Final Risk Evaluation for Cyclic Aliphatic Bromides Cluster (HBCD)

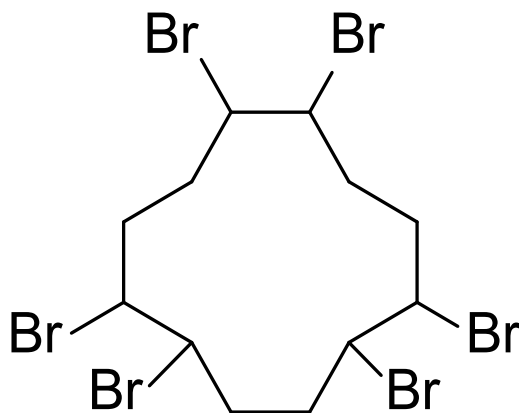## Supplemental Information File:

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:	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

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial Use
Life Cycle Description (Subcategory of Use):	Insulation products in buildings
Release Source:	Emission from EPS and XPS insulation samples from manufacturers, measured in chamber tests
Environmental Media:	Air
Release or Emission Factor:	See table 5. Emission is ng of HBCD per m2 of insulation per hour. EPS = 4 ng/m2-h and 1 ng/m2-h. XPS = 29 ng/m2-h and 0.1 ng/m2-h.
Release Estimation Method:	Measured

EVALUATION

Domain		Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Represents release in a chamber and may not be fully representative of the circumstances during actual use
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Germany
	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	Medium	× 1	2	There are two insulation samples with four test results - is cahracterized but may not be representative
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Release circumstances are fully characterized
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Discusses how sample type, chamber temperature, and chamber size may affect results

Continued on next page

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 Determination†		High		1.6	

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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:	ToxNet Hazardous Substances Data, Bank. 2017. HSDB: Hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970277

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Release Source:	HBCD in sewage sludge from EPA's 2001 National Sewage Sludge Survey
Disposal /Treatment Method:	Sewage sludge to Biosolids, land applications, incineration, landfill
Environmental Media:	Water, Land
Release Estimation Method:	Measured
Annual Release Quantity (kg/yr):	101-127 kg/yr to biosolids; 49.9-75.9 to land application; 20.8-26 to incineration; 17.7-20.9 kg/yr to landfill
Waste Treatment Method:	Sewage sludge to Biosolids, land applications, incineration, landfill

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	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	Captures releases from all possible stages, some of which are not in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2001
	Metric 5:	Sample Size	Low	× 1	3	Sample size not listed, just cites the National Sewage Sludge Survey
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	Low	× 1	3	The report does not address variability or uncertainty with respect to this data element.
Overall Quality Determination[†]			Medium		1.9	

Source Citation:	ToxNet Hazardous Substances Data, Bank. 2017. HSDB: Hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970277

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:	Nicnas,. 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34.	
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;	
Hero ID	3978355	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS /XPS Compounding and converting
Environmental Media:	Water, Land, Air, Incineration
Release or Emission Factor:	Loss fractions cited from the 2004 Plastics Compounding and Converting ESD
Release Estimation Method:	Estimated
Release Days per Year:	2004 Plastics Compounding and Converting ESD
Number of Sites:	2004 Plastics Compounding and Converting ESD

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Information is from 2004 Plastics Compounding and Converting ESD
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	OECD
	Metric 3:	Applicability	Medium	× 2	4	EPS compounding not in scope, but other scenarios are
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2004
	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	Medium	× 1	2	Limited discussion on uncertainty and variability
Overall Quality Determination[†]			Medium		1.9	

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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:	Nicnas,. 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3978355

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial Use
Life Cycle Description (Subcategory of Use):	Insulation products in buildings
Release Source:	Life of EPS /XPS insulation
Environmental Media:	Air and water
Release Estimation Method:	Estimated
Annual Release Quantity (kg/yr):	1.4 (Air) and 1.4 (Water)

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	Australia
	Metric 3: Applicability	High	× 2	2	Occupational scenario (use of insulation in offices).
	Metric 4: Temporal Representativeness	High	× 2	2	2012
	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	Discusses variability and uncertainty
Overall Quality Determination[†]		High		1.3	

* 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:	2014. The 2012 annual effluent guidelines review report.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3860559

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Release Source:	Data from the United Kingdom indicate that the primary sources of HBCD release are fugitive emissions during its manufacture and subsequent use in products, leaching from landfills, and incinerator emissions
Environmental Media:	50 percent to WWT, 29 percent surface water, 21 percent air
Release Estimation Method:	Measured
Annual Release Quantity (kg/yr):	3100

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	EU
	Metric 3: Applicability	Medium	× 2	4	Captures releases from all possible stages, some of which are not in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	Metric 5: Sample Size	Low	× 1	3	Information stated from Europe, unknown sample size
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	Discusses variability and uncertainty with regards to limitations on how European data can be applied to US
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:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Insulation products in buildings
Release Source:	Building and construction waste
Release or Emission Factor:	Information from industry shows that, in 1992, out of the total construction- and demolition (C&D) waste, plastic waste was 0.4 percent 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

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	Low	× 2	6	1992
	Metric 5: Sample Size	Low	× 1	3	Distribution 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.
Overall Quality Determination†		Medium		1.8	

* 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.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Formulation of EPS and HIPS
Environmental Media:	WW, surface water, air
Release Estimation Method:	Measured
Annual Release Quantity (kg/yr):	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:	1 to 340
Number of Sites:	13

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	Medium	× 2	4	HIPS similar but not in scope
	Metric 4:	Temporal Representativeness	High	× 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/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.
Overall Quality Determination[†]			High		1.3	

Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970747

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:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Formulation of EPS and HIPS
Environmental Media:	WW, surface water, air
Release Estimation Method:	Estimated for sites that did not provide data using the 90th percentile of measured values from sites that did provide data
Annual Release Quantity (kg/yr):	Table 3-6 = 22.8 (surface water), 2.2 (air)
Release Days per Year:	300
Number of Sites:	6

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	Medium	× 2	4	HIPS similar but not in scope
	Metric 4:	Temporal Representativeness	High	× 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/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.
Overall Quality Determination†			High		1.3	

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Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970747

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:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS Compounding /Masterbatch
Environmental Media:	surface water, air
Release Estimation Method:	Measured
Annual Release Quantity (kg/yr):	Table 3-9 = 0.12 to 37 (WW) and 1.2 to 3.3 (air)
Release Days per Year:	300
Number of Sites:	3

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	Use is in scope
	Metric 4: Temporal Representativeness	High	× 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/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.
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:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS Compounding /Masterbatch
Environmental Media:	surface water, air
Release Estimation Method:	Estimated for sites that did not provide data using the 90th percentile of measured values from sites that did provide data
Annual Release Quantity (kg/yr):	Table 3-10 = 26 (WW), 2.6 (air)
Release Days per Year:	300
Number of Sites:	11

