'^	Score	Comments
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources
Domain 2: Repres	entative					
1	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4: Variab	ility and Ur Metric 7:	ncertainty Metadata Completeness	Medium	× 1	2	limited discussion
Overall Quality D	eterminatio	n^\dagger	High		1.4	

Source Citation: Type of Data Source Hero ID	Echa, 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified. Facility; Completed Exposure or Risk Assessments; 3970750							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Number of Sites: Chemical Concentration:		Processing EPS converting 600 0.70 percent						
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 9. Doma	antatina							
Domain 2: Repres	Metric 2.	Geographic Scope	Medium	× 1	2	Europe		
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2009		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variab	ility and Ur Metric 7:	ncertainty Metadata Completeness	Medium	$\times 1$	2	limited discussion		
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.4			

EXTRACTION Parameter	Data				
Life Cycle Stage: Life Cycle Description (Subca Process Description:	ategory of Use):	Processing HIPS (pla Note: Info mainly for lines in th but increa	g /Use astics for prmation r video a e constru- asing pro	electror is cited nd stere action se portion	nic devices) from 3970747. The use of HBCDD in HIPS is eo equipment, distribution boxes for electrical ector and refrigerator lining. An undetermined of waste generated from HIPS and textile ar-
Total Annual U.S. Volume (and percent of PV): Number of Sites: Chemical Concentration:			s/yr (Eu rmulator nt	The rest rope) s (Euro	pe)
EVALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Beliability					
Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources
Domain 2: Representative					
Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe
Metric 3:	Applicability	Medium	$\times 2$	4	The processing /use of HIPS is not in scope; however, infor- mation on concentrion of HBCD in HIPS may be useful for in-scope use (worker exposure during recycling of electronics)
Metric 4:	Temporal Representativeness	High	$\times 2$	2	2009
Metric 5:	Sample Size	Low	$\times 1$	3	Concentration is provided in a range characterized by no statis- tics.
Domain 3: Accessibility/Clar	ity				
Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4: Variability and U	ncertainty				
Metric 7:	Metadata Completeness	Medium	$\times 1$	2	limited discussion

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Source Citation: Type of Data Source Hero ID	Echa, 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified. Facility; Completed Exposure or Risk Assessments; 3970750								
EVALUATION Domain	Metric	Metric Rating MWF* Score Comments							
Overall Quality I	$\operatorname{Determination}^\dagger$	Medium	1.7						

Source Citation:InType of Data SourceFHero ID3	Ineos Styrenics. 2017. Analysis of alternatives: HBCDD use in EPS for building applications. Facility; Reports for Data or Information Other than Exposure or Release Data; 3970752							
EXTRACTION Parameter	Data							
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Chemical Concentration:			Processing EPS bead production There are two single-step processes, the suspension process and the mass process. The suspension process is described first in 2.1.1.1, with key differences in the mass process described in 2.1.1.2. HBCD pre-added to styrene or added to reactor during polymerization. An expansion agent, pentane, is added to the reactor during polymerisation (at a temperature of approximately 130oC) and is absorbed by the polymer droplets. EPS pellets formed and are dried. 0.70 percent					
EVALUATION		Matria	Datima		Coore	Commonto		
Domain		Metric	Rating	IVI VV F	Score	Comments		
Domain 1: Reliabilit	ty /letric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Ronroson	totivo							
Domain 2. Represen	Aetric 2.	Geographic Scope	Medium	× 1	2	Europe		
N	Aetric 3:	Applicability	Medium	$\times 2$	4	EPS compounding not in scope but may provide insight into EPS wt frac		
Ν	Aetric 4:	Temporal Representativeness	Medium	$\times 2$	4	Sources are 2003 or more recent		
N	Aetric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type		
Domain 3: Accession	Aetric 6:	ty Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variabilit M	ty and Un Aetric 7:	Acertainty Metadata Completeness	High	$\times 1$	1	Addresses variability and uncertainty in the results. Uncer- tainty is well characterized.		
		Con	tinued on r	next page				

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Source Citation: Type of Data Source Hero ID	Ineos Styrenics. 2017. Analysis of alternatives: HBCDD use in EPS for building applications. Facility; Reports for Data or Information Other than Exposure or Release Data; 3970752							
EVALUATION Domain	Metric Rating MWF* Score Comments							
Overall Quality E	$\operatorname{Petermination}^{\dagger}$	High		1.6				

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Ineos Styrenics. 2017. Analysis of alternatives: HBCDD use in EPS for building applications. Facility; Reports for Data or Information Other than Exposure or Release Data; 3970752							
Data							
Processin EPS foan The EPS expanded sulation described	Processing EPS foam from pellets The EPS pellets are converted to expanded beads using steam. The expanded beads can then be moulded into boards and shapes (e.g. in- sulation boards, specific shapes for packaging). The steps are further described in Section 2.1.3.						
0.70 perc	ent						
Rating	MWF*	Score	Comments				
High	× 1	1	Information is from trusted sources				
Medium	× 1	2	Furone				
High	$\times 2$	2	Use is in scope				
ativeness Medium	$\times 2$	4	Sources are 2003 or more recent				
N/A		N/A	This metric does not relate to this data type				
ness High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.				
ness High	$\times 1$	1	Addresses variability and uncertainty in the results. Uncer- tainty is well characterized.				
High		1.4					
	Data Processin EPS foan The EPS expanded sulation i described 0.70 percessing Rating High Antiveness Medium High Medium N/A ness High high High	Data Processing EPS foam from per The EPS pellets a expanded beads car sulation boards, s described in Section 0.70 percent Rating MWF* High × 1 Medium × 1 Medium × 2 Medium × 1 High × 2 Medium × 1 High × 1	Data Processing EPS foam from pellets The EPS pellets are con expanded beads can then sulation boards, specific described in Section 2.1.3 0.70 percent Rating MWF* Score High × 1 1 Medium × 1 2 High × 1 1 Medium × 1 2 Medium × 2 4 N/A N/A N/A ness High × 1 1 High × 1 1 High × 1 1 Iness High × 1 1 High × 1 1 High × 1 1				

Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster									
Type of Data Source Hero ID	Facility; R 3809277	Facility; Reports for Data or Information Other than Exposure or Release Data; 3809277								
EXTRACTION										
Parameter			Data							
Life Cycle Stage:			Process	ing/Use						
Life Cycle Descrip	otion (Subca	tegory of Use):	EPS bo	ards						
Process Description	on:		Used fo	r interior	insulat	ion				
Total Annual U.S	. Volume (a	nd percent of PV):	45 perce	ent						
Chemical Concent	tration:		0.5							
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
Domain 1: Reliab	Domain 1: Baliability									
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources				
Domain 2: Repres	sentative									
	Metric 2:	Geographic Scope	High	$\times 1$	1	US				
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope				
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012				
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.				
Domain 3: Access	vibility/Clari	t xr								
Domain 5. Access	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.				
Domain 4: Variab	Metric 7:	Metadata Completeness	High	$\times 1$	1	Addresses variability and uncertainty in the results. Uncer- tainty is well characterized.				
		+								
Overall Quality D	eterminatio	n'	High		1.2					

Source Citation:	U.S, E. P. A 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants									
Type of Data Source Hero ID	Facility; R 3809277	Facility; Reports for Data or Information Other than Exposure or Release Data; 3809277								
EXTRACTION										
Parameter			Data							
Life Cycle Stage:			Process	ing/Use						
Life Cycle Descrip	otion (Subca	tegory of Use):	XPS bo	ards						
Process Description	on:	,	XPS foa	m board	is used	mainly for roofing applications and architectural				
Total Annual II S	Volumo (a	nd percent of DV).	molding	, ,						
Chemical Concer	tration:	In percent of 1 \mathbf{v}).	0.5 to 1	5110						
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
Domain 1: Reliab	Metric 1	Methodology	High	× 1	1	Information is from trusted sources				
	Wietrie 1.	Methodology	mgn	~ 1	1					
Domain 2: Repres	sentative									
	Metric 2:	Geographic Scope	High	$\times 1$	1	US				
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope				
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012				
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.				
Domain 3. Access	sibility/Clar	ity								
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.				
Domain 4: Variat	Metric 7.	Nertainty Metadata Completeness	High	× 1	1	Addresses variability and uncertainty in the results. It as				
	Metric 7.	Metadata Completeness	mgn	~ 1	1	tainty is well characterized.				
Overall Quality E	Determinatio	n [†]	High		1.2					

Source Citation:	U.S, E. P. A 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster									
Type of Data Source Hero ID	Facility; R 3809277	Facility; Reports for Data or Information Other than Exposure or Release Data; 3809277								
EXTRACTION Parameter			Data							
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Total Annual U.S. Volume (and percent of PV): Number of Sites:				Import Importation of HBCD (not in articles) 92,270 pounds imported 5 sites manufacture or import						
EVALUATION					q					
Domain		Metric	Rating	MWF'*	Score	Comments				
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources				
Domain 2: Repres	sentative		TT: 1	1	1					
	Metric 2:	Geographic Scope	High	× 1	1	US W				
	Metric 3:	Applicability	High	× 2	2	Use is in scope				
	Metric 4: Motric 5:	Sample Size	Low	$\times 2$ $\times 1$	2	2012				
	metric 5.	Sample Size	LOW	~ 1	5	characterized by no statistics.				
Domain 3: Access	sibility/Clar	ity								
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.				
Domain 4: Variab	ility and Ur	ncertainty								
	Metric 7:	Metadata Completeness	High	$\times 1$	1	Addresses variability and uncertainty in the results. Uncer- tainty is well characterized.				
Overall Quality Determination ^{\dagger}			High		1.2					

Source Citation:	U.S, E. P. A 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants									
Type of Data Source Hero ID	Facility; R 3809277	Facility; Reports for Data or Information Other than Exposure or Release Data; 3809277								
EXTRACTION										
Parameter			Data							
Life Cycle Stage:			Manufact	1110						
Life Cycle Descrit	otion (Subca	ategory of Use):	Manufact	ure						
Total Annual U.S	. Volume (a	nd percent of PV):	4.54E + 06	to 2.29E	E+07 kg	ζ/yr				
Number of Sites:		- /	3							
Operating Days p	er Year and	Batches per Day:	250							
EVALUATION										
Domain		Metric	Rating	MWF^*	Score	Comments				
	•1•									
Domain 1: Reliad	Motrie 1.	Mathadalagy	High	~ 1	1	Information is from touched courses				
	Metric 1.	Methodology	Ingn	× 1	1	Information is from trusted sources				
Domain 2: Repres	entative									
1	Metric 2:	Geographic Scope	High	$\times 1$	1	US				
	Metric 3:	Applicability	Medium	$\times 2$	4	Manufacture is not in scope but information could possibly be applied to import /repackaging				
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012				
	Metric 5:	Sample Size	Medium	$\times 1$	2	characterized by a range with uncertain statistics				
Domain 3: Access	ibility/Clar	ity								
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.				
Domain 4: Variab	Metric 7:	Metadata Completeness	High	$\times 1$	1	Addresses variability and uncertainty in the results. Uncer- tainty is well characterized.				
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.3					

Source Citation:	U.S, E. P. A 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster									
Type of Data Source Hero ID	Facility; R 3809277	Facility; Reports for Data or Information Other than Exposure or Release Data; 3809277								
EXTRACTION										
Parameter			Data							
Life Cycle Stage:			Processin	a.						
Life Cycle Descrit	ntion (Subca	ategory of Use):	EPS resin	ຮ າ						
Total Annual U.S	. Volume (a	nd percent of PV):	2.043E+0	16 to 1.03	1E+07	kg/vr				
Number of Sites:	`	. ,	1 to 4			0,0				
Operating Days p	er Year and	Batches per Day:	250							
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
	•1•4									
Domain 1: Reliad	Motria 1.	Mathadalagy	High	\vee 1	1	Information is from touched courses				
	Metric 1.	Methodology	Ingn	× 1	1	Information is from trusted sources				
Domain 2: Repres	sentative									
1	Metric 2:	Geographic Scope	High	$\times 1$	1	US				
	Metric 3:	Applicability	Medium	$\times 2$	4	EPS compounding not in scope but may provide insight into EPS use rate				
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012				
	Metric 5:	Sample Size	Medium	$\times 1$	2	characterized by a range with uncertain statistics				
Domain 3: Access	ibility/Clar	ity								
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.				
Domain 4: Variat	Metric 7:	Metadata Completeness	High	$\times 1$	1	Addresses variability and uncertainty in the results. Uncer- tainty is well characterized.				
Overall Quality D	eterminatio	n^\dagger	High		1.3					

Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster								
Type of Data Source Hero ID	Facility; R 3809277	Facility; Reports for Data or Information Other than Exposure or Release Data; 3809277							
EXTRACTION									
Parameter			Data						
Life Cycle Stage:			Processin	g					
Life Cycle Descrip	otion (Subca	ategory of Use):	EPS conv	rerting					
Total Annual U.S	. Volume (a	nd percent of PV):	2.043E + 0	6 to 1.03	1E+07	kg/yr			
Number of Sites:			5 to 15						
Operating Days p	er Year and	Batches per Day:	250						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility								
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources			
Domain 2: Repres	sentative								
*	Metric 2:	Geographic Scope	High	$\times 1$	1	US			
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012			
	Metric 5:	Sample Size	Medium	$\times 1$	2	characterized by a range with uncertain statistics			
Domain 3: Access	vibility/Clar	ity							
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4. Variah	ilitar and Ha	o containte							
Domain 4: Variat	Metric 7:	Metadata Completeness	High	$\times 1$	1	Addresses variability and uncertainty in the results. Uncer- tainty is well characterized.			
Overall Quality D	eterminatio	n [†]	High		1.1				

Source Citation:	U.S, E. P. A 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster flame retardants								
Type of Data Source Hero ID	Facility; R 3809277	Facility; Reports for Data or Information Other than Exposure or Release Data; 3809277							
EXTRACTION			Data						
			Data						
Life Cycle Stage:			Processin	g					
Life Cycle Descrip	otion (Subca	ategory of Use):	manufact	ure of XI	PS using	g HBCD powder (not masterbatch)			
Total Annual U.S	. Volume (a	nd percent of PV):	2.316.E + 0	06 to 1.10	68.E+0'	7 kg/yr			
Number of Sites:			6 to 18						
Operating Days p	er Year and	Batches per Day:	250						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility								
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources			
Domain 2: Repres	sentative								
1	Metric 2:	Geographic Scope	High	$\times 1$	1	US			
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012			
	Metric 5:	Sample Size	Medium	$\times 1$	2	characterized by a range with uncertain statistics			
Domain 3. Access	vibility/Clar	ity							
Domain 5. Access	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
D									
Domain 4: Variat	Motrie 7:	Motadata Completeness	High	v 1	1	Addresses multility and unsertaint in the second of T			
	Metric 7:	Metadata Completeness	Ingn	× 1	1	Addresses variability and uncertainty in the results. Uncer- tainty is well characterized.			
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.1				
			_						

Source Citation:	U.S, E. P. A 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster								
Type of Data Source Hero ID	Facility; R 3809277	Facility; Reports for Data or Information Other than Exposure or Release Data; 3809277							
EXTRACTION									
Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use):			Processin compound ing HBCI	Processing compounding of polystyrene resin to produce XPS masterbatch contain- ing HBCD					
Total Annual U.S	. Volume (a	nd percent of PV):	2.316.E+0	06 to 1.10	58.E + 0	7 kg/yr			
Number of Sites:	37 1		10 to 29						
Operating Days p	er Year and	Batches per Day:	250						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility		TT: 1		-				
	Metric 1:	Methodology	High	× 1	1	Information is from trusted sources			
Domain 2: Repres	sentative								
	Metric 2:	Geographic Scope	High	$\times 1$	1	US			
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012			
	Metric 5:	Sample Size	Medium	$\times 1$	2	characterized by a range with uncertain statistics			
Domain 3: Access	sibility/Clar	ity							
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4. Variah	vility and U	ocertainty							
	Metric 7:	Metadata Completeness	High	$\times 1$	1	Addresses variability and uncertainty in the results. Uncer- tainty is well characterized.			
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.1				

Source Citation:	U.S, E. P. A. 2015. TSCA Work Plan chemical problem formulation and initial assessment. Cyclic aliphatic bromide cluster								
Type of Data Source Hero ID	Facility; R 3809277	Facility; Reports for Data or Information Other than Exposure or Release Data; 3809277							
EXTRACTION									
Parameter			Data						
Life Cycle Stage:			Processin	g					
Life Cycle Descrip	otion (Subca	ategory of Use):	XPS conv	verting					
Total Annual U.S	. Volume (a	nd percent of PV):	2.316.E + 0	06 to 1.1	68.E + 07	7 kg/yr			
Number of Sites:			10 to 24						
Operating Days p	er Year and	Batches per Day:	250						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility								
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources			
Domain 2: Repres	sentative								
1	Metric 2:	Geographic Scope	High	$\times 1$	1	US			
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2012			
	Metric 5:	Sample Size	Medium	$\times 1$	2	characterized by a range with uncertain statistics			
Domain 3. Access	vibility/Clar	itv							
Domain 5. Access	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Damain 4. Wariah	:1:41 TT-								
Domain 4: Variab	Metric 7:	Metadata Completeness	High	$\times 1$	1	Addresses variability and uncertainty in the results. Uncer- tainty is well characterized.			
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.1				

Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment report: Hexabromocyclododecane. Facility; Completed Exposure or Risk Assessments; 3970756							
EXTRACTION			_					
Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Total Annual U.S. Volume (and percent of PV): Number of Sites: Chemical Concentration:			Processing Formulation of flame-retarded PS compound for XPS taken from 2008 EU assessment (HERO 3970747) 1700 tons/yr >14 40 percent in compound					
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Repres	sentative							
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as-		
Domain 4: Variab	ility and U Metric 7:	ncertainty Metadata Completeness	Medium	× 1	2	limited discussion		
Overall Quality Determination [†]			High		1.4			

Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment report: Hexabromocyclododecane. Facility; Completed Exposure or Risk Assessments; 3970756							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Total Annual U.S. Volume (and percent of PV): Number of Sites: Chemical Concentration:			Processing Formulation of flame-retarded EPS beads taken from 2008 EU assessment (HERO 3970747) 3400 tons/yr >18 0.7 percent in EPS beads					
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Repres	sentative Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
	Metric 3:	Applicability	Medium	× 2	4	EPS compounding not in scope but may provide insight into EPS wt frac and use rate		
	Metric 4: Metric 5:	Sample Size	High Low	$\times 2 \times 1$	$\frac{2}{3}$	2008 characterized by no statistics.		
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variab	ility and Ur Metric 7:	ncertainty Metadata Completeness	Medium	× 1	2	limited discussion		
Overall Quality D	eterminatio	n [†]	Medium		1.7			

Source Citation: Type of Data Source Hero ID	2008. Summary risk assessment report: Hexabromocyclododecane. Facility; Completed Exposure or Risk Assessments; 3970756							
EXTRACTION								
Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Total Annual U.S. Volume (and percent of PV): Number of Sites: Chemical Concentration:			Processing Industrial use of EPS beads to produce flameretardedEPS taken from 2008 EU assessment (HERO 3970747) 3400 tons/yr hundreds 0.7 percent in foam					
EVALUATION								
Domain		Metric	Rating	MWF^*	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Repres	sentative							
Domain 2. Repres	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variab	oility and U Metric 7:	ncertainty Metadata Completeness	Medium	× 1	2	limited discussion		
Overall Quality Determination [†]		High		1.4				
Source Citation: 200 Type of Data Source Fac Hero ID 397	2008. Summary risk assessment report: Hexabromocyclododecane. Facility; Completed Exposure or Risk Assessments; 3970756							
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EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Total Annual U.S. Volume (and percent of PV): Number of Sites: Chemical Concentration:			Processing Industrial use of HBCDD in PS compound to produce flame-retarded XPS taken from 2008 EU assessment (HERO 3970747) 1700 tons/yr 17 1 to 3 percent in foam					
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliability Me	tric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Representa	tive							
Met	tric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
Met	tric 3:	Applicability	High	$\times 2$	2	Use is in scope		
Met	tric 4:	Temporal Representativeness	High	$\times 2$	2	2008		
Met	tric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Accessibilit Met	y/Clar tric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability Me	and Uı tric 7:	ncertainty Metadata Completeness	Medium	× 1	2	limited discussion		
Overall Quality Detern	ninatio	\mathbf{n}^{\dagger}	High		1.4			

Source Citation: Type of Data Source	2008. Summary risk assessment report: Hexabromocyclododecane. Facility; Completed Exposure or Risk Assessments;						
Hero ID	3970756						
EXTRACTION							
Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Total Annual U.S. Volume (and percent of PV): Number of Sites: Chemical Concentration:			Processing Industrial use of HBCDD as powder to produce flame-retarded XPS taken from 2008 EU assessment (HERO 3970747) 3200 tons/yr 18 0.5 to 3 percent in foam				
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
		0.					
Domain 2: Repres	sentative		M II	1	0		
	Metric 2:	Geographic Scope	Medium	× 1	2	Europe	
	Metric 3:	Applicability	High	× 2	2	Use is in scope	
	Metric 4:	Temporal Representativeness	High	× 2	2	2008	
	Metric 5:	Sample Size	Low	× 1	3	characterized by no statistics.	
Domain 3: Access	sibility/Clar	ity Metadata Completeness	Himb	× 1	1		
	Metric 6:	Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variab	oility and U Metric 7:	ncertainty Metadata Completeness	Medium	× 1	2	limited discussion	
Overall Quality D	Determinatio	n^\dagger	High		1.4		

* MWF = Metric Weighting Factor

Source Citation:	Echa, 2011. Proposal for identification of a substance as a CMR Cat 1 or 2, PBT, vPvB, or a substance of an equivalent level of concern: Proposal for identification of hexabromocyclododecane as a SVHC.							
Type of Data Source Hero ID	Facility; C 3970757	Facility; Completed Exposure or Risk Assessments; 3970757						
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Total Annual U.S. Volume (and percent of PV):			Use EPS foam for construction taken from 2008 EU assessment (HERO 3970747) 420,000 tonnes of EPS is used /yr; 170 000 of this is used in Eastern Europe (99 percent is flame retarded); 250 000 tonnes of EPS in Western (70 percent flame retarded)					
EVALUATION		Metric	Bating	MWF*	Score	Comments		
		Wiethe	Itating	IVI VV I	bcore	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Repres	sentative							
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as-		
						sessment methods, results, and assumptions.		
Domain 4: Variah	oility and U	ncertainty						
	Metric 7:	Metadata Completeness	Medium	$\times 1$	2	limited discussion		
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.4			

Source Citation: Type of Data Source Hero ID	Echa, 2011. Proposal for identification of a substance as a CMR Cat 1 or 2, PBT, vPvB, or a substance of an equivalent level of concern: Proposal for identification of hexabromocyclododecane as a SVHC. Facility; Completed Exposure or Risk Assessments; 3970757						
	0010101						
Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Total Annual U.S. Volume (and percent of PV): Number of Sites: Chemical Concentration:			Processing Formulation of flame-retarded PS compound for XPS taken from 2008 EU assessment (HERO 3970747) 1700 tons/yr >14 40 percent in compound				
EVALUATION Domain		Metric	Bating	MWF*	Score	Comments	
		Wieblie	Hatting	IVI VV I	DUDIE	Connients	
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
Domain 2: Ropro	contativo						
Domain 2. Repres	Metric 2.	Geographic Scope	Medium	× 1	2	Europe	
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope	
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008	
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.	
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as-	
		-				sessment methods, results, and assumptions.	
Domain 4. Variat	vility and U	acertainty					
Domain 4. Vallat	Metric 7:	Metadata Completeness	Medium	$\times 1$	2	limited discussion	
Overall Quality D	Peterminatio	n†	High		1.4		

Source Citation: Type of Data Source Hero ID	Echa,. 201 level of con Facility; C 3970757	Echa, 2011. Proposal for identification of a substance as a CMR Cat 1 or 2, PBT, vPvB, or a substance of an equivalent level of concern: Proposal for identification of hexabromocyclododecane as a SVHC. Facility; Completed Exposure or Risk Assessments; 3970757						
EXTRACTION								
Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Total Annual U.S. Volume (and percent of PV): Number of Sites: Chemical Concentration:			Processing Formulation of flame-retarded EPS beads taken from 2008 EU assessment (HERO 3970747) 3400 tons/yr >18 0.7 percent in EPS beads					
EVALUATION					~			
Domain		Metric	Rating	MWF'*	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Repres	entative	~			_			
	Metric 2:	Geographic Scope	Medium	× 1	2	Europe		
	Metric 3:	Applicability	Medium	$\times 2$	4	EPS compounding not in scope but may provide insight into EPS wt frac and use rate		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Access	ibility/Clar	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources as		
	Methe 0.	Metadata Completeness	mgn	~ 1	T	sessment of report clearly documents its data sources, as-		
Domain 4: Variab	ility and Ur Metric 7:	ncertainty Metadata Completeness	Medium	× 1	2	limited discussion		
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Medium		1.7			

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source	Echa, 2011. Proposal for identification of a substance as a CMR Cat 1 or 2, PBT, vPvB, or a substance of an equivalent level of concern: Proposal for identification of hexabromocyclododecane as a SVHC. Facility: Completed Exposure or Bisk Assessments:						
Hero ID	3970757						
EXTRACTION							
Parameter			Data				
Life Cycle Stage:			Processin	g			
Life Cycle Descrip	tion (Subca	ategory of Use):	Industrial	use of E	PS bea	ds to produce flameretardedEPS	
Process Descriptio	on:		taken from	n 2008 E	U asses	sment (HERO 3970747)	
Total Annual U.S.	Volume (a	nd percent of PV):	3400 tons	/yr			
Number of Sites:	ration.		nundreds	at in foor	0		
Chemical Concent	141011.		0.7 percer	n in ioan	11		
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Damain 1. Daliahi	1:4						
Domain 1: Reliabl	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
			0				
Domain 2: Repres	entative						
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe	
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope	
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008	
	Metric 5:	Sample Size	Low	× 1	3	characterized by no statistics.	
Domain 3: Access	ibility/Clar	itv					
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Damain 4. Variahi	·						
Domain 4: Variab	Metric 7.	Metadata Completeness	Medium	× 1	9	limited discussion	
	metric 7.	metadata Completeness	meurum	~ 1	4		
Overall Quality D	eterminatio	n^{\dagger}	High		1.4		
			8				

Source Citation:	Echa, 2011. Proposal for identification of a substance as a CMR Cat 1 or 2, PBT, vPvB, or a substance of an equivalent level of concern: Proposal for identification of hexabromocyclododecane as a SVHC.								
Type of Data Source Hero ID	Facility; C 3970757	Facility; Completed Exposure or Risk Assessments; 3970757							
EXTRACTION									
Parameter			Data						
Life Cycle Stage: Life Cycle Descrip	otion (Subca	ategory of Use):	Processin Industrial XPS	g use of I	HBCDI) in PS compound to produce flame-retarded			
Process Descriptio	on:		taken from	n 2008 E	U asses	ssment (HERO 3970747)			
Total Annual U.S Number of Sites:	. Volume (a	nd percent of PV):	1700 tons	/yr					
Chemical Concent	tration:		1 to 3 per	cent in f	oam				
EVALUATION									
Domain		Metric	Bating	MWF*	Score	Comments			
			11001118		50010				
Domain 1: Reliab	ility								
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources			
Domain 2: Repres	sentative								
Domain 2. Ropror	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe			
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008			
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.			
Densin 2. Access	:1:1:4/ <i>C</i> 1	4							
Domain 3: Access	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4. V	iliter and T-								
Domain 4: Variat	Metric 7.	Metadata Completeness	Medium	$\times 1$	2	limited discussion			
	WIE011C 7.	Metalata Completeness	meunin	^ 1	4	mineed discussion			
Overall Quality D	eterminatio	n^\dagger	High		1.4				

Source Citation:	Echa, 2011. Proposal for identification of a substance as a CMR Cat 1 or 2, PBT, vPvB, or a substance of an equivalent level of concern: Proposal for identification of hexabromocyclododecane as a SVHC.							
Hero ID	3970757	3970757						
EXTRACTION								
Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Total Annual U.S. Volume (and percent of PV):			Processing Industrial use of HBCDD as powder to produce flame-retarded XPS taken from 2008 EU assessment (HERO 3970747)					
Number of Sites:	× ×	. ,	18	, .				
Chemical Concent	tration:		0.5 to 3 p	ercent in	foam			
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility							
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Repres	sentative							
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Access	ibility/Clar	ity						
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variah	ility and U	ocertainty						
	Metric 7:	Metadata Completeness	Medium	$\times 1$	2	limited discussion		
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.4			

Source Citation:Nicnas, 2001. Polybrominated flame retaType of Data SourceFacility; Reports for Data or InformationHero ID1443962	rdants (PBI Other than	FRs): Pri Exposure	iority ez e or Rel	xisting chemical assessment report no. 20. lease Data;		
EXTRACTION Parameter	Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description:		Processing XPS masterbatch Formulation of resins containing the flame-retardant chemicals consists of weighing or pumping, mixing and blending, processing/extrusion and cutting and packaging of the granular pellets or liquid resins. The PBFRs are compounded with the appropriate polymer (polypropylene or polystyrene) to produce a masterbatch containing up to 30 percent of the flame-retardant. It is possible that more than one flame-retardant chemical may be used in the formulation process.				
EVALUATION Natria	Dating	MMTEX	Coone	Comments		
	Rating	IVI VV F	Score	Comments		
Domain 1: Reliability Metric 1: Methodology	High	$\times 1$	1	From trusted source		
Domain 2: Representative Metric 2: Geographic Scope Metric 3: Applicability Metric 4: Temporal Representativeness	Medium High Medium	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \end{array}$	2 2 4	Australia Information related to in-scope scenario 2001		
Metric 5: Sample Size	N/A		N/A	This metric does not relate to this data type		
Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.		
Overall Quality Determination [†]	High		1.4			
Con	ntinued on r	next page)			

			P	F 8 -	
Source Citation: Type of Data Source Hero ID	Nicnas, 2001. Polybrominated flame reta Facility; Reports for Data or Information 1443962	rdants (PB) Other than	FRs): Prie Exposure	ority existing or Release	g chemical assessment report no. 20. Data;
EVALUATION					
Domain	Metric	Rating	$\rm MWF^{\star}$	Score	Comments

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Source Citation: Type of Data Source Hero ID	Nicnas, 2001. Polybrominated flar Facility; Reports for Data or Inform 1443962	ne retardants (PBFRs): Priority existing chemical assessment report no. 20. nation Other than Exposure or Release Data;
EXTRACTION Parameter		Data
Life Cycle Stage: Life Cycle Descri Process Descripti	ption (Subcategory of Use): on:	Processing Manufacture of XPS Using HBCD Powder In the blending plant, weighed amounts of the powdered or granulated polymeric material are transferred to rotary mixers/blenders. Weighing is a manual process, whereby workers transfer the flame retardant by tipping the drums or bags in specially designed dispensary. Weighed quantities of flame retardant, pigment and other additives are added either via a closed transfer system or through a chute with a vacuum collar or under local exhaust ventilation to remove dust. The blended material is discharged to a collection bin, usually either in an enclosed system or under local exhaust ventilation and transferred to an extruder, whereby the mixture is extruded under high temperatures to form strips, which are cooled then cut into small pellets or granules with the desired concentration of flame retardant. These are bagged and dispatched to customers.

VALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	$\times 1$	1	From trusted source
Domain 2: Representative					
Metric 2:	Geographic Scope	Medium	$\times 1$	2	Australia
Metric 3:	Applicability	High	$\times 2$	2	Information related to in-scope scenario
Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2001
Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type
Domain 3: Accessibility/Clar	ity				
Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as sessment methods, results, and assumptions.
	Con	tinued on r	next page)	

					r8-		
Source Citation: Type of Data Source Hero ID	Nicnas, 2001. Polybrominated flame retardants (PBFRs): Priority existing chemical assessment report no. 20. Facility; Reports for Data or Information Other than Exposure or Release Data; 1443962						
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 4: Variab	oility and Un Metric 7:	ncertainty Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
Overall Quality D	Determination	n^\dagger	High		1.4		

- continued from previous page

Source Citation:EType of Data SourceFHero ID3	Ccha,. 200 `acility; R 970759	9. Prioritisation and Annex XIV eports for Data or Information (/ backgrour Other than	nd inform Exposure	nation: 1 e or Rel	hexbromocyclododecane. lease Data;
EXTRACTION Parameter			Data			
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Total Annual U.S. Volume (and percent of PV):			Import Import Net Imports. Not including imports in articles. In all products HBCDD is uniformly incorporated as an integral encapsulated component within the polymer matrix; however it is not bound to the matrix or trans- formed. 6,000 tonnes/yr (EU - 2007)			
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliabilit N	ty Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted source (ECHA)
Domain 2: Represen	tativo					
N	Aetric 2:	Geographic Scope	Medium	$\times 1$	2	Europe
Ν	Aetric 3:	Applicability	High	$\times 2$	2	Use is in scope
Ν	letric 4:	Temporal Representativeness	Medium	$\times 2$	4	2007
Ν	letric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.
Domain 3: Accossibi	ility/Clari					
Domain 5. Accession	Aetric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.
Domain 4: Variabilit	ty and Ur	ncertainty				
N	Jetric 7:	Metadata Completeness	Medium	$\times 1$	2	limited discussion
Overall Quality Determination [†]		Medium		1.7		

Source Citation: Type of Data Source Hero ID	Echa, 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane. Facility; Reports for Data or Information Other than Exposure or Release Data; 3970759							
EXTRACTION								
Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Total Annual U.S. Volume (and percent of PV): Number of Sites:			Processin EPS form 5,301 ton 21	Processing EPS formulation 5,301 tonnes per year (EU - 2006) 21				
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	oility Metric 1:	Methodology	High	× 1	1	Information is from trusted source (ECHA)		
Domain 2: Panna	contativo		0					
Domain 2: Repres	Metric 2.	Geographic Scope	Medium	× 1	2	Europe		
	Metric 3:	Applicability	Medium	$\times 2$	4	EPS compounding not in scope but may provide insight into EPS wt frac and use rate		
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2006		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as-		
						sessment methods, results, and assumptions.		
Domain 4: Varial	oility and U	ncertainty						
	Metric 7:	Metadata Completeness	Medium	$\times 1$	2	limited discussion		
Overall Quality D	Determinatio	n†	Medium		1.9			

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Echa, 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane. Facility; Reports for Data or Information Other than Exposure or Release Data; 3970759							
EXTRACTION			Data					
Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Total Annual U.S. Volume (and percent of PV): Number of Sites:		Processin XPS form 5,859 ton 28	Processing XPS formulation 5,859 tonnes /yr (EU - 2006) 28					
EVALUATION								
Domain		Metric	Rating	MWF^*	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted source (ECHA)		
Domain 2: Repres	sentative			1	0			
	Metric 2:	Geographic Scope	Medium	× I	2	Europe		
	Metric 3: Motrie 4:	Applicability	High Medium	$\times 2$	2	Use is in scope		
	Metric 4:	Sample Size	Low	$\times 2$ $\times 1$	4	2006		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
						r		
Domain 4: Variat	ility and Un Metric 7:	ncertainty Metadata Completeness	Medium	$\times 1$	2	limited discussion		
Overall Quality D	Peterminatio	\mathbf{n}^{\dagger}	Medium		1.7			

Source Citation: Type of Data Source Hero ID	Echa,. 200 Facility; R 3970759	Echa, 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane. Facility; Reports for Data or Information Other than Exposure or Release Data; 3970759								
EXTRACTION										
Parameter			Data	Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Number of Sites:		Processin XPS conv 35	Processing XPS converting 35							
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted source (ECHA)				
Domain 2: Repres	sentative									
*	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe				
	Metric 3:	Applicability	High	$\times 2$	2	Use is in scope				
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008				
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.				
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.				
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Medium	$\times 1$	2	limited discussion				
Overall Quality D	Peterminatio	\mathbf{n}^{\dagger}	High		1.4					

Source Citation:Echa., 200Type of Data SourceFacility; FHero ID3970759	09. Prioritisation and Annex XIV Reports for Data or Information (V backgrour Other than	nd inform Exposur	nation: 1 e or Rel	hexbromocyclododecane. lease Data;		
EXTRACTION Parameter		Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description:		Processing /Use HIPS (plastics for electronic devices) The use of HBCDD into HIPS is mainly for video and stereo equipment, distribution boxes for electrical lines in the construction sector and re- frigerator lining. An undetermined but increasingproportion of waste generated from HIPS and textile articles is recycled					
Total Annual U.S. Volume (and percent of PV):		210 tonne	es/yr (in	Europe) is unused for HIPS but an unknown portion		
Number of Sites:		An unkno	own num	ber of r	ecyclers of HIPS parts from electronic equip-		
Chemical Concentration:			ment. 1-7wt percent in HIPS				
EVALUATION							
Domain	Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliability Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted source (ECHA)		
Domain 2. Donnegentative							
Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
Metric 3:	Applicability	Medium	$\times 2$	4	The processing /use of HIPS is not in scope; however, infor- mation on concentrion of HBCD in HIPS may be useful for in-scope use (worker exposure during recycling of electronics)		
Metric 4:	Temporal Representativeness	High	$\times 2$	2	2008		
Metric 5:	Sample Size	Medium	$\times 1$	2	Range of HBCD concentration in HIPS is provided; uncertain other statistics		
Domain 3: Accessibility/Clar	ity						
Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability and U	ncertainty						
	Con	tinued on r	next page	е			