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	Use is in scope
	Metric 4:	Temporal Representativeness	High	× 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/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.
Overall Quality Determination[†]			High		1.1	

Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970747

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:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS Converting
Environmental Media:	WW, surface water, air
Release Estimation Method:	Estimated
Annual Release Quantity (kg/yr):	Table 3-16 = 20.4 (surface water), 82 (WW), 102 (Air)
Release Days per Year:	Table 3-5
Number of Sites:	hundreds

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	Use is in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	Metric 5: Sample Size	Low	× 1	3	Distribution of samples 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.
Overall Quality Determination†		High		1.3	

* 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.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS converting
Environmental Media:	WW, air
Release Estimation Method:	Measured
Annual Release Quantity (kg/yr):	Table 3-19 = 0 to 4.2 (WW), 0.31 to 18 (air)
Release Days per Year:	15 to 300
Number of Sites:	4

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	Use is in scope
	Metric 4: Temporal Representativeness	High	× 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/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.
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:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS converting
Environmental Media:	WW, air
Release Estimation Method:	Estimated for sites that did not provide data using the 90th percentile of measured values from sites that did provide data
Annual Release Quantity (kg/yr):	Table 3-20 = 7.9 (WW), 17.4 (air)
Number of Sites:	13

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	Use is in scope
	Metric 4: Temporal Representativeness	High	× 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/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.
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:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS from HBCD powder
Environmental Media:	WW, air
Release Estimation Method:	Measured
Annual Release Quantity (kg/yr):	Table 3-22 = 0.00004 to 15 (WW), 0.15 to 3.8 (air)
Number of Sites:	18

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	Use is in scope
	Metric 4: Temporal Representativeness	High	× 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/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.
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:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial Use
Life Cycle Description (Subcategory of Use):	Insulation products in buildings
Release Source:	emission from boads during service life
Environmental Media:	surface water, WW, air
Release or Emission Factor:	release factor = 8.4E-06; 5 ug/m2 insulation/yr
Release Estimation Method:	estimates taken from sources
Annual Release Quantity (kg/yr):	Table 3-33 = 54 (air), 0 (surface water and WW)

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	sources date back to 2002
	Metric 5:	Sample Size	Low	× 1	3	Distribution 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.
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:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Insulation products in buildings
Release Source:	demolotion of buildings
Disposal /Treatment Method:	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:	incineration
Release or Emission Factor:	5E-06 release factor from incineration to WW or air
Release Estimation Method:	estimated

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	Use is in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	Metric 5: Sample Size	Low	× 1	3	Distribution 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.
Overall Quality Determination†		High		1.3	

Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970747

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:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Recycling
Life Cycle Description (Subcategory of Use):	Insulation products in buildings
Release Source:	demolotion of buildings - breaking boards for recycling
Release or Emission Factor:	90 g EPS-particles/tonne EPS; 0 g XPS particles/tonne XPS
Release Estimation Method:	Measured

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	Use is in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	Metric 5: Sample Size	Low	× 1	3	Distribution 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.
Overall Quality Determination†		High		1.3	

* 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.				
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;				
Hero ID	3970747				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Insulation products in buildings
Release Source:	demolotion of buildings - breaking boards for disposal
Release or Emission Factor:	release factor of 0.1 percent
Release Estimation Method:	estimated

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	Use is in scope
Metric 4:	Temporal Representativeness	High	× 2	2	2008
Metric 5:	Sample Size	Low	× 1	3	Distribution characterized by no statistics.
Domain 3: Accessibility/Clarity					
Metric 6:	Metadata Completeness	Unacceptable	× 1	4	Assessment list source as Anonymous and is not included in the list of references
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†		Unacceptable		4	Metric Mean Score: 1.7.

Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	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

† 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,. 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970748

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS /XPS Converting
Environmental Media:	Water, Land, Air, Incineration
Release or Emission Factor:	Loss fractions cited from the 2004 Plastics Converting ESD
Release Estimation Method:	Estimated
Release Days per Year:	2004 Plastics Converting ESD
Number of Sites:	2004 Plastics Converting ESD

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Information is from 2004 Plastics Converting ESD
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	OECD
	Metric 3:	Applicability	High	× 2	2	In scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2004
	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	Medium	× 1	2	Limited discussion on uncertainty and variability
Overall Quality Determination[†]			Medium		1.7	

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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:	Echa,. 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970748

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Cutting of EPS boards
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 Media:	50 percent to surface water and 50 percent to air or landfill
Release or Emission Factor:	100 g/tonnes HBCDD from cutting of boards
Release Estimation Method:	Estimated
Annual Release Quantity (kg/yr):	95 percent of the particles generated during cutting operations are assumed to end up in waste.
Release Days per Year:	?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:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	High	× 2	2	Use is in scope
	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 in the results. Uncertainty is well characterized.

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

EVALUATION

Domain	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:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Sawing and cutting of EPS and XPS boards
Release Source:	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:	50 percent to surface water and 50 percent to air or landfill
Release or Emission Factor:	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
Release Estimation Method:	Measured
Annual Release Quantity (kg/yr):	95 percent of the particles generated during cutting operations are assumed to end up in waste.

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	Use is in scope
	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 in the results. Uncertainty is well characterized.

Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970747

EVALUATION

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

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	cutting of EPS boards 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 Media:	50 percent to surface water and 50 percent to air
Release or Emission Factor:	10 g particulates/tonnes EPS
Release Estimation Method:	Estimated - During professional use (i.e.at construction sites) it is estimated that only 10 percent of boards are cut
Release Days per Year:	250

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	Use is in scope
	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 in the results. Uncertainty is well characterized.

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

EVALUATION

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

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	cutting of XPS boards 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 Media:	50 percent to surface water and 50 percent to air
Release or Emission Factor:	5 g XPS particlesper tonne XPS
Release Estimation Method:	Estimated

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	Use is in scope
	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 in the results. Uncertainty is well characterized.
Overall Quality Determination[†]		High		1.6	

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

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:	Echa,. 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified.	
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;	
Hero ID	3970748	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial Use
Life Cycle Description (Subcategory of Use):	Insulation products in buildings
Release Source:	service life of EPS boards at construction sites
Environmental Media:	water, land, incineration
Release or Emission Factor:	No loss of HBCD is expected to occur in the foam during service life, even when exposed to natural light.
Release Estimation Method:	The service life of the boards is estimated as 30 to 100 years.
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 uncertainty in the results. Uncertainty is well characterized.
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:	Echa,. 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970748

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial Use
Life Cycle Description (Subcategory of Use):	Insulation products in buildings
Release Source:	service life of EPS boards at construction sites
Environmental Media:	air
Release or Emission Factor:	release factor = 8.4E-06
Release Estimation Method:	over a 100 year service life
Daily Release Quantity (kg/day):	1.8E-05 kg/day
Annual Release Quantity (kg/yr):	6.7E-03 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	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 in the results. Uncertainty is well characterized.
Overall Quality Determination†		High		1.6	