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Source Citation: Type of Data Source Hero ID	Echa,. 200 Facility; Re 3970759	Echa, 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane. Facility; Reports for Data or Information Other than Exposure or Release Data; 1970759							
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score		Comments		
	Metric 7:	Metadata Completeness	Medium	$\times 1$	2	limited discussion			
Overall Quality Determination [†]					1.6				

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Source Citation:IType of Data SourceIHero ID3	 Pinfa, 2016. Recycling of plastics containing hazardous substances. Facility; Reports for Data or Information Other than Exposure or Release Data; 3982158 								
EXTRACTION Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description:				Recycling Recycling EPS (Recycling EPS by reomving HBCD; in EU, where HBCD is being regu- lated more stringently). A process exists to redissolve EPS and remove the HBCD. The report refers to the Solvolyse process, noting issues with achieving the low levels of HBCD in the recycled polystyrene required by chemical regulation. Editor"s note: this process, now CreaSolve", has been improved to achieve well below 100 ppm HBCD (the EU POP regulation limit).					
EVALUATION									
Domain		Metric	Rating	MWF^*	Score	Comments			
Domain 1: Reliabili	ity Metric 1:	Methodology	High	× 1	1	From trusted source			
Domain 2: Represe	ntative	Coordination Coordination	M - 1:	v 1	0				
I	Metric 2: Metric 3:	Applicability	Medium	$\times 1 \times 2$	$\frac{2}{4}$	Europe Recycling is in scope; however, this process operation is for recycling EPS with the intention of removing HBCD and not utilizing it as a FR.			
I	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2016			
I	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type			
Domain 3: Accessib	oility/Clari	ty							
I	Metric 6:	Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Variabili	ity and Un	certainty							
]	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty			
Continued on next page									

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Source Citation: Type of Data Source Hero ID	'infa, 2016. Recycling of plastics containing hazardous substances. 'acility; Reports for Data or Information Other than Exposure or Release Data; 982158							
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score	Comments			
Overall Quality D	$\operatorname{Petermination}^{\dagger}$	High		1.6				

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* MWF = Metric Weighting Factor

Source Citation:	European Flame Retardants, Association. 2015. Keeping fire in check an introduction to flame retardants used in transport applications.									
Type of Data Source Hero ID	Facility; R 3986543	Facility; Reports for Data or Information Other than Exposure or Release Data; 3986543								
EXTRACTION Parameter	Data									
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description:			Processing /Use Compounding related to the manufacture of auto parts On average, personal vehicles contain over 105 kg of plastics. Amount of plastics in cars was 16 percent in 2010. The ratio is expected to amount to 18 percent by the end of the decade. The average weight of a vehicle is predicted to decrease to 1,100 kg in 2020 as compared to the 1,400 kg level in 2010.							
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments				
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	From trusted source				
Domain 2: Repres	sentative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High N/A	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \end{array}$	2 2 2 N/A	Europe Information related to in-scope scenario Unknown, but cites sources as recent as 2013 This metric does not relate to this data type				
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.				
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty				
Overall Quality Determination [†]		High		1.4						

Source Citation:	European flame retai	European Brominated Flame Retardant Industry, Panel. 2008. EBFRIP statement RE UBA's publication on brominated flame retardant.								
Type of Data Source Hero ID	Facility; R 3986544	Facility; Reports for Data or Information Other than Exposure or Release Data; 3986544								
EXTRACTION										
Parameter			Data							
Life Could Sterry			I.I.							
Life Cycle Stage:	otion (Suber	togory of Use).	Domand in FU	r						
Total Annual US	Volumo (a	nd percent of PV).	0.600 toppos a	voar in I	TI					
10tal Alliuar 0.5	. volume (a	nu percent of i v).	5,000 tonnes a	year mi	20					
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
Domain 1: Reliab	ility		TT (11	1	4					
	Metric 1:	Methodology	Unacceptable	× 1	4	The assessment or report uses data or techniques that are not high quality or not sound science. This is a very biased com- mentary.				
Domain 2: Ropros	contativo									
Domain 2. Repres	Metric 2	Geographic Scope	Low	× 1	3	Furopo				
	Metric 3:	Applicability	Unaccentable	$\times 2$	8	Includes out of scope uses and is not applicable to the US				
	Metric 4:	Temporal Representativeness	High	$\times 2$	$\frac{0}{2}$	2008				
	Metric 5:	Sample Size	N/A	~ =	N/A	This metric does not relate to this data type				
Domain 3: Access	sibility/Clar	ity								
	Metric 6:	Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.				
Domain 4. Variah	ility and U-	agentainte								
Domain 4. variat	Motric 7:	Motadata Completeness	Low	~ 1	3	No discussion of variability or uncertainty				
	MEULIC 7.	metadata Completeness	LOW	^ I	5	The discussion of variability of uncertainty				
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.6.				

** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, two of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

 \star MWF = Metric Weighting Factor

Source Citation:	Environme stracts Ser	2011. Screening assessment report on hexabromocyclododecane. Chemical Ab- Ottawa, Canada.						
Type of Data Source Hero ID	Facility; Completed Exposure or Risk Assessments; 1937209							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Total Annual U.S. Volume (and percent of PV): Chemical Concentration:			Use EPS and XPS foam Canadian values 0.5-1 percent					
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments		
			8					
Domain 1: Reliab	ility							
	Metric 1:	Methodology	High	$\times 1$	1	Data from trusted source (Environment Canada & Health Canada)		
Domain 2: Bonroe	ontotivo							
Domain 2. Repres	Metric 2.	Geographic Scope	Medium	× 1	2	Canada		
	Metric 3:	Applicability	High	$\times 2$	2	The assessment is for an occupational scenario within the scope of the risk evaluation		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2011		
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type		
Domain 3: Access	sibility/Clar	ity	TT: 1					
	Metric 6:	Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4. Variah	vility and U	acertainty						
	Metric 7:	Metadata Completeness	High	$\times 1$	1	well characterized		
Overall Quality D	eterminatio	n^\dagger	High		1.1			

Source Citation:	Remberger	Remberger, M., Sternbeck, J., Palm, A., Kaj, L., StrĶmberg, K., BrorstrĶm-Lundén, E. 2004. The environmental occur-							
Type of Data Source Hero ID	Facility; R 1927826	Facility; Reports for Data or Information Other than Exposure or Release Data; 1927826							
EXTRACTION	Data								
Farameter			Data						
Life Cycle Stage:			Import						
Life Cycle Descrip	otion (Subca	ategory of Use):	HBCD (n	eat) imp	ort amo	ount			
Process Description	on:		Net impo	rts. Con	tains tl	he total tons per year of HBCD imported to			
-			Sweden fr	om 1993	to 2000)			
Total Annual U.S	. Volume (a	nd percent of PV):	5 -120 tor	ns HBCD	per ye	ar (Sweden)			
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
	•1•,								
Domain 1: Reliab	Metric 1:	Methodology	High	$\times 1$	1	Data from trusted source (Products Register, Swedish National Chemicals Inspectorate)			
Domain 2: Repres	sentative			-	0				
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Sweden			
	Metric 3:	Applicability	High	× 2	2	Information related to in-scope scenario			
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2004			
	Metric 5:	Sample Size	Low	× 1	3	characterized by no statistics.			
Domain 3: Access	ibility/Clar	ity							
Domain 9. Recess	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
	•1•, 1 • •								
Domain 4: Variab	Inty and Un	Matadata Caradat	τ	., 1	0				
	Metric 7:	Metadata Completeness	LOW	× 1	3	No discussion of variability or uncertainty			
Overall Quality Determination ^{\dagger}		Medium		1.8					

Source Citation:	Remberger, M., Sternbeck, J., Palm, A., Kaj, L., StrĶmberg, K., BrorstrĶm-Lundén, E 2004. The environmental occurrence of hexabromocyclododecane in Sweden. Chemosphere.									
Type of Data Source Hero ID	Facility; C 1927826	ompleted Exposure or Risk Asse	essments;	sments;						
EXTRACTION										
Parameter			Data							
Life Cycle Stage:			Use							
Life Cycle Descrip	otion (Subca	ategory of Use):	EPS or X	PS Foan	ı					
Process Description	on:		Amount u	used per	year in l	EU according to an EU Risk Assessment (The				
Total Annual U.S	. Volume (a	nd percent of PV):	Chemical 10,000 to:	Inspecto ns HBCE	orate (K) per ye	EMI), 2002) ar (85 percent of total used in EU)				
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
Damain 1. Daliah	:1:4									
Domain 1: Kellad	Metric 1:	Methodology	High	$\times 1$	1	Data from trusted source (Products Register, Swedish National Chemicals Inspectorate)				
Domain 2: Bepres	sentative									
Domain 2. Ropro.	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Sweden				
	Metric 3:	Applicability	High	$\times 2$	2	Information related to in-scope scenario				
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2004				
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.				
Domain 3: Access	ibility/Clar	ity	TT· 1	1	1					
	Metric 6:	Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.				
Domain 4. Variah	ility and U	acertainty								
Domain 4. Variat	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty				
			<u> </u>		· ·					
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Medium		1.8					

Source Citation: Type of Data Source	Remberger rence of he Facility; C	Remberger, M.,Sternbeck, J.,Palm, A.,Kaj, L.,Strömberg, K.,Brorström-Lundén, E. 2004. The environmental occur- rence of hexabromocyclododecane in Sweden. Chemosphere. Facility; Completed Exposure or Risk Assessments;							
Hero ID	1927826								
EXTRACTION			_						
Parameter			Data						
Life Cycle Stage: Life Cycle Descrip Process Descriptio Total Annual U.S	Use Polymer matrices for cotton or cotton containing textile matrices Amount used per year in EU according to an EU Risk Assessment (The Chemical Inspectorate (KEMI), 2002) 1 000 tons HBCD per year (10 percent of total used in EU)								
	× ×	1 /	,	1 0	~	. /			
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Data from trusted source (Products Register, Swedish National Chemicals Inspectorate)			
Domain 2: Repres	sentative	~			_				
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Sweden			
	Metric 3:	Applicability	Unacceptable	× 2	8	Use is out of scope			
	Metric 4: Motric 5:	Sample Size	Low	$\times 2$ $\times 1$	4	2004 characterized by no statistics			
	metric 5.	Sample Size	LOW	~ 1	5	characterized by no statistics.			
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty			
Overall Quality Determination [†]		Unacceptable		4	Metric Mean Score: 2.4.				
		(Continued on nex	t page					

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Source Citation:	Remberger, M., Sternbeck, J., Palm, A., K rence of hexabromocyclododecane in Swe	aj, L.,Strömberg eden. Chemospher	g, K.,BrorstrÃ re.	$\tilde{A}\P$ m-Lund \tilde{A} ©n, E. . 2004. The environmental occur-				
Type of Data Source	Facility; Completed Exposure or Risk Assessments;							
Hero ID	1927826							
EVALUATION								
Domain	Metric	Rating	MWF^* Sco	Fore Comments				

** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation:	Remberger, M., Sternbeck, J., Palm, A., Kaj, L., StrĶmberg, K., BrorstrĶm-Lundén, E. 2004. The environmental occurrence of hexabromocyclododecane in Sweden. Chemosphere.									
Type of Data Source Hero ID	Facility; C 1927826	ompleted Exposure or Risk Asse	Assessments;							
EXTRACTION										
Parameter			Data							
Life Cycle Stage:			Use							
Life Cycle Descrip	otion (Subca	ategory of Use):	HIPS (pla	astics for	electron	nic devices)				
Process Description	on:		Amount u	used per g	year in 1	EU according to an EU Risk Assessment (The				
			Chemical	Inspecto	orate (K	EMI), 2002)				
Total Annual U.S	. Volume (a	nd percent of PV):	600 tons]	HBCD p	er year	(5 percent of total used in EU)				
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
ויות ו י ת	•1•4									
Domain 1: Reliab	Metric 1:	Methodology	High	$\times 1$	1	Data from trusted source (Products Register, Swedish National Chemicals Inspectorate)				
Domain 2: Repres	sentative									
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Sweden				
	Metric 3:	Applicability	High	$\times 2$	2	Use of HIPS is in scope				
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2004				
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.				
		•,								
Domain 3: Access	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.				
Domain 4: Variab	ility and Ur	ncertainty	Ŧ	-						
	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty				
Overall Quality Determination ^{\dagger}		Medium		1.8						

Source Citation: Type of Data Source Hero ID	Rauert, C. emission ra Facility; R 2343745	Rauert, C.,Lazarov, B.,Harrad, S.,Covaci, A.,Stranger, M 2014. A review of chamber experiments for determining specific emission rates and investigating migration pathways of flame retardants. Atmospheric Environment. Facility; Reports for Data or Information Other than Exposure or Release Data; 2343745							
EXTRACTION Parameter		Data							
Life Cycle Stage: Life Cycle Descrip Process Description Total Annual U.S	Manufacture HBCD Amount manufactured annually in Canada, Netherlands, and UK for years 1996 to 2003 Canada - 16,700 to 22,000 metric tons/yrNetherlands - 500 to 7,000 metric tons/yrUK - 1,000 to 5,000 metric tons/yr								
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments			
Domain 1: Reliab	oility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources			
Domain 2: Repres	sentative	a 11 a			2				
	Metric 2: Metric 3:	Geographic Scope Applicability	Medium Unacceptable	$\times 1 \times 2$	2 8	UK Manufacture is not in scope and this information is not appli- cable to in-scope scenarios			
	Metric 4: Metric 5:	Temporal Representativeness Sample Size	High Low	$\times 2 \times 1$	$\frac{2}{3}$	2013 characterized by no statistics.			
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty			
Overall Quality Determination ^{\dagger}		Unacceptable		4	Metric Mean Score: 2.2.				
	Continued on next page								

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Source Citation:	Rauert, C.,Lazarov, B.,Harrad, S.,Covaci, A.,Stranger, M. 2014. A review of chamber experiments for determining specific emission rates and investigating migration pathways of flame retardants. Atmospheric Environment.								
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;								
Hero ID	2343745	/343745							
EVALUATION									
Domain	Metric	Rating	\mathbf{MWF}^{\star}	Score	Comments				

** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation: La alt Te	La Guardia, M. J., Hale, R. C., Harvey, E., Mainor, T. M., Ciparis, S. 2012. In situ accumulation of HBCD, PBDEs, and several alternative flame-retardants in the bivalve (Corbicula fluminea) and gastropod (Elimia proxima). Environmental Science and Technology.						
Type of Data SourceFaHero ID19	Facility; Reports for Data or Information Other than Exposure or Release Data; 1927601						
EXTRACTION							
Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description:		Manufacture Manufacture/import Note that this journal article measured HBCD concentrations in sedi- ment and organisms at and downstream of a WWTP. Thus, no other data was extracted					
Total Annual U.S. Volume (and percent of PV):4535 and 22 679 to				onnes ir	n US (2006)		
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliability Mo	y etric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
Domain 2: Represent	ative	Geographic Scope	Medium	$\times 1$	2	PII	
Me	etric 3:	Applicability	Medium	$\times 1 \times 2$	4	Manufacture is not in scope but information could possibly be applied to import	
Me	etric 4:	Temporal Representativeness	High	$\times 2$	2	2012	
Me	etric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.	
Domain 3: Accessibili	ity/Clari	tv					
Me	etric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Demain 4. Veniabilita							
Domain 4: variability	y and Un etric 7.	Metadata Completeness	Medium	× 1	2	limited discussion	
			mourum	~ 1	-		
Overall Quality Determination ^{\dagger}		Medium		1.7			
		Con	tinued on r	next page	•		

	– contin	nued from	previous	page					
Source Citation:	La Guardia, M. J., Hale, R. C., Harvey, E., Mainor, T. M., Ciparis, S. 2012. In situ accumulation of HBCD, PBDEs, and several alternative flame-retardants in the bivalve (Corbicula fluminea) and gastropod (Elimia proxima). Environmental Science and Technology.								
Type of Data Source Hero ID	Facility; Reports for Data or Information 1927601	Facility; Reports for Data or Information Other than Exposure or Release Data; 1927601							
EVALUATION									
Domain	Metric	Rating	MWF^{\star}	Score	Comments				

* MWF = Metric Weighting Factor

Source Citation:	JanÃjk, K. Fetuarv: d	,Covaci, A.,Voorspoels, S.,Beche	er, G 2005 specific acc	. Hexabr	omocyc	clododecane in marine species from the Western Scheldt				
Type of Data Source Hero ID	Facility; R 1927813	eports for Data or Information (on Other than Exposure or Release Data;							
EXTRACTION Parameter		Data								
Life Cycle Stage:			Use							
Life Cycle Descript	ion (Subca	tegory of Use):	all polysty	yrene and	ł textile	e applications				
Process Description	1:		Note that	this jour	rnal art	icle measured HBCD concentrations in fish at				
			a dutch e	stuary. T	hus, no	o other data was extracted.				
Total Annual U.S.	Volume (ai	nd percent of PV):	16 700 to	ns World	deman	d (2001)				
Chemical Concentra	ation:		0.8 - 4 pe	rcent						
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
Domain 1. Beliabili	ity									
]	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources				
Domain 2: Represe	ntative									
]	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Netherlands				
]	Metric 3:	Applicability	Medium	$\times 2$	4	Contains both in-scope and out of scope uses				
]	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2001-2005				
]	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.				
Domain 2. According	ility /Clari	+								
Domain 5: Accessit	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.				
Domain 4. Variabil	ity and Un	certainty								
	Metric 7.	Metadata Completeness	High	× 1	1	well characterized				
		including completeness		× 1	1	wen entracterized				
Overall Quality Determination ^{\dagger}			Medium		1.8					

Source Citation: Type of Data Source Hero ID	Rani, M.,S consumer Facility; R 2343697	Rani, M.,Shim, W. J.,Han, G. M.,Jang, M.,Song, Y. K.,Hong, S. H 2014. Hexabromocyclododecane in polystyrene based consumer products: An evidence of unregulated use. Chemosphere. Facility; Reports for Data or Information Other than Exposure or Release Data; 2343697						
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Total Annual U.S. Volume (and percent of PV): Possible Physical Form: Chemical Concentration:				Use EPS and XPS foam 23000 tons worldwide foam EPS construction materials = 785181 " 27530 ng/g (i.e., 0.08 percent HBCD w/w); XPS construction = 190.7 " 100 ng g 1 (i.e., 2E-04 percent HBCD w/w)				
EVALUATION Domain	Metric Rating MWF [*] Score Comments							
Domain 1: Reliab	oility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Repre	sentative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium High High High	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \\ \times \ 1 \end{array}$	2 2 2 1	Korea in scope 2014 Study contains all concentration sampling data results, from which statistics can be surmised		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness				× 1	1	well characterized		
Overall Quality Determination ^{\dagger}		High		1.1				
	Continued on next page							

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Source Citation:	Rani, M.,Shim, W. J.,Han, G. M.,Jang, M.,Song, Y. K.,Hong, S. H. 2014. Hexabromocyclododecane in polystyrene based consumer products: An evidence of unregulated use. Chemosphere.							
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;							
Hero ID	2343697							
EVALUATION								
Domain	Metric Rating MWF* Score Comments							

Source Citation:	Takigami, H., Watanabe, M., Kajiwara, N. 2014. Destruction behavior of hexabromocyclododecanes during incineration of solid waste containing expanded and extruded polystyrene insulation foams. Chemosphere.						
Type of Data Source Hero ID	Facility; Reports for Data or Information Other than Exposure or Release Data; 2343703						
EXTRACTION							
Parameter			Data				
Life Cycle Stage:			Uso				
Life Cycle Description (Subcategory of Use):			EPS and XPS foam				
Total Annual U.S. Volume (and percent of PV).			80-90 percent of 31000 metric tonnes worldwide (2011)				
Chemical Concentration:			0.7 percent (EPS) and 2.5 percent (XPS)				
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1. Poliability							
Domain 1. Renab	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
Domain 2: Repres	entative		N.C. IV		0	-	
	Metric 2:	Geographic Scope	Medium	× 1	2	Japan	
	Metric 3:	Transport Decomposite times and	High Histh	× Z	2	in scope	
	Metric 4:	Composal Representativeness	High	× 2	2	2014	
	Metric 5:	Sample Size	LOW	× 1	3	characterized by no statistics.	
Domain 3: Accessibility/Clarity							
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty							
	Metric 7:	Metadata Completeness	High	$\times 1$	1	well characterized	
Overall Quality Determination ^{\dagger}			High		1.3		
-							

* MWF = Metric Weighting Factor
| Source Citation: | Zhang, Y.,Li, Q.,Lu, Y.,Jones, K.,Sweetman, A. J 2016. Hexabromocyclododecanes (HBCDDs) in surface soils from coastal cities in North China: Correlation between diastereoisomer profiles and industrial activities. Chemosphere. | | | | | | | | |
|---|---|---|--------|---------------|--|---|--|--|--|
| Type of Data Source
Hero ID | Facility; R
3350489 | Facility; Reports for Data or Information Other than Exposure or Release Data;
3350489 | | | | | | | |
| EXTRACTION
Parameter | Data | | | | | | | | |
| Life Cycle Stage:
Life Cycle Descrip
Process Descriptio
Total Annual U.S | Life Cycle Stage:
Life Cycle Description (Subcategory of Use):
Process Description:
Total Annual U.S. Volume (and percent of PV): | | | | Use
EPS and XPS foam
Note this source only contains concentrations of HBCD in selected soil
samples
12,000 of 18,000 tons (2011 China) | | | | |
| EVALUATION | | | | | | | | | |
| Domain | | Metric | Rating | MWF^{\star} | Score | Comments | | | |
| Domain 1: Reliab | ility
Metric 1: | Methodology | High | $\times 1$ | 1 | Information is from trusted sources | | | |
| Domain 2: Bepres | sentative | | | | | | | | |
| Domain 2. Repres | Metric 2: | Geographic Scope | Low | $\times 1$ | 3 | China | | | |
| | Metric 3: | Applicability | High | $\times 2$ | 2 | in scope | | | |
| | Metric 4: | Temporal Representativeness | High | $\times 2$ | 2 | 2011 | | | |
| | Metric 5: | Sample Size | Low | $\times 1$ | 3 | characterized by no statistics. | | | |
| Domain 3: Access | sibility/Clar
Metric 6: | ity
Metadata Completeness | High | × 1 | 1 | Assessment or report clearly documents its data sources as- | | | |
| | | modulate compreteness | | ~ 1 | T | sessment methods, results, and assumptions. | | | |
| Domain 4: Variab | oility and U | ncertainty | | | | | | | |
| | Metric 7: | Metadata Completeness | High | $\times 1$ | 1 | well characterized | | | |
| Overall Quality D | eterminatio | \mathbf{n}^{\dagger} | High | | 1.4 | | | | |

Source Citation: Type of Data Source Hero ID	Oecd,. 2007. SIDS initial assessment profile: Hexabromocyclododecane (HBCDD). Facility; Reports for Data or Information Other than Exposure or Release Data; 3809146						
EXTRACTION Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Total Annual U.S. Volume (and percent of PV):			Manufacture Manufacture /import 6,000 tonnes/yr MFG; 5,000 tonnes imported (EU15 - 2005)				
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	SIDS profiles are a trusted source	
Domain 2: Bonro	contativo						
Domain 2. Repres	Metric 2:	Geographic Scope	Medium	$\times 1$	2	SIDS profiles are prepared by OECD nations. US did not pre- pare this SIDS profile.	
	Metric 3:	Applicability	Medium	$\times 2$	4	Manufacture is not in scope but information could possibly be applied to import	
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2007	
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.	
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.	
Domain 4: Variab	ility and U	ncertainty	Ŧ		2		
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty	
Overall Quality I	eterminatio	\mathbf{n}^{\dagger}	Medium		2.2		

Source Citation: Type of Data Source Hero ID	Oecd,. 2007. SIDS initial assessment profile: Hexabromocyclododecane (HBCDD). Facility; Reports for Data or Information Other than Exposure or Release Data; 3809146						
EXTRACTION							
Parameter			Data				
Life Cycle Stage:			Use				
Life Cycle Descrip	otion (Subca	ategory of Use):	EPS and	XPS foat	m		
Total Annual U.S	. Volume (a	nd percent of PV):	88 percen	t in EU	used for	EPS and XPS	
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliab	ility						
	Metric 1:	Methodology	High	$\times 1$	1	SIDS profiles are a trusted source	
Domain 2: Repres	sentative						
Ĩ	Metric 2:	Geographic Scope	Medium	$\times 1$	2	SIDS profiles are prepared by OECD nations. US did not pre- pare this SIDS profile.	
	Metric 3:	Applicability	High	$\times 2$	2	in scope	
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2007	
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.	
Domain 3: Access	sibility/Clar	ity					
	Metric 6:	Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.	
Domain 4. Variah	vility and Ur	ncertainty					
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty	
Overall Quality D	Determinatio	n†	Medium		2.0		

Source Citation:	Yi, S.,Liu, J. G.,Jin, J.,Zhu, J 2016. Assessment of the occupational and environmental risks of hexabromocyclododecane (HBCD) in China. Chemosphere.						
Type of Data Source Hero ID	Facility; R 3350493	Facility; Reports for Data or Information Other than Exposure or Release Data; 3350493					
EXTRACTION							
Parameter			Data				
Life Cycle Stage:			Manufacture				
Life Cycle Descrip	otion (Subca	ategory of Use):	HBCD Produc	tion			
Process Description	on:		Consists of larg	ge, mediu	ım, and	small HBCD production plants	
Number of Sites:			14				
Operating Days p	er Year and	Batches per Day:	5-10 bt/day				
Site Daily Throug	ghput:		6,000 to 7,500	tonnes/a	nnum		
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Beliah	ility						
Domain 1. Renad	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
Domain 2: Repres	sentative		T	1	0		
	Metric 2:	Geographic Scope	Low	× I	3	China	
	Metric 3:	Applicability	Unacceptable	× 2	8	Manufacture is not in scope and this information is not appli- cable to in-scope scenarios	
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2016	
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.	
Domain 2. Accord	sibility /Clar	:+					
Domain 5: Access	Motric 6:	Motadata Completeness	Low	$\vee 1$	3	Assessment or report provides results but the underlying	
	Metric 0.	Metauata Completeness	LOW	~ 1	5	Assessment of report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.	
Domain 4. Variat	vility and U	acortainty					
Domain 4. Variat	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty	
		-					
Overall Quality D)eterminatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.6.	
		(ontinued on nev	t page			
		C	John mueu on nex	t page			

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Source Citation:	Yi, S.,Liu, J. G.,Jin, J.,Zhu, J 2016. Asso (HBCD) in China. Chemosphere.	essment of the	occupation	nal and	environmental risks of hexabromocyclododecane		
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;						
Hero ID	3350493						
EVALUATION							
Domain	Metric	Rating	$\rm MWF^{\star}$	Score	Comments		

** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation:	Yi, S.,Liu, J. G.,Jin, J.,Zhu, J. 2016. Assessment of the occupational and environmental risks of hexabromocyclododecane (HBCD) in China. Chemosphere.							
Type of Data Source Hero ID	Facility; R 3350493	Facility; Reports for Data or Information Other than Exposure or Release Data; 3350493						
EXTRACTION								
Parameter			Data					
			р :					
Life Cycle Stage:	tion (Subas	torony of Uco).	VDS form	g				
Process Description	otion (Subce	ategory of Use).	Consists	of XPS f	amo rot	ardant plants		
Number of Sites	JII.		520	JAISI	ame ret	ardant plants		
Site Daily Throug	hout		1 500 to 1	900 t/a	(not su	re what these units are)		
She Daily Throug	,iiput.		1,000 10 1	.,000 0/ 4	(1100 54	ie with these units are;		
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1, Daliah	:1:+							
Domain 1: Kenad	Motria 1.	Mathadalagy	High	~ 1	1	Information is from touched courses		
	Methe 1.	Methodology	IIIgii	~ 1	1	information is from trusted sources		
Domain 2: Repres	sentative							
•	Metric 2:	Geographic Scope	Low	$\times 1$	3	China		
	Metric 3:	Applicability	High	$\times 2$	2	in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2016		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
Domain 3: Access	ability/Clar	ity	т	1	0			
	Metric 6:	Metadata Completeness	Low	× I	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.		
Demain 4. V. 11	:1:41 TT							
Domain 4: Variab	Motrie 7	Metadata Completeness	Low	× 1	2	NT 11 11 11 11 11 11 11 11 11 11 11 11 11		
	Metric 7:	Metadata Completeness	LOW	× 1	3	No discussion of variability or uncertainty		
Overall Quality Determination [†]					1.9			

Source Citation:	Yi, S.,Liu, J. G.,Jin, J.,Zhu, J 2016. Assessment of the occupational and environmental risks of hexabromocyclododecane (HBCD) in China. Chemosphere.								
Type of Data Source Hero ID	Facility; R 3350493	Facility; Reports for Data or Information Other than Exposure or Release Data; 3350493							
EXTRACTION									
Parameter			Data						
Life Cycle Stage:			Processing						
Life Cycle Descrip	otion (Subca	ategory of Use):	EPS formulation	on					
Process Description	on:	/	Consists of EP	S flame r	etardar	t plants			
Number of Sites:			65						
Site Daily Throug	ghput:		50,000 t/a (not	t sure wh	at these	e units are)			
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility								
Domain 1. Itenab	Metric 1	Methodology	High	× 1	1	Information is from trusted sources			
	Meerie 1.	Methodology	Ingn	~ 1	1	Information is from trusted sources			
Domain 2: Repres	sentative								
	Metric 2:	Geographic Scope	Low	$\times 1$	3	China			
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	EPS compounding not in scope and this information does not seem applicable to in-scope scenarios			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2016			
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.			
Domain 3: Access	vibility/Clar	ity							
	Metric 6:	Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.			
Domain 4: Variah	ility and Ur	acortainty							
Domain 4. Variat	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty			
Overall Quality D	Unacceptable		4	Metric Mean Score: 2.6.					
Continued on next page									

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Source Citation:	Yi, S.,Liu, J. G.,Jin, J.,Zhu, J 2016. Asso (HBCD) in China. Chemosphere.	essment of the	occupation	nal and	environmental risks of hexabromocyclododecane		
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;						
Hero ID	3350493						
EVALUATION							
Domain	Metric	Rating	$\rm MWF^{\star}$	Score	Comments		

** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor

Source Citation:	Nie, Z., Yang, Z., Fang, Y., Yang, Y., Tang, Z., Wang, X., Die, Q., Gao, X., Zhang, F., Wang, Q., Huang, Q. 2015. Environmental risks of HBCDD from construction and demolition waste: a contemporary and future issue. Environmental Science and Pollution Research.							
Type of Data Source Hero ID	Facility; R 3350517	Facility; Reports for Data or Information Other than Exposure or Release Data; 3350517						
EXTRACTION								
Parameter			Data					
Life Cycle Stage: Life Cycle Descrip Process Descriptio Total Annual U.S	ption (Subca on: . Volume (a	ategory of Use): nd percent of PV):	Recycling EPS and XPS foam Review of several soruces with information about HBCD in construction and demolition waste all over the world. Does not provide much novel information, just a review of other industry data. Indicates that 30 percent of EPS and XPS foam is recycled in the EU (source dated 2011					
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Repres	Sentative Matria 2:	Coorrenkie Soone	Madium	~ 1	0			
	Metric 2:	Applicability	High	$\times 1$ $\times 2$	2	EU in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2015		
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.		
		x				* *		
Domain 3: Access	sibility/Clar Metric 6:	Metadata Completeness	Low × 1 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.					
	:1:41 TT							
Domain 4: Variab	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
		1 1				v v		
Overall Quality D	eterminatio	n [†]	Medium		1.8			
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Source Citation:	Nie, Z., Yang, Z., Fang, Y., Yang, Y., Tang, Z., Wang, X., Die, Q., Gao, X., Zhang, F., Wang, Q., Huang, Q. 2015. Environmental science risks of HBCDD from construction and demolition waste: a contemporary and future issue. Environmental Science Pollution Research.	ental and
Type of Data Source Hero ID	Facility; Reports for Data or Information Other than Exposure or Release Data; 3350517	
EVALUATION		
Domain	Metric Rating MWF* Score Comments	

^{*} MWF = Metric Weighting Factor
[†] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation: Type of Data Source Hero ID	Morose, G Facility; R 3809151	2006. An overview of alternat eports for Data or Information (ives to tetr Other than	abomobis Exposure	sphenol e or Rel	A (TBBPA) and hexabromocyclododecane (HBCD). lease Data;	
EXTRACTION			_				
Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Total Annual U.S. Volume (and percent of PV):			Use HBCD Global Market Demand Brominated flame redardant global market demand 16,700 metric tonnes globally in 2001 (2,800 metric tonnes in Americas in 2001)				
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
Domain 9. Doma	antatina						
Domain 2: Repres	Metric 2.	Geographic Scope	High	$\times 1$	1	IIS	
	Metric 3:	Applicability	Medium	$\times 2$	4	Contains both in-scope and out of scope uses	
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2006	
	Metric 5:	Sample Size	Low	$\times 1$	3	characterized by no statistics.	
Domain 3: Access	ibility/Clar	ity					
	Metric 6:	Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.	
Domain 4. Variah	ility and Ur	acertainty					
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty	
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Medium		2.1		

Source Citation:	U.S, E. P. A. 2017. Preliminary information on manufacturing, processing, distribution, use, and disposal: Cyclic aliphatic bromide durater (HBCD)							
Type of Data Source Hero ID	Facility; Reports for Data or Information Other than Exposure or Release Data; 3827330							
EXTRACTION								
Parameter	Data							
Life Cycle Stage:			Import	/Processi	ng/Use			
Life Cycle Descrip	otion (Subca	tegory of Use):	All lifed	vcle stag	ges			
Process Description	on:	· · · · · · · · · · · · · · · · · · ·	Support	t docum	, ent crea	ated for the docket by EPA's OCSPP in 2017.		
			Provide	s a gener	ral discu	ission on the life cycle of HBCD in the U.S.		
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
	•1•4							
Domain 1: Reliad	Metric 1	Methodology	High	× 1	1	Information is from trusted sources		
	Meetic 1.	Methodology	mgn	~ 1	1			
Domain 2: Repres	sentative							
*	Metric 2:	Geographic Scope	High	$\times 1$	1	US		
	Metric 3:	Applicability	High	$\times 2$	2	in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2017		
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type		
Domain 2. Access	ibiliter /Class	4						
Domain 5: Access	Motrie 6	Motadata Completeness	High	\vee 1	1	Assessment on non-out clouds, documents its data sources of		
	Metric 0.	Metadata Completeness	Ingn	~ 1	1	Assessment of report clearly documents its data sources, as- sessment methods, results, and assumptions.		
D								
Domain 4: Variab	oility and Ur	ncertainty	TT· 1	1	1			
	Metric 7:	Metadata Completeness	High	× 1	1	well characterized		
Overall Quality D	eterminatio	n^\dagger	High		1.0			
-								

Source Citation: Type of Data Source Hero ID	2004. Kirk-Othmer Encyclopedia of Chemical Technology. Facility; Reports for Data or Information Other than Exposure or Release Data; 3859418							
EXTRACTION Parameter	Data							
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Number of Sites:			Manufacture Manufacture of HBCD List of producers of HBCD is provided: Albermarle (US), DSBG (Israel), Great Lakes (US), ISC Chemicals, Ltd. (UK) 4					
EVALUATION Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Repres	Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	High Unacceptable Medium N/A	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \end{array}$	1 8 4 N/A	US Manufacture is not in scope and this information is not appli- cable to in-scope scenarios 2004 This metric does not relate to this data type		
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.		
Domain 4: Variab	ility and Ur Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.5.		
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Source Citation: Type of Data Source Hero ID	2004. Kirk-Othmer Encyclopedia of Chemical Technology. Facility; Reports for Data or Information Other than Exposure or Release Data; 3859418						
EVALUATION							
Domain	Metric	Rating	\mathbf{MWF}^{\star}	Score	Comments		

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Mack, A. G 2004. Flame retardants, halogenated. Facility; Reports for Data or Information Other than Exposure or Release Data; 3859419						
EXTRACTION							
Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description:			Manufacture Manufacture of HBCD List of producers and trade names of HBCD is provided				
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources	
Domain 2: Repres	sentative	~	TT. 1	_	_		
	Metric 2:	Geographic Scope	High	× 1	1	US	
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Manufacture is not in scope and this information is not appli- cable to in-scope scenarios	
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2004	
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type	
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.	
Domain 4: Variat	Motrie 7	Metadata Completeness	Low	× 1	9		
	metric 7:	Metadata Completeness	LOW	× 1	3	No discussion of variability or uncertainty	
Overall Quality D	eterminatio	n^\dagger	Unacceptable		4	Metric Mean Score: 2.5.	