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

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:	Echa,. 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970748

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Insulation products in buildings
Release Source:	demolition - breaking boards
Environmental Media:	50 percent is assumed to go to waste water and 50 percent to air.
Release or Emission Factor:	90 g EPS-particles/tonne EPS
Release Estimation Method:	taken from EU RAR
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	Use is in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2008
	Metric 5:	Sample Size	Low	× 1	3	Distribution 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.
Overall Quality Determination†			High		1.3	

* 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,. 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970748

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Insulation products in buildings
Release Source:	demolition - disposal of boards
Disposal /Treatment Method:	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:	incineration
Release or Emission Factor:	5E-06 release factor from incineration to WW or air
Release Estimation Method:	taken from EU RAR
Release Days per Year:	330

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	Use is in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2008
	Metric 5:	Sample Size	Low	× 1	3	Distribution 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

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

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination†		High		1.3	

* 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,. 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified, Part 2.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970753

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	formulation of EPS beads
Release Source:	Waste-water from the reaction process
Environmental Media:	wastewater
Release or Emission Factor:	2 g per tonne of HBCDD used
Release Estimation Method:	informtation from industry
Release Days per Year:	?330 days

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	Medium	× 2	4	EPS compounding not in scope but may provide insight into XPS compounding
	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						
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination†			High		1.6	

* 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:	Echa,. 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified, Part 2.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970753

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	formulation of EPS beads
Release Source:	waste packaging contaminated with the substance, filters, filter dust and off-spec product
Disposal /Treatment Method:	release of less than 0.001 percent of the flame retardant put into the incinerator
Environmental Media:	incineration
Release or Emission Factor:	<0.5 percent of the HBCDD used to incineration
Release Estimation Method:	informtation from industry
Release Days per Year:	?330 days

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	Medium	× 2	4	EPS compounding not in scope but may provide insight into XPS compounding
	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						
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.

Source Citation:	Echa,. 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified, Part 2.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970753

EVALUATION

Domain	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:	Echa,. 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified, Part 2.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970753

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	formulation of EPS beads
Environmental Media:	landfill
Release or Emission Factor:	1 g per tonne of HBCDD used
Release Estimation Method:	informtation from industry
Release Days per Year:	?330 days

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	Medium	× 2	4	EPS compounding not in scope but may provide insight into XPS compounding
	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					
	Metric 7: Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination[†]		High		1.6	

[*] 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:	Echa,. 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970750

EXTRACTION

Parameter	Data
Life Cycle Stage:	manufacturing
Life Cycle Description (Subcategory of Use):	manufacturing
Release Estimation Method:	Estimated - see table 3
Annual Release Quantity (kg/yr):	2 kg/yr (air); <1 kg/y (WW)
Number of Sites:	1

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	Medium	× 2	4	Manufacturing not in scope but maybe can be applied to importation
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	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.
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:	Echa,. 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970750

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Cutting of EPS boards
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 Media:	air
Release or Emission Factor:	100 g/tonnes HBCDD from cutting of boards
Release Estimation Method:	taken from EU RAR

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	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: 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	Medium	× 1	2	limited discussion
Overall Quality Determination†		High		1.4	

Source Citation:	Echa,. 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970750

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:	Echa,. 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified.	
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;	
Hero ID	3970750	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	cutting of XPS boards 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 Media:	air
Release or Emission Factor:	5 g XPS particlesper tonne XPS
Release Estimation Method:	taken from EU RAR

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	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: 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	Medium	× 1	2	limited discussion
Overall Quality Determination†		High		1.4	

Source Citation:	Echa,. 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970750

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:	Echa,. 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970750

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial Use
Life Cycle Description (Subcategory of Use):	Insulation products in buildings
Release Source:	service life of EPS and XPS boards at construction sites
Environmental Media:	air
Release Estimation Method:	measured
Annual Release Quantity (kg/yr):	70 kg/year

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	High	× 2	2	2008
	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	Medium	× 1	2	limited discussion
Overall Quality Determination†		High		1.4	

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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:	Echa,. 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970750

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS Compounding /Masterbatch
Environmental Media:	air, wastewater, surface water
Release Estimation Method:	Estimated - see table 3
Annual Release Quantity (kg/yr):	14 kg/y (air), 84 kg/y (WW), 10 kg/y (surface water)

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	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: 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	Medium	× 1	2	limited discussion
Overall Quality Determination†		High		1.4	

* 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,. 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified.	
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;	
Hero ID	3970750	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS and HIPSformulation
Environmental Media:	air, wastewater, surface water
Release Estimation Method:	Estimated - see table 3
Annual Release Quantity (kg/yr):	30 kg/y (air), 75 kg/y (WW), 330 kg/y (surface water)

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	Medium	× 2	4	EPS and HIPS compounding not in scope but may provide insight into XPS compounding
Metric 4:	Temporal Representativeness	High	× 2	2	2008
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	Medium	× 1	2	limited discussion
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.

Source Citation:	Echa,. 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970750

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS converting from beads to foam
Environmental Media:	air, wastewater, surface water
Release Estimation Method:	Estimated - see table 3
Annual Release Quantity (kg/yr):	159 kg/y (air), 128 kg/y (WW), 31 kg/y (surface water)

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	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: 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	Medium	× 1	2	limited discussion
Overall Quality Determination†		High		1.4	

⋆ 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,. 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970750

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS converting from beads to foam
Environmental Media:	air, wastewater, surface water
Release Estimation Method:	Estimated - see table 3
Annual Release Quantity (kg/yr):	146 kg/y (air), 63 kg/y (WW), 16 kg/y (surface water)

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	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: 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	Medium	× 1	2	limited discussion
Overall Quality Determination[†]		High		1.4	

[*] 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,. 2015. RAC and SEAC Opinion on an application for authorisation for hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970755

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Insulation products in buildings
Release Source:	demolition - disposal of EPS boards
Environmental Media:	incineration
Release or Emission Factor:	90 g HBCD/tonne EPS boards
Release Estimation Method:	proposed by industry
Annual Release Quantity (kg/yr):	3.20 tonnes/yr (if 32,000 tonnes HBCDD are used)

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Medium	× 1	2	Not from trusted sources; however, Associated information does not indicate flaws or quality issues
Domain 2: Representative					
	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	2014
	Metric 5: Sample Size	Low	× 1	3	characterized by no statistics.
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Low	× 1	3	report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	Fully addresses variability and 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.

Source Citation:	Echa,. 2015. RAC and SEAC Opinion on an application for authorisation for hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970755

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	construction /installation of EPS boards at consrtuction sites
Environmental Media:	unknown
Release or Emission Factor:	10 g HBCD/tonne EPS boards
Release Estimation Method:	proposed by industry
Annual Release Quantity (kg/yr):	1.97 tonnes/yr (if 32,000 tonnes HBCDD are used)

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Medium	$\times 1$	2	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	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: Accessibility/Clarity					
	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: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	$\times 1$	1	Fully addresses variability and 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.