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Ashford, R. D 2001. Ashford's Dictionary of Industrial ChemicalsHexabromocyclododecane. Facility; Reports for Data or Information Other than Exposure or Release Data; 3860436							
EXTRACTION								
Parameter			Data					
Life Cycle Stage: Life Cycle Descrip Process Description	ption (Subca	ategory of Use):	All HBCD Provides	physical	propert	ies of HBCD		
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Benre	sentative							
Domain 2. Repres	Metric 2:	Geographic Scope	Medium	× 1	2	ПК		
	Metric 3:	Applicability	High	$\times 2$	2	Physical properties are applicable to in scope uses		
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2001		
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type		
Domain 3: Access	sibility/Clar	ity						
	Metric 6:	Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.		
Domain 4: Variat	Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality D	Determinatio	\mathbf{n}^{\dagger}	Medium		1.9			

^{*} MWF = Metric Weighting Factor
[†] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:2017. CheType of Data SourceFacility; RHero ID3860462	mical data reporting: 1,2,5,6,9,1 eports for Data or Information (0-hexabro Other tha	omo-cyclo n Exposi	ododeca ure or F	ne. Release Data;	
EXTRACTION Parameter		Data				
Life Cycle Stage: Life Cycle Description (Subca Process Description: Total Annual U.S. Volume (a Number of Sites: Possible Physical Form: Chemical Concentration:	Manufacture and import Manufacture and import CDR data pulled from Chemview. Import site imports with HBCD never at import site. CBI 1 site MFG; 1 site Import Import site lists pellets as phys form. MFG site lists dry powder <1 percent in Building/Construction Materials					
EVALUATION Domain	Metric	Rating	MWF*	Score	Comments	
Domain 1: Reliability Metric 1:	Methodology	High	× 1	1	Information is from trusted sources	
Domain 2: Representative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	High High High N/A	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \end{array}$	1 2 2 N/A	US import information is in scope 2017 This metric does not relate to this data type	
Domain 3: Accessibility/Clar Metric 6:	ity Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.	
Domain 4: Variability and Un Metric 7:	ncertainty Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty	
Overall Quality Determinatio	\mathbf{n}^{\dagger}	High		1.5		
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Source Citation: Type of Data Source Hero ID	2017. Chemical data reporting: 1,2,5,6,9,10-hexabromo-cyclododecane. Facility; Reports for Data or Information Other than Exposure or Release Data; 3860462							
EVALUATION								
Domain	Metric	Rating N	MWF*	Score	Comments			
EVALUATION Domain	Metric	Rating M	MWF*	Score	Comments			

tinued from proviou

* MWF = Metric Weighting Factor
 † If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation: Type of Data Source Hero ID	Pubchem, 2017. PubChem: 1,2,5,6,9,10-Hexabromocyclododecane. Facility; Reports for Data or Information Other than Exposure or Release Data; 3970249									
EXTRACTION										
Parameter			Data							
Life Cycle Stage:			Manufacture	Manufacture						
Life Cycle Descrip	otion (Subca	ategory of Use):	Manufacture o	f HBCD						
Process Descriptio	on:		PubChem data	a pulled f	form the	e Open Chemistry Database for HBCD.				
Total Annual U.S	Volume (a	nd percent of PV):	10 million to 5	0 million	pounds	5 in 2002				
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
Domain 1: Reliab	ility Matria 1.	Mathadalam	Hish	× 1	1					
	Metric 1:	Methodology	High	× 1	1	Information is from trusted sources				
Domain 2: Repres	entative									
Domain 2. Ropros	Metric 2:	Geographic Scope	High	$\times 1$	1	US				
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Manufacture is not in scope and this information is not appli- cable to in-scope scenarios				
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2010-2011				
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type				
Domain 3: Access	ibility/Clar	ity								
	Metric 6:	Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.				
Domain 4. Variab	ility and U	acortainty								
Domain 4. Vallad	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty				
		L				v v				
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.2.				

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Pubchem, 2017. Pubchem Compound: Hexabromocyclododecane. Facility; Reports for Data or Information Other than Exposure or Release Data; 3970250							
EXTRACTION								
Parameter			Data					
Life Cycle Stage:			All					
Life Cycle Descrip	ption (Subca	ategory of Use):	HBCD					
Process Description:			Search results in with HBCD in	for HBCl the nam	D in Pul le but pi	bechem Compound. Identifies compounds rovides no extractable information.		
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
	WICCIIC 1.	Wiethodology	Ingn	~ 1	1	mormation is nom trusted sources		
Domain 2: Repres	sentative							
_	Metric 2:	Geographic Scope	High	$\times 1$	1	US		
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	This information cannot be applied to any in-scope uses		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2017		
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type		
Domain 3: Access	sibility/Clar	ity						
	Metric 6:	Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.		
Domain 4: Variah	vility and Ur	acortainty						
Domain 4. Variat	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality D	Determinatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.2.		

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Echa,. 201 Facility; R 3970735	7. Hexabromocyclododecane. eports for Data or Information (Other than	Exposure	e or Rel	lease Data;	
EXTRACTION			Data				
Farameter			Data				
Life Cycle Stage:	(6.1		All				
Life Cycle Description (Subcategory of Use): Process Description:			HBCD Search results of searching HBCD in ECHA and provides several trade names for HBCD.				
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliab	ility						
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
Domain 2: Repres	sentative						
1	Metric 2:	Geographic Scope	Medium	$\times 1$	2	UK	
	Metric 3:	Applicability	High	$\times 2$	2	Trade names may be usefull for background information sections in the risk evaluation	
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2017	
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type	
Domain 3: Access	sibility/Clar	ity					
	Metric 6:	Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.	
Demeir 4 V 11	:1:4 J TT						
Domain 4: Variat	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty	
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	High		1.6		

* MWF = Metric Weighting Factor
 † If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:KemI, 2Type of Data SourceFacility;Hero ID3970751	009. Proposal for harmonised clas Reports for Data or Information	ssification a Other than	nd labell Exposur	ing: Su e or Re	bstance name: Hexabromocyclododecane. lease Data;	
EXTRACTION		D /				
Parameter		Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Total Annual U.S. Volume (and percent of PV): Possible Physical Form: Chemical Concentration:			Manufacture and import Manufacture and import Table 2-1 lists import and MFG volumes for multiple countries White odorless solid 90-100 percent HBCD; impurities in HBCDD are usually less than 4 percent w/w.			
EVALUATION						
Domain	Metric	Rating	MWF^*	Score	Comments	
Domain 1: Reliability Metric 1	Methodology	High	$\times 1$	1	Information is from trusted sources	
Domain 2: Roprosontativa						
Metric 2	Geographic Scope	Medium	× 1	2	Sweden	
Metric 3	Applicability	High	$\times 2$	2	Information is directly related to Import	
Metric 4	Temporal Representativeness	High	$\times 2$	2	2009	
Metric 5	Sample Size	Medium	$\times 1$	2	Wt fraction and PV provided in ranges with no other statistics	
Domain 3: Accessibility/Cla Metric 6	urity Metadata Completeness	High	$\times 1$	1	clearly documents its data sources	
Domain 4: Variability and Metric 7	Jncertainty Metadata Completeness	Medium	× 1	2	Some discussion	
Overall Quality Determinat	ion†	High		1.3		

Source Citation:	Echa, 2016. Annex XV report: An assessment of whether the use of HBCDD in articles should be restricted in accordance with Article 69(2) of reach								
Type of Data Source Hero ID	Facility; R 3970758	Facility; Reports for Data or Information Other than Exposure or Release Data; 3970758							
EXTRACTION			Data						
			Data						
Life Cycle Stage:	(0.1		Manufact	ure					
Life Cycle Descrip Total Annual U.S.	Volume (a	ategory of Use): nd porcent of PV):	Manufact	ure of HI	SCD oor ood	h MEC and imported in EU (2006/2007)			
Number of Sites:	. volume (a	nu percent of i v).	35 notifica	ations fro	om both	producers and importers of articles.			
Chemical Concent	tration:		amount o	f contam	inants/	unknown constituents varies (0-5 percent)			
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
	.1.,								
Domain 1: Reliab	Metric 1.	Methodology	High	× 1	1	Information is from trusted sources			
	Wietrie 1.	Methodology	Ingn	~ 1	1				
Domain 2: Repres	sentative								
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	EU			
	Metric 3:	Applicability	Medium	$\times 2$	4	Manufacture is not in scope but some info applies to import			
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2006-2007			
	Metric 5:	Sample Size	LOW	× 1	3	characterized by no statistics.			
Domain 3: Access	sibility/Clar	ity							
	Metric 6:	Metadata Completeness	High	$\times 1$	1	clearly documents its data sources			
Domain 4: Variat	oility and Ui	ncertainty	A.C. 19	1	0				
	Metric 7:	Metadata Completeness	Medium	× 1	2	Some discussion			
Overall Quality D	Determinatio	\mathbf{n}^{\dagger}	Medium		1.9				

Source Citation:	Echa, 2016. Annex XV report: An assessment of whether the use of HBCDD in articles should be restricted in accordance with Article 69(2) of reach									
Type of Data Source Hero ID	Facility; R 3970758	Facility; Reports for Data or Information Other than Exposure or Release Data; 3970758								
EXTRACTION										
Parameter			Data							
Life Cycle Stage: Life Cycle Description (Subcategory of Use):			Processin XPS com	Processing XPS compounding						
Total Annual U.S	. Volume (a	nd percent of PV):	Number o	of sites ai	nd use r	ates same as 3970759				
EVALUATION										
Domain		Metric	Bating	MWF*	Score	Comments				
Domani		Metric	Itating	IVI VV I	50016	Comments				
Domain 1. Reliability										
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources				
	_									
Domain 2: Repres	sentative			-	2					
	Metric 2:	Geographic Scope	Medium	× 1	2	EU				
	Metric 3:	Applicability	High	$\times 2$	2	in scope				
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2006-2007				
	Metric 5:	Sample Size	Low	× 1	3	characterized by no statistics.				
Domain 3: Access	sibility/Clar	ity								
20111011101110000	Metric 6:	Metadata Completeness	High	$\times 1$	1	clearly documents its data sources				
Domain 4: Variab	oility and Ui	ncertainty								
	Metric 7:	Metadata Completeness	Medium	$\times 1$	2	Some discussion				
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Medium		1.7					

Source Citation: Type of Data Source Hero ID	Echa, 2017. Uses at industrial sites: hexabromocyclododecane. Facility; Reports for Data or Information Other than Exposure or Release Data; 3970762							
EXTRACTION Parameter			Data					
Life Cycle Stage: Manufacturing/Processing/Use Life Cycle Description (Subcategory of Use): HBCD Process Description: Provides a general list of the manufacturing, processing, and us tions that are performed using HBCD. Only provides a short desc No data was extracted.					g/Use the manufacturing, processing, and use opera- sing HBCD. Only provides a short description.			
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Repres	sentative							
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	EU		
	Metric 3:	Applicability	Medium	$\times 2$	4	This document is just a list of uses of HBCD. Some uses are in scope and some are out of scope.		
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	No Date (cites a source from 2006)		
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.		
Domain 4: Variab	oility and U Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality Determination [†]			Medium		2.1	~ ~ ~		

Source Citation: Type of Data Source Hero ID	Echa, 2017. Uses by professional workers: hexabromocyclododecane. Facility; Reports for Data or Information Other than Exposure or Release Data; 3970763								
EXTRACTION			_						
Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use):			All HBCD						
Process Description: Provides a general list of potential uses for HBCD containi Only provides a short descriptions. No data was extracted.					potential uses for HBCD containing articles. criptions. No data was extracted.				
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility		TT- 1	1	1				
	Metric 1:	Methodology	High	× 1	1	Information is from trusted sources			
Domain 2: Repres	sentative								
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	EU			
	Metric 3:	Applicability	Medium	$\times 2$	4	This document is just a list of uses for HBCD articles. Some uses are in scope and some are out of scope.			
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	No Date (cites a soucce from 2006)			
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type			
Domain 3: Access	ibility/Clar	i+							
Domain 5. Access	Metric 6:	Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.			
		, • ,							
Domain 4: Variab	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty			
Overall Quality Determination [†]					2.1				

* MWF = Metric Weighting Factor
 † If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:Acc, 2017Type of Data SourceFacility; RHero ID3978170	7. Flame retardants: Frequently eports for Data or Information (asked questions: Other than Expo	Safety r sure or I	egulatio Release 1	ns. Data;			
EXTRACTION								
Parameter		Data						
Life Cycle Stage:	All	All						
Process Description:	HBCD Fact sheet on some questions about flame redardants and HBCD in the U.S. No data was extracted.							
EVALUATION								
Domain	Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliability								
Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources - American Chemistry Council			
Domain 2: Representative								
Metric 2:	Geographic Scope	High	$\times 1$	1	US			
Metric 3:	Applicability	Unacceptable	$\times 2$	8	Not detailed enough to provide data in scope.			
Metric 4:	Temporal Representativeness	Low	$\times 2$	6	No date			
Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type			
Domain 3: Accessibility/Clar	ity							
Metric 6:	Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.			
Domain 4: Variability and U	acortainty							
Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty			
Overall Quality Determinatio	n^\dagger	Unacceptable		4	Metric Mean Score: 2.8.			

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Nicnas, 2013. NICNAS: Hexabromocyclododecane (HBCD). Facility; Reports for Data or Information Other than Exposure or Release Data; 3978354							
EXTRACTION								
Parameter			Data					
Life Cycle Stage:			All					
Process Description:			HBCD Provides general background information. No information was ex- tracted.					
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
			0					
Domain 2: Repres	Sentative Motrie 2.	Coographia Second	Uich	× 1	1			
	Metric 2:	Applicability	Iligii Unaccentable	$\times 1$ $\times 2$	1 8	US Not detailed enough to provide data in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	$\frac{0}{2}$	2013		
	Metric 5:	Sample Size	N/A	~ =	N/A	This metric does not relate to this data type		
Domain 3: Access	ibility/Clari Metric 6:	ity Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans-		
						parent.		
Domain 4: Variab	oility and Ur	ncertainty						
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.2.		

* MWF = Metric Weighting Factor

Type of Data Source Hero ID Facility; Reports for Data or Information Other than Exposure or Release Data; 3978365 EXTRACTION Parameter Data Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: All HBCD Fact sheet on how HBCD is used and assessed in Canada. No information was extracted. EVALUATION EVALUATION	Source Citation:	Government of, Canada. 2016. Fact sheets & frequently asked questions: Cyclododecane, 1,2,5,6,9,10-hexabromo- (hexabromocyclododecane; HBCD).							
EXTRACTION Parameter Data Life Cycle Stage: All Life Cycle Description (Subcategory of Use): HBCD Process Description: Fact sheet on how HBCD is used and assessed in Canada. No information was extracted. EVALUATION EVALUATION	Type of Data Source Hero ID	Facility; Reports for Data or Information Other than Exposure or Release Data; 3978365							
Life Cycle Stage: All Life Cycle Description (Subcategory of Use): HBCD Process Description: Fact sheet on how HBCD is used and assessed in Canada. No information was extracted. EVALUATION EVALUATION	EXTRACTION Parameter			Data					
EVALUATION	Life Cycle Stage:AllLife Cycle Description (Subcategory of Use):HBCDProcess Description:Fact sheet on how HBCD is used and assessed in Canada. No information was extracted.								
	EVALUATION								
Domain Metric Rating MWF [*] Score Comments	Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliability	Domain 1: Reliab	oility				_			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Representative	Domain 2: Repres	sentative							
Metric 2: Geographic Scope Medium $\times 1$ 2 Canada	*	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Canada		
Metric 3: Applicability Unacceptable $\times 2$ 8 Not detailed enough to provide data in scope.		Metric 3:	Applicability	Unacceptable	$\times 2$	8	Not detailed enough to provide data in scope.		
Metric 4: Temporal Representativeness High $\times 2$ 2 2017		Metric 4:	Temporal Representativeness	High	$\times 2$	2	2017		
Metric 5: Sample Size N/A N/A This metric does not relate to this data type		Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type		
Domain 3: Accessibility/Clarity	Domain 3: Access	sibility/Clar	ity						
Metric 6: Metadata Completeness Low × 1 3 Assessment or report provides results, but the u methods, data sources, and assumptions are not fu parent.		Metric 6:	Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.		
Demain 4. Variability and Uncertainty	Domain 4. Varial	ilitar and TI-	- containt-						
$\underline{\qquad \qquad Metric 7: Metadata Completeness \qquad Low \qquad \times 1 \qquad 3 \qquad No discussion of variability or uncertainty}$	Domain 4: Variab	Metric 7:	Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality Determination [†] Unacceptable 4 Metric Mean Score: 2.4.	Overall Quality D	Determinatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.4.		
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Source Citation:	Government of, Canada. 2016. (hexabromocyclododecane; HBCD).	Fact sheets & frequent	ly asked questions:	: Cyclododecane, 1,2,5,6,9,10-hexabromo-				
Type of Data Source Hero ID	Facility; Reports for Data or Information Other than Exposure or Release Data; 3978365							
EVALUATION								
Domain	Metric	Rating M	WF* Score	Comments				

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Xpsa,. XPSA white paper "safety of FRs in energy-efficient XPS foam insulation. Facility; Reports for Data or Information Other than Exposure or Release Data; 3981024							
EXTRACTION			_					
Parameter			Data					
Life Cycle Stage: Life Cycle Descrip Process Descriptio	Processing and Consumer Use XPS Foam Insulation Fact sheet about using HBCD in XPS Foam Insulation written by the Extruded Polystryene Foam Association. No information was extracted.							
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Repres	sentative							
	Metric 2:	Geographic Scope	High	$\times 1$	1	US		
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Not detailed enough to provide data in scope.		
	Metric 4: Motric 5:	Sample Size	N / A	X Z	Z N/A	No Date (cites a source from 2013) This metric does not value to this data tune		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.		
Domain 4: Variab	ility and Uı Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality Determination [†]		Unacceptable		4	Metric Mean Score: 2.2.			

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	2012. XPS industry perspective on sustainability and environmental awareness. Facility; Reports for Data or Information Other than Exposure or Release Data; 3981025								
EXTRACTION									
Parameter	Data								
Life Cycle Stage: Life Cycle Descrip Process Description	Processing and Consumer Use XPS Foam Insulation Fact sheet about using HBCD in XPS Foam Insulation written by the Extruded Polystryene Foam Association. No information was extracted.								
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources			
Domain 2: Repres	sentative	a 11 a	1	_					
	Metric 2:	Geographic Scope	High	$\times 1$	1	US			
	Metric 3: Motric 4:	Applicability Temporal Representativeness	Unacceptable	$\times 2$ $\times 2$	8	Not detailed enough to provide data in scope.			
	Metric 4:	Sample Size	N/A	~ 2	N/A	This metric does not relate to this data type			
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.			
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty			
Overall Quality Determination [†]		Unacceptable		4	Metric Mean Score: 2.2.				