Source Citation:	European Flame Retardants, Association. 2016. Fireaway! the EFRA newsletter.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3981170

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal /Recycle
Life Cycle Description (Subcategory of Use):	HIPS
Release Source:	Household waste
Environmental Media:	In Belgium, 71 percent of household waste is reused, recycled or composted; 27 percent is incinerated; <1 percent is landfilled
Release or Emission Factor:	4 percent of all plastics (not just household) are recycled

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Low	× 1	3	The data, data sources, and/or techniques used in the assessment or report are not specified.
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	Belgium
	Metric 3: Applicability	High	× 2	2	Disposal of HIPs materials, including packging, is in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2016
	Metric 5: Sample Size	Low	× 1	3	characterized by no statistics.
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Low	× 1	3	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	does not address variability or uncertainty
Overall Quality Determination†		Medium		2.0	

⋆ 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:	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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;	
Hero ID	3575294	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Insulation products in buildings
Release Source:	sorting and crushing
Environmental Media:	air
Release 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		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Journal article
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	China
	Metric 3:	Applicability	High	× 2	2	disposal in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2016
	Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative
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	Fully addresses variability and uncertainty
Overall Quality Determination[†]			High		1.2	

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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3575294

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:	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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;	
Hero ID	3575294	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Insulation products in buildings
Release Source:	landfilling of foam insulation
Environmental Media:	landfill
Release or Emission Factor:	7039.00 ?g/kg of HBCD found in foam in landfills

EVALUATION

Domain	Metric	Rating	MWF[*]	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Journal article
Domain 2: Representative					
	Metric 2: Geographic Scope	Low	× 1	3	China
	Metric 3: Applicability	High	× 2	2	disposal in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2016
	Metric 5: Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative
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	Fully addresses variability and uncertainty
Overall Quality Determination[†]		High		1.2	

[*] 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:	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	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS compounding
Release Source:	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 Media:	water
Release or Emission Factor:	7.60E-06
Release Estimation Method:	taken from 2008 EU assessment (HERO 3970747)
Release Days per Year:	300

EVALUATION

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	Europe
Metric 3:	Applicability	Medium	× 2	4	EPS and HIPS compounding not in scope but may provide insight into XPS compounding
Metric 4:	Temporal Representativeness	High	× 2	2	2008
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.

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	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:	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

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS compounding
Release Source:	This is the emission factor for a generic site and is equal to the maximum emission factor calculated from site-specific data that pertain to three processing steps including formulation of EPS and XPS compounds.
Environmental Media:	air
Release or Emission Factor:	7.60E-06
Release Estimation Method:	taken from 2008 EU assessment (HERO 3970747)
Release Days per Year:	300
Number of Sites:	13

EVALUATION

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	Europe
	Metric 3:	Applicability	Medium	× 2	4	EPS and HIPS compounding not in scope but may provide insight into XPS compounding
	Metric 4:	Temporal Representativeness	High	× 2	2	2008
	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						

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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	MWF*	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination†		High		1.6	

* 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:	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	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS compounding
Release Source:	These values are reasonable worst case values that are the sums of emission 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 Media:	water
Release or Emission Factor:	6.80E-03
Release Estimation Method:	taken from 2012 Australian assessment (HERO 3978355)
Release Days per Year:	150

EVALUATION

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	Medium	× 2	4	EPS and HIPS compounding not in scope but may provide insight into XPS compounding
	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						

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	MWF*	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination†		High		1.6	

* 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:	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

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS compounding
Release Source:	These values are reasonable worst case values that are the sums of emission 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 Media:	air
Release or Emission Factor:	2.50E-04
Release Estimation Method:	taken from 2012 Australian assessment (HERO 3978355)
Release Days per Year:	150

EVALUATION

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	Medium	× 2	4	EPS and HIPS compounding not in scope but may provide insight into XPS compounding
	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						

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	MWF*	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination†		High		1.6	

* 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:	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

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS Converting
Release Source:	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:	water
Release or Emission Factor:	3.00E-05
Release Estimation Method:	taken from 2008 EU assessment (HERO 3970747)
Release Days per Year:	300

EVALUATION

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	Europe
	Metric 3:	Applicability	High	× 2	2	in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2008
	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.

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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	MWF*	Score	Comments
Overall Quality Determination†		High		1.3	

* 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:	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

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS Converting
Release Source:	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:	air
Release or Emission Factor:	3.00E-05
Release Estimation Method:	taken from 2008 EU assessment (HERO 3970747)
Release Days per Year:	300

EVALUATION

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	Europe
	Metric 3: Applicability	High	× 2	2	in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	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.

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	MWF[*]	Score	Comments
Overall Quality Determination[†]		High		1.3	

[*] 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:	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

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	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 or Emission Factor:	1.60E-03
Release Estimation Method:	taken from 2012 Australian assessment (HERO 3978355)
Release Days per Year:	200

EVALUATION

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						

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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	MWF*	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination†		High		1.3	

* 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:	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

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	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:	air
Release or Emission Factor:	1.60E-03
Release Estimation Method:	taken from 2012 Australian assessment (HERO 3978355)
Release Days per Year:	200

EVALUATION

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					

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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	MWF*	Score	Comments
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination†			High		1.3	

* 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:	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			

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Compounding of Polystyrene Resin to Produce XPS Masterbatch
Release Source:	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.
Environmental Media:	water
Release or Emission Factor:	7.40E-06
Release Estimation Method:	taken from 2008 EU assessment (HERO 3970747)
Release Days per Year:	300

EVALUATION

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	Europe
	Metric 3: Applicability	High	× 2	2	in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	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.
Overall Quality Determination†		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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3809277

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:	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

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Compounding of Polystyrene Resin to Produce XPS Masterbatch
Release Source:	This is the emission factor for a generic site and is equal to the maximum emission factor calculated from site-specific data that pertain to three processing steps including formulation of EPS and XPS compounds.
Environmental Media:	air
Release or Emission Factor:	7.30E-06
Release Estimation Method:	taken from 2008 EU assessment (HERO 3970747)
Release Days per Year:	300

EVALUATION

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	Europe
	Metric 3: Applicability	High	× 2	2	in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	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.

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	MWF*	Score	Comments
Overall Quality Determination[†]		High		1.3	

* 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:	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

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Compounding of Polystyrene Resin to Produce XPS Masterbatch
Release Source:	This is the emission factor for a generic site and is the sum of emission factors for handling and compounding organic solid flame retardants with particle sizes <40 ?m that are of relatively medium volatility as reported in OECD (2004b).
Environmental Media:	water
Release or Emission Factor:	6.60E-03
Release Estimation Method:	taken from 2011 Canadian assessment
Release Days per Year:	60 or 200

EVALUATION

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	Canada
	Metric 3:	Applicability	High	× 2	2	in scope
	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.