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Spin,. 2017. SPIN substances in preparations in nordic countries cyclododecane, 1, 2, 5, 6, 9, 10-hexabromo. Facility; Reports for Data or Information Other than Exposure or Release Data; 3981131							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Descrip Process Descriptio Total Annual U.S	otion (Subca on: . Volume (a	ategory of Use): nd percent of PV):	All HBCD A database for nordic countries HBCD use over the years in several life cycle stages. Note that most of the info is confidential. 3 to 200.4 tonnes per year (in nordic countries - Finland, Denmark, Sweden, and Norway)					
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Repres	sentative							
-	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Sweden, Norway, Denmark, and Finland		
	Metric 3:	Applicability	Medium	$\times 2$	4	This document includes all uses of HBCD. Some uses are in scope and some are out of scope.		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2017		
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type		
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.		
Domain 4: Variab	ility and Ur Metric 7:	ncertainty Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty		
Overall Quality Determination ^{\dagger}			Medium		1.9			

Source Citation: Type of Data Source Hero ID	European Facility; R 3981169	European Flame Retardants, Association. 2006. Flame retardants fact sheet hexabromocyclododecane. Facility; Reports for Data or Information Other than Exposure or Release Data; 3981169							
EXTRACTION									
Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description:			All HBCD Fact sheet on how HBCD is used and assessed in the EU. No information was extracted.						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources			
Domain 2: Repres	sentative				_				
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe (Belgium)			
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Not detailed enough to provide data in scope.			
	Metric 4: Motric 5:	Sample Size	Medium N / A	× 2	4 N / A	2006 This metric does not relate to this date time			
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.			
Domain 4: Variab	oility and Un Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty			
Overall Quality Determination [†]			Unacceptable		4	Metric Mean Score: 2.6.			

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	European Facility; R 3981173	European Flame Retardants, Association. 2016. EFRA members portal Private Transport. Facility; Reports for Data or Information Other than Exposure or Release Data; 3981173							
EXTRACTION Parameter			Data						
Life Cycle Stage: Life Cycle Descrip Process Description	ategory of Use):	All HBCD Fact sheet about the transportation industry sectors that use several different flame retardants (including HBCD) in transport applications. No information was extracted.							
EVALUATION		Mateic	Dating		Coone	Commente			
Domain		Metric	Kating	M W F	Score	Comments			
Domain 1: Reliab	oility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources			
Domain 2: Repres	sentative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium Unacceptable High N/A	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \end{array}$	2 8 2 N/A	Europe Not detailed enough to provide data in scope. 2017 This metric does not relate to this data type			
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.			
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty			
Overall Quality Determination [†]		Unacceptable		4	Metric Mean Score: 2.4.				
		(Continued on nex	t page					

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Source Citation: Type of Data Source Hero ID	European Flame Retardants, Association. 2016. EFRA members portal Private Transport. Facility; Reports for Data or Information Other than Exposure or Release Data; 3981173						
EVALUATION							
Domain	Metric	Rating	MWF^{\star}	Score	Comments		

** Consistent with our Application of Systematic Review in TSCARisk Evaluations document, if a metric for a data source receives a score of Unacceptable (score = 4), EPA will determine the study to be unacceptable. In this case, one of the metrics were rated as unacceptable. As such, the study is considered unacceptable and the score is presented solely to increase transparency.

* MWF = Metric Weighting Factor
| Source Citation:European Flame Retardants, Association.Type of Data SourceFacility; Reports for Data or InformationHero ID3981174 | European Flame Retardants, Association. 2016. EFRA members portal structural elements.
Facility; Reports for Data or Information Other than Exposure or Release Data;
3981174 | | | | | | |
|---|---|------------|-------|---|--|--|--|
| EXTRACTION
Parameter | Data | | | | | | |
| Life Cycle Stage:
Life Cycle Description (Subcategory of Use):
Process Description: | All
HBCD
Fact sheet about the use of flame retardants (including HBCD) in struc-
tural elements (e.g., foam insulation, electronics). No information was
extracted. | | | | | | |
| EVALUATION
Domain Metric | Bating | MWF* | Score | Comments | | | |
| | Rating | IVI VV F | Score | Comments | | | |
| Domain 1: Reliability
Metric 1: Methodology | High | $\times 1$ | 1 | Information is from trusted sources | | | |
| Domain 2: Representative | | | | | | | |
| Metric 2: Geographic Scope | Medium | $\times 1$ | 2 | Europe | | | |
| Metric 3: Applicability | Unacceptable | $\times 2$ | 8 | Not detailed enough to provide data in scope. | | | |
| Metric 4: Temporal Representativeness | High | $\times 2$ | 2 | 2017 | | | |
| Metric 5: Sample Size | N/A | | N/A | This metric does not relate to this data type | | | |
| Domain 3: Accessibility/Clarity | | | | | | | |
| Metric 6: Metadata Completeness | Low | $\times 1$ | 3 | Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent. | | | |
| Domain 4. Variability and Uncertainty | | | | | | | |
| Metric 7: Metadata Completeness | Low | $\times 1$ | 3 | No discussion of variability or uncertainty | | | |
| Overall Quality Determination ^{\dagger} | Unacceptable | | 4 | Metric Mean Score: 2.4. | | | |
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Source Citation: Type of Data Source Hero ID	European Flame Retardants, Association. 2016. EFRA members portal structural elements. Facility; Reports for Data or Information Other than Exposure or Release Data; 3981174					
EVALUATION	Metric	Bating	MWF*	Score	Comments	
	Wiethe	reading	101 00 1	50010	Comments	

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	European Facility; R 3981176	European Brominated Flame Retardant Industry, Panel. 2008. ebfrip our substances, hexabromocyclododecane (HBCD). Facility; Reports for Data or Information Other than Exposure or Release Data; 3981176						
EXTRACTION								
Parameter			Data					
Life Cycle Stage: Life Cycle Descrip Process Description	ption (Subca	ategory of Use):	All HBCD General discus tracted.	sion abo	ut the	uses of HBCD. No information was ex-		
EVALUATION								
Domain		Metric	Rating	MWF^*	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Repres	sentative							
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Not detailed enough to provide data in scope.		
	Metric 4: Motric 5:	Sample Size	Hign N / A	× Z	Z N / A	2017 This metric dass pet velets to this data type		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.		
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.4.		

* MWF = Metric Weighting Factor

Source Citation:	Fishbein, B. K 2002. Waste in the Wireless World: The Challenge of Cell PhonesChapter 3: The toxic content of cell phones and other electronic devices.							
Type of Data Source Hero ID	Facility; R 3982069	Facility; Reports for Data or Information Other than Exposure or Release Data; 3982069						
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Total Annual U.S. Volume (and percent of PV):		All HBCD Provides the 1999 Market Demand for HBCD in Europe, Americas, and Asia Americas - 3,100 metric tons/yearEurope - 8,900 metric tons/yrAsia - 3,900 metric tons/yr (in 1999)						
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Repres	sentative Metric 2:	Geographic Scope	Medium	× 1	2	Furope		
	Metric 3:	Applicability	Medium	$\times 2$	4	This document includes all uses of HBCD. Some uses are in scope and some are out of scope.		
	Metric 4: Metric 5:	Temporal Representativeness Sample Size	Medium N/A	$\times 2$	4 N/A	2004 This metric does not relate to this data type		
Domain 3: Access	sibility/Clari Motric 6:	ty Matadata Completeness	Low	× 1	3	Assessment or report provides results but the underlying		
	Metric 0.	Metadata Completeness	LOW	~ 1	5	methods, data sources, and assumptions are not fully trans- parent.		
Domain 4: Variab	oility and Ur Metric 7:	certainty Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty		
Overall Quality D	Determinatio	n†	Medium		2.1			

Source Citation: Type of Data Source Hero ID	Pinfa,. 201 Facility; R 3982156	16. Correction to article pinfa ne eports for Data or Information (ewsletter no64 'n Other than Expo	recylcing sure or I	of plast Release 1	ics containing hazardous substances'. Data;
EXTRACTION						
Parameter			Data			
Life Cycle Stage: Life Cycle Descrij Process Descriptio	ption (Subca	ategory of Use):	All HBCD General discuss Retardants Ass	sion abou sociation	it the Pl . No inf	nosphorous, Inorganic, & Nitrogen Flame formation was extracted.
EVALUATION						
Domain		Metric	Rating	MWF^{\star}	Score	Comments
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources
Domain 2: Repres	sentative	a 11 a		_		
	Metric 2: Matria 2:	Geographic Scope	Medium	$\times 1$	2	Europe
	Metric 3: Motric 4:	Applicability Temporal Representativeness	Unacceptable	$\times 2$ $\times 2$	8	Not detailed enough to provide data in scope.
	Metric 4:	Sample Size	N/A	~ 2	N/A	This metric does not relate to this data type
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty
Overall Quality D	Determinatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.4.

* MWF = Metric Weighting Factor

Source Citation: Pinfa,.	Pinfa, 2010. Innovative and sustainable flame retardants in transportations, non-halogenated phosphorus, inorganic and						
Type of Data SourceFacility;Hero ID3982171	Facility; Reports for Data or Information Other than Exposure or Release Data; 3982171						
EXTRACTION Parameter		Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Chemical Concentration:			Disposal/Recycling Electronics Source only contains generic information on electronics and electronics disposal /recycling: "According to the WEEE directive, plastics con- taining brominated flame retardants have to be separated before further treatment of the waste. The used polymer resins must be suitable for easy separation and they should be recyclable with standard processes." typically 10 to 20 percent halogenateed flame retardants for HIPS				
EVALUATION	Metric	Bating	MWF*	Score	Comments		
	Wiethe	Itatilig	101 00 1	50016	Comments		
Domain 1: Reliability Metric 1	: Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Representative							
Metric 2	: Geographic Scope	Medium	$\times 1$	2	Europe (Belgium)		
Metric 3	: Applicability	High	$\times 2$	2	Electronics recycling is in scope		
Metric 4	: Temporal Representativeness	High	$\times 2$	2	2010		
Metric 5	: Sample Size	Medium	$\times 1$	2	Range of concentration of flame retardants in electronics is provided; uncertain other statistics		
Domain 3: Accessibility/Cl	arity						
Metric 6	: Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.		
Domain 4. Variabilita 1	Incontainte						
Metric 7	: Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
	A				· ·		
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Source Citation:	Pinfa,. 2010. Innovative and sustainable flame retardants in transportations, non-halogenated phosphorus, inorganic and nitrogen flame retardants.						
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;						
Hero ID	3982171						
EVALUATION							
Domain	Metric	Rating	MWF^{\star}	Score	Comments		
Overall Quality D	$\operatorname{Petermination}^\dagger$	Medium		1.7			

Source Citation: Type of Data Source Hero ID	Structural Facility; R 3982180	Structural Insulated Panel, Association. 2017. Expanded polystyrene flame retardants. Facility; Reports for Data or Information Other than Exposure or Release Data; 3982180					
EXTRACTION							
Parameter			Data				
Life Cycle Stage: Life Cycle Descrip Process Descriptio	ption (Subca	ategory of Use):	Processing EPS formulation Fact sheet on tracted.	on flame ret	tardants	used in EPS . No information was ex-	
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
Domain 2: Repres	sentative						
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe	
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Not detailed enough to provide data in scope.	
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2017	
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type	
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.	
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty	
Overall Quality D	Determinatio	n [†]	Unacceptable		4	Metric Mean Score: 2.4.	

* MWF = Metric Weighting Factor

Source Citation:	Ipc,. 2007. RE: Norway's prohibition on certain hazardous substances in consumer products; Norway notification number 2007/9016/N under EU 98/34 procedure.							
Type of Data Source Hero ID	Facility; R 3982413	Facility; Reports for Data or Information Other than Exposure or Release Data; 3982413						
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description:			All HBCD IPC (Association Connecting Electronics Industries) comments on Nor- way's Prohibition on Certain Hazardous Substances in Consumer Prod- ucts; Norway Notification Number 2007/9016/N under EU 98/34 Pro- cedure					
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Repres	sentative				_			
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Europe		
	Metric 5: Metric 4:	Temporal Representativeness	Medium	$\times 2$ $\times 2$	0 4	Not detailed enough to provide data in scope.		
	Metric 5:	Sample Size	N/A	~ 2	N/A	This metric does not relate to this data type		
Domain 3: Access	sibility/Clari Metric 6:	ity Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.		
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty		
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.6.		
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Source Citation:	Ipc,. 2007. RE: Norway's prohibition on a 2007/9016/N under EU 98/34 procedure.	certain hazardo	ous substa	nces in o	consumer products; Norway notification number	
Type of Data Source Hero ID	Facility; Reports for Data or Information C 3982413	Facility; Reports for Data or Information Other than Exposure or Release Data; 3982413				
EVALUATION						
Domain	Metric	Rating	MWF^{\star}	Score	Comments	

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Sipa,. 2012 Facility; R 3982469	Sipa,. 2012. Technical bulletin no. 6: SIPs and HBCD flame retardants. Facility; Reports for Data or Information Other than Exposure or Release Data; 3982469					
EXTRACTION							
Parameter			Data				
Life Cycle Stage: Life Cycle Descrip Process Descriptio	ption (Subca	ategory of Use):	All HBCD Fact sheet abo extracted	out HBC	D in the	e US and Canada. No information was	
EVALUATION							
Domain		Metric	Rating	MWF^*	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
Domain 2: Repres	sentative						
	Metric 2:	Geographic Scope	High	$\times 1$	1	US	
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Not detailed enough to provide data in scope.	
	Metric 4:	Temporal Representativeness	High	$\times 2$	2 N / A	2012	
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type	
Domain 3: Access	ibility/Clar Metric 6:	ity Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.	
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Low	$\times 1$	3	No discussion of variability or uncertainty	
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.2.	

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Jpma,. 201 Facility; R 3982479	Jpma, 2016. Washington state chemical update. Facility; Reports for Data or Information Other than Exposure or Release Data; 3982479						
EXTRACTION								
Parameter			Data					
Life Cycle Stage:		Use	Use					
Life Cycle Description (Subcategory of Use): Process Description:		News article a Washington sta	HBCD in Children's products News article about the restriction of HBCD in children's products in Washington state. No information was extracted.					
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
Domain 2: Repres	sentative							
Domain 2. Hopro.	Metric 2:	Geographic Scope	High	$\times 1$	1	US		
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Not detailed enough to provide data in scope.		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2016		
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.		
Domain 4: Variab	oility and Ur Motric 7:	ncertainty Matadata Completeness	Low	× 1	3	No dissussion of variability or uncertainty		
	metric 7.	metadata Completeness	LUW	^ 1	0	no discussion of variability or uncertainty		
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Unacceptable		4	Metric Mean Score: 2.2.		

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Orn, U.,Be Facility; R 3986477	ergman, A 2004. An attempt to eports for Data or Information (o assess the pres Other than Expo	ent comr sure or I	nercial j Release	production of brominated flame retardants. Data;	
EXTRACTION							
Parameter			Data				
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description:			All HBCD Provides a list of brominated flame retardants that are commercially available. No information was extracted.				
EVALUATION							
Domain		Metric	Rating	MWF^{\star}	Score	Comments	
Domain 1: Reliab	ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources	
Domain 2: Repres	sentative						
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Sweden	
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Not detailed enough to provide data in scope.	
	Metric 4: Metric 5:	Sample Size	N/A	× Z	4 N/A	2003 This metric does not relate to this data type	
Domain 3: Access	sibility/Clari Metric 6:	ity Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.	
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness			Low	$\times 1$	3	No discussion of variability or uncertainty	
Overall Quality Determination [†]			Unacceptable		4	Metric Mean Score: 2.6.	

* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	2012. Burning Questions, ENFIRO 2-day workshop. Facility; Reports for Data or Information Other than Exposure or Release Data; 3986542								
EXTRACTION									
Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description:			All HBCD Provides a con	All HBCD					
Tiocess Description.			Does not provi	de extra	ctable ir	formation.			
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources			
Domain 2: Repres	sentative	<u> </u>	0						
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	Brussels			
	Metric 3:	Applicability	Unacceptable	$\times 2$	8	Not detailed enough to provide data in scope.			
	Metric 4: Metric 5:	Sample Size	N/A	X Z	Z N/A	2012 This metric does not relate to this data type			
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.			
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness			Low	$\times 1$	3	No discussion of variability or uncertainty			
Overall Quality Determination [†]			Unacceptable		4	Metric Mean Score: 2.4.			