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	MWF[*]	Score	Comments
Overall Quality Determination[†]		High		1.3	

[*] 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:	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

EXTRACTION

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:	water
Release or Emission Factor:	2.60E-05
Release Days per Year:	1

EVALUATION

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	Europe
	Metric 3: Applicability	High	× 2	2	in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	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					

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	MWF[*]	Score	Comments
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination[†]			High		1.3	

[*] 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:	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

EXTRACTION

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

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	Europe
Metric 3:	Applicability	High	× 2	2	in scope
Metric 4:	Temporal Representativeness	High	× 2	2	2008
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					

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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	MWF*	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination†		High		1.3	

* 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:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970756

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 Media:	72 percent WW, 22 percent SW, 6 percent air
Release or Emission Factor:	0.1 percent of PV
Release Estimation Method:	taken from 2008 EU assessment (HERO 3970747)
Annual Release Quantity (kg/yr):	8.7 tonnes/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	Medium	× 2	4	Captures releases from all possible stages, some of which are not in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2008
	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	Medium	× 1	2	limited discussion
Overall Quality Determination†			Medium		1.7	

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Source Citation:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970756

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:	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	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	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 Media:	72 percent WW, 22 percent SW, 6 percent air
Release or Emission Factor:	0.1 percent of PV
Release Estimation Method:	taken from 2008 EU assessment (HERO 3970747)
Annual Release Quantity (kg/yr):	8.7 tonnes/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	Medium	× 2	4	Captures releases from all possible stages, some of which are not in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2008
	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	Medium	× 1	2	limited discussion
Overall Quality Determination†			Medium		1.7	

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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	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	3970757

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:	Echa,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.	
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;	
Hero ID	3970759	

EXTRACTION

Parameter	Data
Life Cycle Stage:	manufacturing
Life Cycle Description (Subcategory of Use):	manufacturing
Environmental Media:	air and wastewater
Release Estimation Method:	same as HERO ID 3970750
Annual Release Quantity (kg/yr):	2 kg/yr (air); 0.73 kg/y (WW)

EVALUATION

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	Europe
	Metric 3:	Applicability	Medium	× 2	4	Manufacturing not in scope but maybe can be applied to importation
	Metric 4:	Temporal Representativeness	High	× 2	2	2008
	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	Medium	× 1	2	limited discussion
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.

Source Citation:	Echa,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.				
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3970759				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial Use
Life Cycle Description (Subcategory of Use):	Insulation products in buildings
Release Source:	service life of EPS and XPS boards at construction sites
Environmental Media:	air
Release Estimation Method:	same as HERO ID 3970751
Annual Release Quantity (kg/yr):	70 kg/year

EVALUATION

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	Europe
	Metric 3: Applicability	High	× 2	2	Occupational scenario (use of insulation in offices).
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	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	Medium	× 1	2	limited discussion
Overall Quality Determination†		High		1.4	

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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:	Echa,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970759

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS Compounding /Masterbatch
Environmental Media:	air, wastewater, surface water
Release Estimation Method:	same as HERO ID 3970752
Annual Release Quantity (kg/yr):	14 kg/y (air), 84 kg/y (WW), 10 kg/y (surface water)

EVALUATION

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	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: 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	Medium	× 1	2	limited discussion
Overall Quality Determination†		High		1.4	

⋆ 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,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.	
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;	
Hero ID	3970759	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS and HIPSformulation
Environmental Media:	air, wastewater, surface water
Release Estimation Method:	same as HERO ID 3970753
Annual Release Quantity (kg/yr):	30 kg/y (air), 75 kg/y (WW), 330 kg/y (surface water)

EVALUATION

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	Europe
Metric 3:	Applicability	Medium	× 2	4	EPS and HIPS compounding not in scope but may provide insight into XPS compounding
Metric 4:	Temporal Representativeness	High	× 2	2	2008
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	Medium	× 1	2	limited discussion
Overall Quality Determination†		Medium		1.7	

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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:	Echa,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970759

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS converting from beads to foam
Environmental Media:	air, wastewater, surface water
Release Estimation Method:	same as HERO ID 3970754
Annual Release Quantity (kg/yr):	159 kg/y (air), 128 kg/y (WW), 31 kg/y (surface water)

EVALUATION

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	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: 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	Medium	× 1	2	limited discussion
Overall Quality Determination†			High		1.4	

* 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,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970759

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS converting from beads to foam
Environmental Media:	air, wastewater, surface water
Release Estimation Method:	same as HERO ID 3970755
Annual Release Quantity (kg/yr):	146 kg/y (air), 63 kg/y (WW), 16 kg/y (surface water)

EVALUATION

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	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: 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	Medium	× 1	2	limited discussion
Overall Quality Determination[†]		High		1.4	

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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:	European Flame Retardants, Association. 2013. Fireaway! the EFRA newsletter, Part 2.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3981171

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Disposal of packaging
Release Source:	Waste packaging
Environmental Media:	97 percent was incinerated while 3 percent went to controlled landfill

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	Low	× 1	3	The data, data sources, and/or techniques used in the assessment or report are not specified.
Domain 2: Representative					
Metric 2:	Geographic Scope	Medium	× 1	2	Belgium
Metric 3:	Applicability	High	× 2	2	Disposal of HIPs materials, including packging, is in scope
Metric 4:	Temporal Representativeness	High	× 2	2	2010-2014
Metric 5:	Sample Size	Low	× 1	3	characterized by no statistics.
Domain 3: Accessibility/Clarity					
Metric 6:	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†		Medium		2.0	

* 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:	European Flame Retardants, Association. 2013. Fireaway! the EFRA newsletter, Part 2.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3981171

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal /Recycle
Life Cycle Description (Subcategory of Use):	Waste of Electric and Electronic Equipment (WEEE)
Release Source:	Disposal /Recycling of WEEE is difficult due to difficulty in identifying the type of polymer when dissassembling electronics.
Disposal /Treatment Method:	12wt percent of collected WEEE plastics and and almost no FR plastics are currently recycled in Europe
Annual Release Quantity (kg/yr):	700,000 tons/yr of annual waste WEEE is expected to contain FRs (in Europe)

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Low	× 1	3	The data, data sources, and/or techniques used in the assessment or report are not specified.
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	Belgium
	Metric 3: Applicability	High	× 2	2	Eelectronics recycling plants are in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2010-2014
	Metric 5: Sample Size	Low	× 1	3	characterized by no statistics.
Domain 3: Accessibility/Clarity					
	Metric 6: 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†		Medium		2.0	

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Source Citation:	European Flame Retardants, Association. 2013. Fireaway! the EFRA newsletter, Part 2.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3981171

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:	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 the Environment; Environmental Release Data;
Hero ID	1676764