* MWF = Metric Weighting Factor

Source Citation:	Echa, 2009. Data on manufacture, import, export, uses and releases of HBCDD as well as information on potential alternatives to its use								
Type of Data Source Hero ID	Facility; Reports for Data or Information Other than Exposure or Release Data; 3809166								
EXTRACTION Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Total Annual U.S. Volume (and percent of PV):			All HBCD Provides process descriptions that are taken from the EURAR (HERO ID 3970747) Provides european data on the market breakdown of HBCD use (Pages 2 - 3)						
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources			
Domain 2: Repre	sentative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	Medium Medium High N/A	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \end{array}$	2 4 2 N/A	Multiple European countries Provides infomration on both in-scope and out of scope uses. 2009 This metric does not relate to this data type			
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	fully transparent.			
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness		High	× 1	1	discussion of variability or uncertainty				
Overall Quality D	Determinatio	n [†]	High		1.4				

Source Citation:	S. Tatman. 2017. Comment submitted by Stacy Tatman, MS, JD, Director, Environmental Affairs, Alliance of Automobile Manufacturers (Alliance). Alliance of Automobile Manufacturers.									
Type of Data Source Hero ID	Facility; R 3986667	Facility; Reports for Data or Information Other than Exposure or Release Data; 3986667								
EXTRACTION Parameter			Data							
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description:				Use Auto replacement parts Our members have indicated to us that this chemical is not used during the auto manufacturing process. HBCD has been aggressively phased out by the auto industry over the past several years. However, the chemical may still be used by some automakers as a flame retardant in coatings of certain components (e.g., dashboards and headliners) and in solder paste in interior components (e.g., circuits). This chemical may also be present in adhesives and foams.						
EVALUATION Domain		Metric	Rating	MWF^{\star}	Score	Comments				
Domain 1: Reliab	ility Metric 1:	Methodology	Medium	× 1	2	The assessment or report uses high quality data and/or tech- niques that are not from trusted sources (industry associa- tion); however, Associated information does not indicate flaws or quality issues.				
Domain 2: Repres	sentative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	High High High N/A	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \end{array}$	1 2 2 N/A	US in scope 2017 This metric does not relate to this data type				
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Medium	$\times 1$	2	Data sources are generally described but not fully transparent.				
Domain 4: Variab	ility and Un Metric 7:	ncertainty Metadata Completeness	N/A		N/A	This metric does not relate to this data type				
Continued on next page										

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Source Citation:	5. Tatman. 2017. Comment submitted by Stacy Tatman, MS, JD, Director, Environmental Affairs, Alliance of Automobile									
Type of Data Source Hero ID	Manufacturers (Alliance). Alliance of Automobile Manufacturers. Facility; Reports for Data or Information Other than Exposure or Release Data; 3986667									
EVALUATION										
Domain	Metric	Rating	MWF^{\star}	Score	Comments					
Overall Quality I	High		1.3							

Source Citation: Type of Data Source	 J. M. Rege. 2017. Comment submitted by Julia M. Rege, Director, Environment & Energy, Association of Global Automakers, Inc. (Global Automakers). Association of Global Automakers, Inc. Facility; Reports for Data or Information Other than Exposure or Release Data; 								
Hero ID	3986785								
EXTRACTION Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description:			Use Auto replacement parts Our members, in an effort to provide duediligence, have reviewed avail- able data related to the use of HBCD and have not identified any on- going uses in the manufacture of new vehicles. However, both CASRNs 25637-99-4 and 3194-55-6 have been and arecurrently being used in the manufacture of replacement parts only-replacement parts designed prior to the dateof publication of the HBCD scoping document and, more importantly, prior to the publication of any rulemaking in the Federal Register.						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	Medium	× 1	2	The assessment or report uses high quality data and/or tech- niques that are not from trusted sources (industry associa- tion); however, Associated information does not indicate flaws or quality issues.			
Domain 2: Repres	sentative Metric 2:	Geographic Scope	High	× 1	1	US			
	Metric 3: Motric 4:	Applicability Tomporal Representativeness	High High	$\times 2$ $\times 2$	2	in scope			
	Metric 5:	Sample Size	N/A	~ 2	N/A	This metric does not relate to this data type			
Domain 3: Access	ibility/Clari Metric 6:	ity Metadata Completeness	Medium	× 1	2	Data sources are generally described but not fully transparent.			
Domain 4: Variab	ility and Ur	ncertainty							
Continued on next page									

- continued from previous page										
Source Citation:	J. M. Rege. 2017. Comment submitted by Julia M. Rege, Director, Environment & Energy, Association of Global Automakers, Inc. (Global Automakers). Association of Global Automakers, Inc. Eacility: Reports for Data or Information Other than Exposure or Belease Data:									
Hero ID	3986785	3986785								
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
	Metric 7:	Metadata Completeness	N/A		N/A	This metric does not relate to this data type				
Overall Quality I	High		1.3							

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Source Citation: Type of Data Source	Safer Chemicals. 2017. Comments to the U.S. Environmental Protection Agency (EPA) on the Scope of its Risk Evaluation for the TSCA Work Plan Chemicals: CYCLIC ALIPHATIC BROMIDE CLUSTER or HEXABROMOCYCLODODECANE (HBCD) CAS Reg. Nos. 25637-99-4, 3194-55-6, 3194-57-8. Submitted on March 15, 2017. Facility; Reports for Data or Information Other than Exposure or Release Data;									
	4100100									
EXTRACTION			Data							
			Data							
Life Cycle Stage:			Use							
Life Cycle Descrip	otion (Subca	ategory of Use):	Service lif	le le						
Total Annual U.S	. Volume (a	nd percent of PV):	100 millio	n pound	s in serv	vice				
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
Domain 1: Reliab	ility									
	Metric 1:	Methodology	Medium	× 1	2	The assessment or report uses high quality data and/or tech- niques that are not from trusted sources; however, Associated information does not indicate flaws or quality issues.				
Domain 2. Poppor	antativa									
Domain 2: Repres	Motric 2.	Geographic Scope	High	~ 1	1	IIC				
	Metric 3:	Applicability	High	$^{\wedge 1}$ $\times 2$	2	US				
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2017				
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type				
Domain 3: Access	sibility/Clar	ity			_					
	Metric 6:	Metadata Completeness	Medium	$\times 1$	2	Data sources are generally described but not fully transparent.				
Domain 4. Variah	ility and Ur	acortainty								
Domain 4. Variau	Metric 7.	Metadata Completeness	Medium	× 1	2	Provides limited discussion				
		motadata compreteness	mourum	~ 1	4					
Overall Quality Determination [†]		High		1.4						
			8							

Source Citation: Type of Data Source Hero ID	ECB. 2003 Facility; R 196375	ECB. 2003. Technical guidance document on risk assessment: Part II. Facility; Reports for Data or Information Other than Exposure or Release Data; 196375								
EXTRACTION										
Parameter			Data							
Life Cycle Stage:			Import							
Life Cycle Descrip	ption (Subca	ategory of Use):	Import							
Operating Days per Year and Batches per Day:			B-tables f	for $IC =$	2: CHE	MICAL INDUSTRY: BASIC CHEMICALS				
EVALUATION										
Domain		Metric	Rating	\mathbf{MWF}^{\star}	Score	Comments				
Domain 1: Reliab	oility Metric 1:	Methodology	Low	× 1	3	The data sources for these tables are not transparently speci- fied				
Domain 2: Repres	sentative									
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	European Union				
	Metric 3:	Applicability	Medium	$\times 2$	4	The data in the report is for an occupational scenario that is similar to importation				
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2003				
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type				
Domain 3: Access	sibility/Clar	ity								
	Metric 6:	Metadata Completeness	Medium	$\times 1$	2	Data sources are generally described but not fully transparent.				
Domain 4: Variab	bility and Un Metric 7:	ncertainty Metadata Completeness	Medium	× 1	2	The report provides only limited discussion of the variability and uncertainty in the results.				
Overall Quality D	Determinatio	\mathbf{n}^{\dagger}	Medium		2.1					

Source Citation: Type of Data Source Hero ID	ECB. 2003 Facility; R 196375	ECB. 2003. Technical guidance document on risk assessment: Part II. Facility; Reports for Data or Information Other than Exposure or Release Data; 196375								
EXTRACTION										
Parameter			Data							
Life Cycle Stage:			Processin	o						
Life Cycle Descrip	otion (Subca	ategory of Use):	All polym	o ner proce	ssing op	erations				
Operating Days p	er Year and	Batches per Day:	B-tables f	for $IC =$	11: POI	LYMERS INDUSTRY				
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
Domain 1: Beliah	ility									
	Metric 1:	Methodology	Low	$\times 1$	3	The data sources for these tables are not transparently specified				
Domain 2: Repres	sentative									
	Metric 2:	Geographic Scope	Medium	$\times 1$	2	European Union				
	Metric 3:	Applicability	Medium	$\times 2$	4	The data in the report is for an occupational scenario that is similar to importation				
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2003				
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type				
Domain 3: Access	sibility/Clar	ity								
	Metric 6:	Metadata Completeness	Medium	$\times 1$	2	Data sources are generally described but not fully transparent.				
Domain 4. Variah	ilitar and Ha	a conta inter								
	Metric 7:	Metadata Completeness	Medium	× 1	2	The report provides only limited discussion of the variability and uncertainty in the results.				
Overall Quality D	eterminatio	\mathbf{n}^{\dagger}	Medium		2.1					

Source Citation: Type of Data Source Hero ID	ECB. 2003 Facility; R 196375	ECB. 2003. Technical guidance document on risk assessment: Part II. Facility; Reports for Data or Information Other than Exposure or Release Data; 196375								
EXTRACTION										
Parameter			Data							
Life Cycle Stage:			Use							
Life Cycle Descrip	ption (Subca	ategory of Use):	Solder ap	plication						
Operating Days per Year and Batches per Day:			B-tables f	for $IC =$	4: ELE	CTRICAL/ELECTRONIC INDUSTRY				
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
Domain 1. Reliah	vility									
	Metric 1:	Methodology	Low	$\times 1$	3	The data sources for these tables are not transparently speci- fied				
Domain 2: Repres	sentative									
Domain 2. Ropio	Metric 2:	Geographic Scope	Medium	$\times 1$	2	European Union				
	Metric 3:	Applicability	Medium	$\times 2$	4	The data in the report is for an occupational scenario that is similar to importation				
	Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2003				
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type				
Domain 3: Access	sibility/Clar	ity								
	Metric 6:	Metadata Completeness	Medium	$\times 1$	2	Data sources are generally described but not fully transparent.				
Domain 4: Variat	Dility and Un	Metalata Conversioner	M		0					
	Metric 7:	Metadata Completeness	Medium	× 1	2	The report provides only limited discussion of the variability and uncertainty in the results.				
Overall Quality D	Determinatio	\mathbf{n}^{\dagger}	Medium		2.1					

Source Citation:	U.S. Environmental Protection Agency. 2016. Technical review of hexabromocyclododecane (HBCD): CAS registry numbers									
Type of Data Source Hero ID	Facility; Reports for Data or Information Other than Exposure or Release Data; 3350607									
EXTRACTION										
Parameter			Data							
			4.11							
Life Cycle Stage:			All							
Life Cycle Descrij	ption (Subca	ategory of Use):	All The media			A				
Process Description	on:		faara (ED	use of H	IBCD IS	s as a name retardant in expanded polystyrene $(\mathbf{X}\mathbf{PS})$ There is little rule				
			lichod inf	s) and e	about t	the distribution of HPCD in the United States				
			however	data for t	the Eur	opean Union (EU) market shows that about 96				
			percent o	f HBCD	is used	in EPS and XPS (ECHA 2009) HBCD may				
			also be us	ed as a f	lame re	tardant in textiles. In addition, HBCD is used				
			as a flame	e retardai	nt in hig	th impact polystyrene (HIPS) for electrical and				
				applian	ces.					
Total Annual U.S	. Volume (a	nd percent of PV):	This analysis assumes a total import/production volume of 10-50 million							
			pounds for HBCD, as reported in the 2006 IUR (U.S. EPA, 2006).							
Chemical Concent	tration:		EPS boar	rds conta	ain app	roximately 0.5-0.7 percent HBCD by weight,				
			while XP	while XPS insulation contains approximately 0.8-2.5 percent HBCD by						
			weight (UNEP, 2011).							
EVALUATION										
Domain		Metric	Rating	MWF^*	Score	Comments				
Domain 1: Beliah	vility									
Domain 1. Itenae	Metric 1:	Methodology	Medium	× 1	2	EPA is a trusted source				
		internetacios,	mourain		_					
Domain 2: Repres	sentative									
_	Metric 2:	Geographic Scope	High	$\times 1$	1	United States				
	Metric 3:	Applicability	High	$\times 2$	2	The report lists conditions of use of HBCD in the United States				
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2016				
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type				
	·1 ·1· / / / / 1	•,								
Domain 3: Access	Motrie 6	Ity Motodoto Completeness	Uich	× 1	1					
	Metric 0:	metadata Completeness	піgn	× 1	1	Data sources are fully transparent.				
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Source Citation:	U.S. Environmental Protection Agency. 2016. Technical review of hexabromocyclododecane (HBCD): CAS registry numbers 3194-55-6 and 25637-99-4.								
Type of Data Source Hero ID	Facility; Reports 3350607	Facility; Reports for Data or Information Other than Exposure or Release Data; 3350607							
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 4: Variab	ility and Uncerta Metric 7: Met	inty adata Completeness	Medium	× 1	2	The report provides limited discussion on the variability of these uses in the United States.			
Overall Quality D	$Petermination^{\dagger}$		High		1.3				

Source Citation:	U.S. Department of Housing and Urban Development. 2016. American housing survey, components of inventory change: 20112013.									
Type of Data Source Hero ID	Facility; Reports for Data or Information Other than Exposure or Release Data; 6386974									
EXTRACTION Parameter			Data							
Life Cycle Stage:			Use							
Life Cycle Descrip	otion (Subca	tegory of Use):	Demolit	ion and	Disposa	ıl				
Process Description	on:		Informa	tion on	changes	to the US housing market between 2011-2013				
			(numbe	r of hous	ses lost f	to demolition or disaster)				
Number of Sites:			470,000	houses	lost bet	tween 2011-2013. Total of 132,419,000 houses				
			present	in 2011.	Loss fra	action of 0.00355.				
EVALUATION										
Domain		Metric	Rating	MWF^{\star}	Score	Comments				
	_									
Domain 1: Reliab	ility									
	Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources				
Domain 2: Repres	sentative									
	Metric 2:	Geographic Scope	High	$\times 1$	1	US				
	Metric 3:	Applicability	High	$\times 2$	2	in scope				
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	Source published in 2016, data from 2011-2013				
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type				
Domain 3: Access	sibility/Clar	ity								
	Metric 6:	Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.				
Domain 4: Variah	oility and Ur	ncertainty								
	Metric 7:	Metadata Completeness	High	$\times 1$	1	well characterized				
			0		-					
Overall Quality F	eterminatio	\mathbf{n}^{\dagger}	High		1.0					
Overan Quality E			111511		1.0					

Source Citation:	U.S. Department of Housing and Urban Development. 2016. American housing survey, components of inventory change: 20112013.								
Type of Data Source Hero ID	Facility; Reports for Data or Information Other than Exposure or Release Data; 6386974								
EXTRACTION Parameter			Data						
			Data						
Life Cycle Stage:			Use						
Life Cycle Descrip	ption (Subca	ategory of Use):	Constru	iction					
Process Description	on:		Informa	ation on	changes	to the US housing market between 2011-2013			
			(newly	construct	ted hou	ses)			
Number of Sites:			1,160,00	00 houses	s constr	ucted between 2011-2013. Total of 132,419,000			
			houses	present in	n 2011.	Increase fraction of 0.00876.			
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
	_								
Domain 1: Reliab	oility		TT: 1	1	1				
	Metric 1:	Methodology	High	× 1	1	Information is from trusted sources			
Domain 2: Repres	sentative								
	Metric 2:	Geographic Scope	High	$\times 1$	1	US			
	Metric 3:	Applicability	High	$\times 2$	2	in scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	Source published in 2016, data from 2011-2013			
	Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type			
Domain 3: Access	sibility/Clar	ity	TT· 1	1	1				
	Metric 6:	Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4. Variat	vility and U	ncertainty							
Domain 4. Variat	Metric 7.	Metadata Completeness	High	× 1	1	well characterized			
			111611	~ 1	1	won ondractioniziou			
Overall Quality F)eterminatio	\mathbf{n}^{\dagger}	High		1.0				
					1.0				

Source Citation: Type of Data Source Hero ID	U.S. Census Bureau. 2019. Building permits survey, Table 1a: New privately owned housing units authorized. Facility; Reports for Data or Information Other than Exposure or Release Data; 6387687							
EXTRACTION Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description:			Use Demolition and Disposal Data on changes to the US housing market (number of housing lost or gained year to year). 4 percent increase in housing market between 2017- 2018 and a 1 percent decrease in the housing market between Aug 2018 and Aug 2019.					
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from trusted sources		
Domain 2: Repres	sentative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	High High High N/A	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \end{array}$	1 2 2 N/A	US in scope 2019 This metric does not relate to this data type		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.		
Domain 4: Variab	oility and Ur Metric 7:	ncertainty Metadata Completeness	Medium	$\times 1$	2	No discussion of variability or uncertainty		
Overall Quality D	eterminatio	n†	High		1.4			

Data Data Life Cycle Stage: Life Cycle Description (Subcateory of Use): Process Description: Number of Sites: Use Life Cycle Description (Subcateory of Use): Process Description: Number of Sites: Use Life Cycle Description (Subcateory of Use): Number of Sites: Use Life Cycle Description: Number of Sites: Use Life Cycle Description: Number of Sites: Use Life Cycle Description: Nummary Use Life Cycle Description: Numericities: Nummary Use Life Cycle Description: Numericities: Nummary Use Life Cycle Description: Numericities: Numericities: Numericities: Nummary Use Life Cycle Description: Numericities: Numericities: Nummary Use Life Cycle Description: Numericities: Nummary Use Life Cycle Description: Numericities: Numericities: Num	Source Citation: Type of Data Source Hero ID	Citation:Waste Business Journal. 2019. Directory of waste processing & disposal sites 2019 (US edition).Data SourceFacility; Reports for Data or Information Other than Exposure or Release Data; 6387396								
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Use Demolition and Disposal Information on number of different types of waste disposal facilities cur- reuly operating in US (full text not available, information taken from summary) 1,120 CKD Landfills, 3,835 Waste Transfer Stations, 1,903 Material Re- covery facilities, and 108 Waste to Energy facilities EVALUATION Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology Medium × 1 2 The assessment or report uses high quality data and/or tech- niques that are not from trusted sources; however, Associated information does not indicate flaws or quality issues. Domain 2: Representative Metric 3: High × 1 1 Us Metric 4: Temporal Representative High × 2 2 100 Domain 3: Accessibility/Charity Metric 4: Metric 8: N/A N/A This metric does not relate to this data type Domain 3: Accessibility/Clarity Metric 7: Metric 7: Metadata Completeness Low × 1 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- purcet. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Medium × 1 2 No discussion of variability or uncertainty metho	EXTRACTION Parameter			Data						
Number of Sites: 1,120 C&D Landfills, 3,835 Waste Transfer Stations, 1,993 Material Recovery facilities, and 108 Waste to Energy facilities EVALUATION Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology Medium × 1 2 The assessment or report uses high quality data and/or techniques that are not from trusted sources; however, Associated information does not indicate flaws or quality issues. Domain 2: Representative Metric 2: Geographic Scope High × 1 1 US Metric 3: Applicability High × 2 2 in scope Metric 4: Temporal Representativeness High × 2 2 1009 Metric 5: Sample Size N/A N/A This metric does not relate to this data type Domain 3: Accessibility/Clarity Low × 1 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent. Domain 4: Variability and Uncertainty Medium × 1 2 No discussion of variability or uncertainty Metric 7: Metadata Completeness Medium × 1 2 No discussion of variability or uncertainty	Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description:			Use Demolition and Disposal Information on number of different types of waste disposal facilities cur- rently operating in US (full text not available, information taken from						
EVALUATION Domain Metric Rating MWF* Score Comments Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology Medium $\times 1$ 2 The assessment or report uses high quality data and/or techniques that are not from trusted sources; however, Associated information does not indicate flaws or quality issues. Domain 2: Representative Metric 2: Geographic Scope High $\times 1$ 1 US Metric 3: Applicability High $\times 2$ 2 in scope Metric 4: Temporal Representativeness High $\times 2$ 2 2019 Metric 5: Sample Size N/A N/A N/A This metric does not relate to this data type Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low $\times 1$ 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent. Domain 4: Variability and Uncertainty Medium $\times 1$ 2 No discussion of variability or uncertainty Overall Quality Determination [†] High 1.5 1.5 Continu	Number of Sites:			1,120 C& covery fac) D Landfi cilities, ar	lls, 3,83 nd 108 '	5 Waste Transfer Stations, 1,993 Material Re- Waste to Energy facilities			
Domain Metric Rating MWF* Score Comments Domain 1: Reliability Metric 1: Methodology Medium × 1 2 The assessment or report uses high quality data and/or techniques that are not from trusted sources; however, Associated information does not indicate flaws or quality issues. Domain 2: Representative Metric 2: Geographic Scope High × 1 1 US Metric 3: Applicability High × 2 2 in scope Metric 4: Temporal Representativeness High × 2 2 2019 Metric 5: Sample Size N/A N/A This metric does not relate to this data type Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low × 1 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent. Domain 4: Variability and Uncertainty Medium × 1 2 No discussion of variability or uncertainty Overall Quality Determination [†] High 1.5	EVALUATION									
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Domain		Metric	Rating	MWF*	Score	Comments			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Domain 1: Reliab	ility Metric 1:	Methodology	Medium	$\times 1$	2	The assessment or report uses high quality data and/or tech- niques that are not from trusted sources; however, Associated information does not indicate flaws or quality issues.			
Domain 2: Representative Metric 2: Geographic Scope High \times 1 1 US Metric 3: Applicability High \times 2 2 in scope Metric 4: Temporal Representativeness High \times 2 2 2019 Metric 5: Sample Size N/A N/A N/A This metric does not relate to this data type Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low \times 1 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Medium \times 1 2 No discussion of variability or uncertainty Overall Quality Determination [†] High 1.5 Low \times 1 2 No discussion of variability or uncertainty										
$\begin{array}{c cccc} & \operatorname{High} & \times 1 & 1 & 0 \\ & \operatorname{Metric 2:} & \operatorname{Geographic Scope} & \operatorname{High} & \times 2 & 2 & \operatorname{in scope} \\ & \operatorname{Metric 3:} & \operatorname{Applicability} & \operatorname{High} & \times 2 & 2 & 2019 \\ & \operatorname{Metric 4:} & \operatorname{Temporal Representativeness} & \operatorname{High} & \times 2 & 2 & 2019 \\ & \operatorname{Metric 5:} & \operatorname{Sample Size} & \operatorname{N/A} & \operatorname{N/A} & \operatorname{This metric does not relate to this data type} \\ \hline & \operatorname{Domain 3:} & \operatorname{Accessibility/Clarity} & \\ & \operatorname{Metric 6:} & \operatorname{Metadata Completeness} & \operatorname{Low} & \times 1 & 3 & \operatorname{Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent. \\ \hline & \operatorname{Domain 4:} & \operatorname{Variability} \text{ and Uncertainty} & \\ & \operatorname{Metric 7:} & \operatorname{Metadata Completeness} & \operatorname{Medium} & \times 1 & 2 & \operatorname{No discussion of variability or uncertainty} \\ \hline & \operatorname{Overall Quality Determination}^{\dagger} & \operatorname{High} & 1.5 & \\ \hline & \operatorname{Continued on next page} \end{array}$	Domain 2: Repres	Matria 2	Coorrespin Soon o	II: mb	× 1	1	Ho.			
Metric 5. Applicability Ingit \times 2 2 in stope Metric 4: Temporal Representativeness High \times 2 2 2019 Metric 5: Sample Size N/A N/A N/A This metric does not relate to this data type Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low \times 1 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Medium \times 1 2 No discussion of variability or uncertainty Overall Quality Determination [†] High 1.5 Continued on next page		Metric 2: Metric 3:	Applicability	пі <u>g</u> п High	$\times 1$ $\times 2$	1	US			
Metric 5: Sample Size N/A N/A N/A Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low × 1 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Medium × 1 2 No discussion of variability or uncertainty Overall Quality Determination [†] High 1.5 Image		Metric 4:	Temporal Representativeness	High	$\times 2 \times 2$	$\frac{2}{2}$	2019			
Domain 3: Accessibility/Clarity Metric 6: Metadata Completeness Low × 1 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Medium × 1 2 No discussion of variability or uncertainty Overall Quality Determination [†] High 1.5 Continued on next page Continued on next page		Metric 5:	Sample Size	N/A	~ -	N/A	This metric does not relate to this data type			
Domain 3: Accessionity/Charty Low $\times 1$ 3 Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent. Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Medium $\times 1$ 2 No discussion of variability or uncertainty Overall Quality Determination [†] High 1.5 Continued on next page	Domain 2. Accord	:h:l:ter/Clam	:							
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Medium × 1 2 No discussion of variability or uncertainty Overall Quality Determination [†] High 1.5 Continued on next page	Domain 5. Access	Metric 6:	Metadata Completeness	Low	$\times 1$	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.			
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness Medium × 1 2 No discussion of variability or uncertainty Overall Quality Determination [†] High 1.5 Continued on next page										
Overall Quality Determination [†] High 1.5 Continued on next page	Domain 4: Variab	Metric 7:	Metadata Completeness	Medium	$\times 1$	2	No discussion of variability or uncertainty			
Continued on next page	Overall Quality Determination [†]		High		1.5					
		Continued on next page								

			P	F0-	
Source Citation: Type of Data Source Hero ID	Waste Business Journal. 2019. Directory of Facility; Reports for Data or Information C 6387396	waste pro ther than	cessing & Exposure	z disposal e or Relea	sites 2019 (US edition). ee Data;
EVALUATION					
Domain	Metric	Rating	MWF^{\star}	Score	Comments

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* MWF = Metric Weighting Factor

Source Citation: Type of Data Source Hero ID	Energy Recovery Council. 2018. 2018 Directory of waste-to-energy facilities. Facility; Reports for Data or Information Other than Exposure or Release Data; 6387323								
EXTRACTION Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Number of Sites:				Use Demolition and Disposal Information on number of waste-to-energy facilities operating in the US and variation in number between 2001 - 2018 Between 75 - 97 facilities operating between 2001 - 2018. 75 active in 2018.					
EVALUATION Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	oility Metric 1:	Methodology	Medium	$\times 1$	2	The assessment or report uses high quality data and/or tech- niques that are not from trusted sources; however, Associated information does not indicate flaws or quality issues.			
Domain 2: Repre	sentative Metric 2: Metric 3: Metric 4: Metric 5:	Geographic Scope Applicability Temporal Representativeness Sample Size	High High High N/A	$\begin{array}{c} \times \ 1 \\ \times \ 2 \\ \times \ 2 \end{array}$	1 2 2 N/A	US in scope 2018 This metric does not relate to this data type			
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	High	$\times 1$	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Varial	bility and Un Metric 7:	ncertainty Metadata Completeness	High	× 1	1	well characterized			
Overall Quality I	Determinatio	\mathbf{n}^{\dagger}	High		1.1				

Source Citation:U.Type of Data SourceFaHero ID63	urce Citation:U.S. Environmental Protection Agency. 2015. Incident waste decision support tool (I-WASTE DST).rpe of Data SourceFacility; Reports for Data or Information Other than Exposure or Release Data;ero ID6387324								
EXTRACTION Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Number of Sites:			Use Demolition and Disposal Waste tool that provides information on a variety of waste treatment and disposal facilities (count, location, capacity) 1,577 C&D Landfills included for reporting year 2015 and 3,864 Waste Transfer Stations included for reporting year 2016						
EVALUATION Domain		Metric	Rating	MWF*	Score	Comments			
Domain 1: Reliability	y etric 1:	Methodology	High	× 1	1	Information is from trusted sources			
Domain 2: Represent	ative	Coographic Scope	High	× 1	1	IIS			
M	etric 2. $etric 3$	Applicability	High	$^{\land 1}$ $^{\lor 2}$	1				
M	etric 4.	Temporal Representativeness	High	$\times 2$	2	Reporting years 2015 and 2016			
M	etric 5:	Sample Size	N/A	~ -	N/A	This metric does not relate to this data type			
Domain 3: Accessibil M	ity/Clari etric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness		High	× 1	1	well characterized				
Overall Quality Determination [†]			High		1.0				

U.S. Environmental Protection Agency. 2008. Lifecycle construction resource guide. Facility; Reports for Data or Information Other than Exposure or Release Data; 6388408							
		Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Number of Sites:			Use Demolition and Disposal more than one quarter of the buildings that existed in the year 2000 are expected to be replaced by the year 2030 in the U.S. more than one quarter of the buildings that existed in the year 2000 are expected to be replaced by the year 2030 in the U.S.				
	N/ / T	D (:		q			
	Metric	Rating	MWF'^	Score	Comments		
ility Metric 1:	Methodology	High	$\times 1$	1	Information is from trusted sources		
sentative							
Metric 2:	Geographic Scope	High	$\times 1$	1	US		
Metric 3:	Applicability	High	$\times 2$	2	in scope		
Metric 4:	Temporal Representativeness	Medium	$\times 2$	4	2008		
Metric 5:	Sample Size	N/A		N/A	This metric does not relate to this data type		
sibility/Clar Metric 6:	ity Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.		
Domain 4: Variability and Uncertainty Metric 7: Metadata Completeness		Low	$\times 1$	3	No discussion of variability or uncertainty with respect to these data		
Overall Quality Determination ^{\dagger}				1.5			
	U.S. Envir Facility; R 6388408 Detion (Subcator) on: illity Metric 1: Metric 2: Metric 2: Metric 2: Metric 3: Metric 3: Metric 5: sibility/Clar: Metric 6: Determinatio	U.S. Environmental Protection Agency. 20 Facility; Reports for Data or Information 6 6388408	U.S. Environmental Protection Agency. 2008. Lifecyc Facility; Reports for Data or Information Other than 6388408 Data Data Data Use Demolitic more than expected Metric Rating Metric 1: Methodology High sentative Metric 2: Geographic Scope High Metric 3: Applicability High Metric 4: Temporal Representativeness Medium Metric 5: Sample Size N/A sibility/Clarity Metric 6: Metadata Completeness High Determination [†] High	U.S. Environmental Protection Agency. 2008. Lifecycle construct Facility; Reports for Data or Information Other than Exposure 6388408 Data Dotion (Subcategory of Use): Use Demolition and Dimore than one quate expected to be reported to	U.S. Environmental Protection Agency. 2008. Lifecycle construction i Facility; Reports for Data or Information Other than Exposure or Re 6388408 Data Data Use Demolition and Disposal more than one quarter of expected to be replaced b more than one quarter of expected to be replaced b Metric Rating MWF* Score ility Metric 1: Methodology High × 1 sentative Metric 2: Geographic Scope High × 1 Metric 5: Sample Size N/A N/A Metric 6: Metadata Completeness Metric 7: Metadata Completeness Life x 1 willity and Uncertainty Low x 1 wetermination [†] High 1.5		

Source Citation:	Morf, L. S., Tremp, J., Gloor, R., Huber, Y., Stengele, M., Zennegg, M 2005. Brominated flame retardants in waste electrical and electronic equipment: substance flows in a recycling plant. Environmental Science and Technology.								
Hero ID	Facility; R 1927802	eports for Data or Information (Other than	Exposur	e or Re	lease Data;			
EXTRACTION			_						
Parameter			Data						
Life Cycle Stage:			Disposal/	Recvclin	ıg				
Life Cycle Descrip	otion (Subca	ategory of Use):	Waste of	Electric	and Ele	ctronic Equipment (WEEE)			
Process Description	on:	/	Manual d	ismantlii	ng, auto	matic separation (crushing, sieving, magnetic/			
			density/e	lectrosta	tic sepa	ration). See process flow diagram in Figure 1.			
Total Annual U.S	. Volume (a	nd percent of PV):	30,000 me	etric ton	/yr at tl	he studies site (in Switzerland); (7.6 percent)			
			plastic ob	jects col	ntained	detectable amounts of BFRs; 0.23 percent of			
Chemical Concent	tration		Mean co	ncentrati	on of F	IBCD in small WEEE - 17 mg HBCD/kg			
enemiear concern	iration.		WEEE: N	lean con	centrati	on in plastic components only = $60 \text{ mg HBCD}/$			
			kg; Conce	kg; Concentrations in specific WEEE in table 3					
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1. Reliab	ility								
	Metric 1:	Methodology	High	$\times 1$	1	Information is from peer-reviewed journal article			
D : O D	, , .								
Domain 2: Repres	Motrie 2:	Coographic Scope	Modium	~ 1	9	Caritanaland			
	Metric 2.	Applicability	High	$^{\wedge 1}$	2	Switzeriand			
	Metric 4:	Temporal Representativeness	Medium	$\times 2 \times 2$	4	2005			
	Metric 5:	Sample Size	Medium	× 1	2	Concentration data provided as means with uncertain other statistics			
Domain 3: Access	sibility/Clar	ity Mata lata Gammalatan an	TT:l.	1	1				
	metric o:	Metadata Completeness	піgn	X I	1	Assessment or report clearly documents its data sources, as- sessment methods, results, and assumptions.			
Domain 4: Variab	ility and U	ncertainty							
		Con	tinued on 1	next page	e				

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Source Citation:	ion: Morf, L. S., Tremp, J., Gloor, R., Huber, Y., Stengele, M., Zennegg, M 2005. Brominated flame retardants in waste electrical and electronic equipment: substance flows in a recycling plant. Environmental Science and Technology.								
Horo ID	Facility; Reports for Data or Information Other than Exposure or Release Data;								
Hero ID	1927802	1927802							
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
	Metric 7:	Metadata Completeness	High	$\times 1$	1	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.			
Overall Quality I	\mathbf{n}^{\dagger}	High		1.4					

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* MWF = Metric Weighting Factor

Source Citation:	U.S. Environmental Protection Agency. 2016. Implementation Study of the Electronics Recycling Standards: R2 and e-Stewards".								
Type of Data Source Hero ID	Facility; Reports for Data or Information Other than Exposure or Release Data; 6558185								
EXTRACTION									
Parameter			Data						
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Number of Sites:				Disposal/Recycling Electronics recycling 550 U.S. electronics recycling facilities are certified to one or both of these standards (Responsible Recycling (R2) or e-Stewards)					
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from an EPA publication			
Domain 2: Bopros	sontativo								
Domain 2. Repres	Metric 2:	Geographic Scope	High	× 1	1	US			
	Metric 3:	Applicability	High	$\times 2$	2	Electronics recycling is in scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2016			
	Metric 5:	Sample Size	Low	$\times 1$	3	One value is provided and is characterized by no statistics.			
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Medium	$\times 1$	2	Data sources are generally described but not fully transparent.			
Domain 4: Variab	oility and Un Metric 7:	ncertainty Metadata Completeness	Low	× 1	3	The report does not address variability or uncertainty.			
Overall Quality Determination [†]			High		1.6				
Source Citation: Type of Data Source Hero ID	U.S. Environmental Protection Agency. 2019. Durable Goods: Product-Specific Data. Facility; Reports for Data or Information Other than Exposure or Release Data; 6558186								
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EXTRACTION Parameter	TION eter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Process Description: Total Annual U.S. Volume (and percent of PV):			Disposal/Recycling Electronics recycling The total number of tons of consumer electronics generated and recycled is provided. Data available for 2000 - 2017. For 2015 (used in RE), 3,100 thousand US tons generated and 1,230 recycled						
EVALUATION									
Domain		Metric	Rating	MWF^{\star}	Score	Comments			
Domain 1: Reliab	ility Metric 1:	Methodology	High	× 1	1	Information is from an EPA website			
Domain 2: Repres	sentative								
	Metric 2:	Geographic Scope	High	$\times 1$	1	US			
	Metric 3:	Applicability	High	$\times 2$	2	Electronics recycling is in scope			
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2015			
	Metric 5:	Sample Size	Low	$\times 1$	3	One value per year is provided and is characterized by no statis- tics.			
Domain 3: Access	sibility/Clar	ity							
	Metric 6:	Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.			
Domain 4: Variat	oility and Ur	ocertainty							
	Metric 7:	Metadata Completeness	Low	× 1	3	The report does not address variability or uncertainty.			
Overall Quality Determination ^{\dagger}			Medium		1.7				

* MWF = Metric Weighting Factor

[†] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3 .

Source Citation: Type of Data Source Hero ID	e-Stewards. 2020. http://e-stewards.org/data/list-recyclers/. Facility; Reports for Data or Information Other than Exposure or Release Data; 6558187							
EXTRACTION			_					
Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use):			Disposal/Recycling Electronics recycling					
Number of Sites:			47 certified sites; 0 uncertified in the United States					
EVALUATION								
Domain		Metric	Rating	MWF^{\star}	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	Low	× 1	3	The data, data sources, and/or techniques used in the assess- ment or report are not specified.		
Domain 2: Representative								
*	Metric 2:	Geographic Scope	High	$\times 1$	1	US		
	Metric 3:	Applicability	High	$\times 2$	2	Electronics recycling is in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2020		
	Metric 5:	Sample Size	High	$\times 1$	1	Name of each recycler (discrete data points) is provided		
Domain 3: Accessibility/Clarity								
	Metric 6:	Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.		
Domain 4: Variability and Uncertainty								
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	The report does not address variability or uncertainty.		
Overall Quality Determination ^{\dagger}			Medium		1.7			

* MWF = Metric Weighting Factor
[†] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation: Type of Data Source Hero ID	Sustainable Electronics Recycling International. 2020. Find a Recycler. https://sustainableelectronics.org/recyclers. Facility; Reports for Data or Information Other than Exposure or Release Data; 6558188							
EXTRACTION								
Parameter			Data					
Life Cycle Stage: Life Cycle Description (Subcategory of Use): Number of Sites:			Disposal/Recycling Electronics recycling 672 certified sites; 27 uncertified sites in the United States					
EVALUATION								
Domain		Metric	Rating	$\rm MWF^{\star}$	Score	Comments		
Domain 1: Reliab	ility Metric 1:	Methodology	Low	× 1	3	The data, data sources, and/or techniques used in the assessment or report are not specified.		
Domain 2: Ropro	contativo							
Domain 2. Repres	Metric 2:	Geographic Scope	High	× 1	1	US		
	Metric 3:	Applicability	High	$\times 2$	2	Electronics recycling is in scope		
	Metric 4:	Temporal Representativeness	High	$\times 2$	2	2020		
	Metric 5:	Sample Size	High	$\times 1$	1	Name of each recycler (discrete data points) is provided		
Domain 3: Access	sibility/Clar Metric 6:	ity Metadata Completeness	Low	× 1	3	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully trans- parent.		
Domain 4: Variability and Uncertainty								
	Metric 7:	Metadata Completeness	Low	$\times 1$	3	The report does not address variability or uncertainty.		
Overall Quality Determination [†]			Medium		1.7			

* MWF = Metric Weighting Factor
[†] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.