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	Wastewater treatment sludge
Release Source:	HBCD measured in anaerobic digestion and activated sludge
Disposal /Treatment Method:	Sewage sludge to soil application, compost, dump, thermal drying, agrarian, or dehydration.
Environmental Media:	water, land, incineration
Release or Emission Factor:	5.17 - 97.5 ng/g dry weight (dw) (mean - 19.3 ng/g dw)
Release Estimation Method:	Measured
Annual Release Quantity (kg/yr):	0.757 kg/yr
Number of Sites:	17

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	Spain
Metric 3:	Applicability	Medium	× 2	4	Captures releases from all possible stages, some of which are not in scope
Metric 4:	Temporal Representativeness	High	× 2	2	2013
Metric 5:	Sample Size	Medium	× 1	2	Sample size provided with some statitistical information such as recovery percent and relative standard deviation
Domain 3: Accessibility/Clarity					
Metric 6:	Metadata Completeness	High	× 1	1	Information is all clearly cited
Domain 4: Variability and Uncertainty					

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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	Releases to the Environment; Environmental Release Data;				
Hero ID	1676764				

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	The report does not address variability or uncertainty with respect to this data element.
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.

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	Releases to the Environment; Published Models for Exposures or Releases;
Hero ID	1927574

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal /Recycle
Life Cycle Description (Subcategory of Use):	Disposal of Waste of Electric and Electronic Equipment (WEEE)
Release Source:	Releases from canadian recycling facility and associated landfill. Article largely talks about environmental fate.
Disposal /Treatment Method:	Recycling and landfill
Annual Release Quantity (kg/yr):	Annual quantities of HBCD partitioned to each media is in Table 2 (based on releases at recyling /landfill site and fate modeling)

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	scientifically sound; no errors found
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Canada
	Metric 3:	Applicability	High	× 2	2	Eelectronics recycling plants are in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2013
	Metric 5:	Sample Size	N/A		N/A	Parameter is not applicable to models
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Model approach, equations, and choice of parameter values are transparent and clear
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	limited discussion
Overall Quality Determination†			High		1.3	

* 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:	Bsef,. 2009. HBCD hexabromocyclododecane fact sheet.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3981179

EXTRACTION

Parameter	Data
Life Cycle Stage:	manufacturing
Life Cycle Description (Subcategory of Use):	manufacturing
Number of Sites:	1
Waste Treatment Method:	Wastewater from the production process is treated at the plant by an advanced wastewater treatment facility including filtration, active carbon treatment and bio membrane reactor, resulting in effluents that can be safely discharged.

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Medium	× 1	2	Sources arent necessarily trusted but do not seem flawed
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	US
	Metric 3: Applicability	Unacceptable	× 2	8	Out of scope and not applicable to in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2009
	Metric 5: Sample Size	N/A		N/A	This metric is not applicable to this data type
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Medium	× 1	2	Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	The report does not address variability or uncertainty
Overall Quality Determination[†]		Unacceptable		4	Metric Mean Score: 2.2.

Source Citation:	Bsef,. 2009. HBCD hexabromocyclododecane fact sheet.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3981179

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

† 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:	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	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	1927576

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS Thermal Cutting
Release Source:	Thermal cutting operation modeled in a closed sampling system
Disposal /Treatment Method:	Particulate (dust)
Environmental Media:	Release rate per hour during the thermal cutting operation
Release or Emission Factor:	4.0E12 particles per hour released or 160.4 ug HBCD per hour released
Release Estimation Method:	Measured
Daily Release Quantity (kg/day):	1.2832E-06

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	Switzerland
	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	Information is all clearly cited
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
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:	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	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	1927576

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS Thermal Cutting
Release Source:	Thermal cutting operation modeled in a closed sampling system
Disposal /Treatment Method:	Particulate (dust)
Environmental Media:	Release rate per hour during the thermal cutting operation
Release or Emission Factor:	5.0E12 particles per hour released or 249.1 ug HBCD per hour released
Release Estimation Method:	Measured
Daily Release Quantity (kg/day):	1.9928E-06

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	Switzerland
	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	Information is all clearly cited
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
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:	European Flame Retardants, Association. 2015. Keeping fire in check an introduction to flame retardants used in transport applications.				
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3986543				

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Environmental Media:	water, air
Release or Emission Factor:	1.5 grams/ton HBCD (water); 47.3 grams/ton HBCD (air) (2013)
Release Estimation Method:	Estimated via industry survey

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	From industry survey
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	Medium	× 2	4	Captures releases from all possible stages, some of which are not in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	Unknown, but cites sources as recent as 2013
	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	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†			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:	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 the Environment; Environmental Release Data;	
Hero ID	1927645	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal /Recycle
Life Cycle Description (Subcategory of Use):	Disposal of Waste of Electric and Electronic Equipment (WEEE)
Release Source:	The mean concentrations of total HBCDs in the surface soils ranged from 0.22 to 0.79 and from 0.31 to 9.99 ng/g dw for two surrounding e-waste recycling sites and industrial areas.
Release Estimation Method:	90 soil samples were taken
Annual Release Quantity (kg/yr):	Estimates of 3.42 kg and 1.84 tonnes for the e-waste recycling areas and industrial areas (these areas include electronics, textiles, and building materials)

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	Medium	× 1	2	Release rate is an estimate for entire lifecycle
Domain 2: Representative					
Metric 2:	Geographic Scope	Low	× 1	3	China
Metric 3:	Applicability	High	× 2	2	Eelectronics recycling plants are in scope
Metric 4:	Temporal Representativeness	High	× 2	2	2011
Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity					
Metric 6:	Metadata Completeness	Unacceptable	× 1	4	Release data do not include any needed metadata to understand what the data represent and are not usable in the risk evaluation
Domain 4: Variability and Uncertainty					

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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 the Environment; Environmental Release Data;				
Hero ID	1927645				

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 1.7.

** 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

† 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:	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	Releases to the Environment; Environmental Release Data;	
Hero ID	1927802	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal /Recycle
Life Cycle Description (Subcategory of Use):	Disposal /Recycle of Waste of Electric and Electronic Equipment (WEEE)
Release Source:	Proportion of HBCD that ends up in various outputs from the recycling plant (fine particulates, copper cbles, printed circuit boards, plastic fractions) shown in figure 3
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-containing materials.
Release or Emission Factor:	0.002 percent to off-gas
Release Estimation Method:	Substance flow analysis and sampling

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	Medium	× 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: Representative					
Metric 2:	Geographic Scope	Medium	× 1	2	Switzerland
Metric 3:	Applicability	High	× 2	2	Eelectronics recycling plants are in scope
Metric 4:	Temporal Representativeness	Medium	× 2	4	2005
Metric 5:	Sample Size	Medium	× 1	2	Only average values or single value provided

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	Releases to the Environment; Environmental Release Data;
Hero ID	1927802

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Medium	× 1	2	Data include media but not the source in the process or release frequency
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†		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:	Stubbings, W. A.,Harrad, S.. 2014. Extent and mechanisms of brominated flame retardant emissions from waste soft furnishings and fabrics: A critical review. Environment International.				
Type of Data Source	Releases to the Environment; Environmental Release Data;				
Hero ID	2528334				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	waste textiltes
Release Source:	emissions from waste textiles
Environmental Media:	air
Release or Emission Factor:	200-3000 mg HBCD/m2 textile-hour

EVALUATION

Domain	Metric	Rating	MWF[*]	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Medium	× 1	2	Only represents air release from waste textiles
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	UK
	Metric 3: Applicability	High	× 2	2	This disposal scenario is in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2014
	Metric 5: Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	data include all associated metadata,
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		1.2	

[*] 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:	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	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	1937209

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	all packaging waste
Release Source:	disposal of packaging that contained HBCD from manufacturers
Disposal /Treatment Method:	landfill
Release Estimation Method:	industrial survey
Annual Release Quantity (kg/yr):	2017 kg/yr (2008); 309 kg/yr (2009)

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Industrial survey is contingent on voluntary participation
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	Canada
	Metric 3:	Applicability	Medium	× 2	4	Captures releases from all possible stages, some of which are not in scope
	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.
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:	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	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	1937209

EXTRACTION

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:	0.60 percent
Release Estimation Method:	2004 Plastics compounding ESD
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					
Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.

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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	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	1937209

EVALUATION

Domain	Metric	Rating	MWF[*]	Score	Comments
Overall Quality Determination[†]		High		1.2	

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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:	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	Releases to the Environment; Completed Exposure or Risk Assessments;	
Hero ID	1937209	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Compounding of Polystyrene Resin to Produce XPS Masterbatch
Release Source:	Use rate of 100,000 kg/yr. Release from compounding dust
Disposal /Treatment Method:	dust to air
Release or Emission Factor:	0.055 percent
Release Estimation Method:	2004 Plastics compounding ESD
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						
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination[†]			High		1.2	

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	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	1937209

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:	Remberger, M.,Sternbeck, J.,Palm, A.,Kaj, L.,Strömberg, K.,Brorström-Lundén, E.. 2004. The environmental occurrence of hexabromocyclododecane in Sweden. Chemosphere.	
Type of Data Source	Releases to the Environment; Monitoring Data;	
Hero ID	1927826	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	XPS Foam
Release Source:	Samples were taked 300-700 meters from a Swedish textile factory that manufactures XPS treated with HBCD two weeks per year
Environmental Media:	Water, Air, Land
Release or Emission Factor:	Air - 1070 ng/m3Soil - 140 to 1,300 ug/kg dry weight
Release Estimation Method:	Concentration in the soil and air
Number of Sites:	1

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	× 1	1	Data from trusted source
Domain 2: Representative					
Metric 2:	Geographic Scope	Medium	× 1	2	Sweden
Metric 3:	Applicability	Unacceptable	× 2	8	Information related to in-scope scenario but not to engineering assessment
Metric 4:	Temporal Representativeness	Medium	× 2	4	2004
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	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.4.

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Source Citation:	Remberger, M.,Sternbeck, J.,Palm, A.,Kaj, L.,StrÃ¶mberg, K.,BrorstrÃ¶m-LundÃ©n, E.. 2004. The environmental occurrence of hexabromocyclododecane in Sweden. Chemosphere.
Type of Data Source	Releases to the Environment; Monitoring Data;
Hero ID	1927826

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

† 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:	Remberger, M.,Sternbeck, J.,Palm, A.,Kaj, L.,Strömberg, K.,Brorström-Lundén, E.. 2004. The environmental occurrence of hexabromocyclododecane in Sweden. Chemosphere.	
Type of Data Source	Releases to the Environment; Monitoring Data;	
Hero ID	1927826	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Landfill
Release Source:	Samples of the air, landfill leachate, and sediment were taked
Disposal /Treatment Method:	landfill
Environmental Media:	Water, Air, Land
Release or Emission Factor:	Air - 0.013 to 0.18 ng/m3 Water - 3 to 9 ng/LSediment - <0.1 ug/kg dry weight
Release Estimation Method:	Concentration in the sediment, water, and air
Number of Sites:	1

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	× 1	1	Data from trusted source
Domain 2: Representative					
Metric 2:	Geographic Scope	Medium	× 1	2	Sweden
Metric 3:	Applicability	Unacceptable	× 2	8	Information related to in-scope scenario but not to engineering assessment
Metric 4:	Temporal Representativeness	Medium	× 2	4	2004
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	Low	× 1	3	No discussion of variability or uncertainty

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Source Citation:	Remberger, M.,Sternbeck, J.,Palm, A.,Kaj, L.,StrÃ¶mberg, K.,BrorstrÃ¶m-LundÃ©n, E.. 2004. The environmental occurrence of hexabromocyclododecane in Sweden. Chemosphere.
Type of Data Source	Releases to the Environment; Monitoring Data;
Hero ID	1927826

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination[†]		Unacceptable		4	Metric Mean Score: 2.4.

** 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

[†] 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:	Remberger, M.,Sternbeck, J.,Palm, A.,Kaj, L.,StrÃ¶mberg, K.,BrorstrÃ¶m-LundÃ©n, E.. 2004. The environmental occurrence of hexabromocyclododecane in Sweden. Chemosphere.
Type of Data Source	Releases to the Environment; Monitoring Data;
Hero ID	1927826

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Textile industry
Release Source:	Fish samples were taken up stream and down stream from a Swedish textile facility. Air samples were take 350 meters from the facility. Surface sediment samples were taked along the river (both upstream and downstream of the facility)
Environmental Media:	Water, Air, Land
Release or Emission Factor:	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 ug/kg dry weight
Release Estimation Method:	Concentration in the sediment, water, air, and sewage sludge
Number of Sites:	1

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	× 1	1	Data from trusted source
Domain 2: Representative					
Metric 2:	Geographic Scope	Medium	× 1	2	Sweden
Metric 3:	Applicability	Unacceptable	× 2	8	Information related to in-scope scenario but not to engineering assessment
Metric 4:	Temporal Representativeness	Medium	× 2	4	2004
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.

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Source Citation:	Remberger, M.,Sternbeck, J.,Palm, A.,Kaj, L.,StrÃ¶mberg, K.,BrorstrÃ¶m-LundÃ©n, E.. 2004. The environmental occurrence of hexabromocyclododecane in Sweden. Chemosphere.
Type of Data Source	Releases to the Environment; Monitoring Data;
Hero ID	1927826

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.4.

** 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

† 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:	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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	2343745

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial Use
Life Cycle Description (Subcategory of Use):	Insulation boards
Release Source:	Insulation board use was modeled in a chamber in another study (Kemmlein et al., 2003)
Release or Emission Factor:	0.0004 to 0.0029 ug/m2h

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	UK
	Metric 3: Applicability	High	× 2	2	Potentially can be applied to occupational scenario (use of insulation in offices).
	Metric 4: Temporal Representativeness	High	× 2	2	2013
	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	Low	× 1	3	No discussion of variability or uncertainty
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:	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	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	2674624

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS Thermal Cutting
Release Source:	From 1 hour long experiments cutting EPS foam
Release or Emission Factor:	5.2 mg particles containing 160 ug HBCD per hour
Release Estimation Method:	measured

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	Switzerland
	Metric 3:	Applicability	High	× 2	2	Information related to in-scope scenario
	Metric 4:	Temporal Representativeness	High	× 2	2	2013
	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	Low	× 1	3	No discussion of variability or uncertainty
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:	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	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	2674624

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS Thermal Cutting
Release Source:	From 1 hour long experiments cutting XPS foam
Release or Emission Factor:	4.5 mg particles containing 250 ug HBCD per hour
Release Estimation Method:	measured

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	Switzerland
	Metric 3:	Applicability	High	× 2	2	Information related to in-scope scenario
	Metric 4:	Temporal Representativeness	High	× 2	2	2013
	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	Low	× 1	3	No discussion of variability or uncertainty
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:	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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	2343745

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commercial Use
Life Cycle Description (Subcategory of Use):	Insulation in Office
Release Source:	Emission test in chamber
Environmental Media:	Offices
Release or Emission Factor:	300 ng/g HBCD in dust

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	UK
	Metric 3: Applicability	High	× 2	2	Occupational scenario (use of insulation in offices).
	Metric 4: Temporal Representativeness	High	× 2	2	2013
	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	Low	× 1	3	No discussion of variability or uncertainty
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:	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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	2343745

EXTRACTION

Parameter	Data
Life Cycle Stage:	Consumer Use
Life Cycle Description (Subcategory of Use):	Insulation in homes
Release Source:	Emission test in chamber
Environmental Media:	Houses
Release or Emission Factor:	100 ng/g HBCD in dust

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	UK
	Metric 3: Applicability	Unacceptable	× 2	8	Non-occupational scenario (in homes). No associated workers.
	Metric 4: Temporal Representativeness	High	× 2	2	2013
	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	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	2343745

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

† 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:	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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	2343745

EXTRACTION

Parameter	Data
Life Cycle Stage:	Consumer Use
Life Cycle Description (Subcategory of Use):	Insulation in homes
Release Source:	Emission test in chamber
Environmental Media:	Near electronic equipment (5 meters from TV)
Release or Emission Factor:	5,700 to 24,000 ng/g HBCD in dust

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	UK
	Metric 3: Applicability	Unacceptable	× 2	8	Non-occupational scenario (in homes). No associated workers.
	Metric 4: Temporal Representativeness	High	× 2	2	2013
	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	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	2343745

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

† 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:	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	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	2674624

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS Thermal Cutting
Release Source:	From 1 hour long experiments cutting EPS foam
Release or Emission Factor:	15 - 40 mg/g for specified particle size range
Release Estimation Method:	10 - 1,000 nm (HBCD was the highest concentrations for these size particles)

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	Switzerland
	Metric 3:	Applicability	High	× 2	2	Information related to in-scope scenario
	Metric 4:	Temporal Representativeness	High	× 2	2	2013
	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	Low	× 1	3	No discussion of variability or uncertainty
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:	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	Releases to the Environment; Completed Exposure or Risk Assessments;
Hero ID	2674624

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS Thermal Cutting
Release Source:	From 1 hour long experiments cutting XPS foam
Release or Emission Factor:	20 - 60 mg HBCD/g particle generated, for specified particle size range
Release Estimation Method:	10 - 1,000 nm (HBCD was the highest concentrations for these size particles)

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	Switzerland
	Metric 3:	Applicability	High	× 2	2	Information related to in-scope scenario
	Metric 4:	Temporal Representativeness	High	× 2	2	2013
	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	Low	× 1	3	No discussion of variability or uncertainty
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:	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	Releases to the Environment; Environmental Release Data;
Hero ID	3350474

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Incineration of plastic wastes
Release Source:	Two incineration plants in China
Disposal /Treatment Method:	airborne particle (51 percent), followed by residualash (44 percent) and the gas phase (5.1 percent);
Environmental Media:	air
Release or Emission Factor:	airborne particle - 26.8 to 5,290 ng HBCD/g plastic wasteresidual ash - 4.9 to 77.1 ng HBCD/g plastic wastegas phase - 10.2 to 17.1 ng HBCD/g plastic waste
Release Estimation Method:	Measured
Annual Release Quantity (kg/yr):	25.5 kg/yr
Number of Sites:	2

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	Low	× 1	3	China
	Metric 3: Applicability	Medium	× 2	4	disposal in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2016
	Metric 5: Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	data include all associated metadata,
Domain 4: Variability and Uncertainty					

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Source Citation:	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	Releases to the Environment; Environmental Release Data;				
Hero ID	3350474				

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
	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	

⋆ 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:	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	Releases to the Environment; Environmental Release Data;
Hero ID	3350474

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Incineration of plastic wastes
Release Source:	Two incineration plants in China
Disposal /Treatment Method:	airborne particle (51 percent), followed by residualash (44 percent) and the gas phase (5.1 percent);
Environmental Media:	land
Release or Emission Factor:	airborne particle - 26.8 to 5,290 ng HBCD/g plastic wasteresidual ash - 4.9 to 77.1 ng HBCD/g plastic wastegas phase - 10.2 to 17.1 ng HBCD/g plastic waste
Release Estimation Method:	Measured
Annual Release Quantity (kg/yr):	71.7 kg/yr
Number of Sites:	2

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	Low	× 1	3	China
Metric 3:	Applicability	Medium	× 2	4	disposal in scope
Metric 4:	Temporal Representativeness	High	× 2	2	2016
Metric 5:	Sample Size	High	× 1	1	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/Clarity					
Metric 6:	Metadata Completeness	High	× 1	1	data include all associated metadata,
Domain 4: Variability and Uncertainty					

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Source Citation:	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	Releases to the Environment; Environmental Release Data;				
Hero ID	3350474				

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
	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	

* 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:	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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3350476				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacturing
Life Cycle Description (Subcategory of Use):	HBCD production
Release Source:	All releases were modeled from previous risk assessments, reports, and China's HBCD industry data
Release or Emission Factor:	3.30E-07

EVALUATION

Domain	Metric		Rating	MWF⋆	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Information compiled from several different sources
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	China
	Metric 3:	Applicability	Medium	× 2	4	Manufacturing not in scope but maybe can be applied to importation
	Metric 4:	Temporal Representativeness	High	× 2	2	2016
	Metric 5:	Sample Size	Low	× 1	3	characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 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 Determination†			Medium		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:	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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3350476

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS Foam
Release Source:	All releases were modeled from previous risk assessments, reports, and China's HBCD industry data
Release or Emission Factor:	5.2E-6 to 3.3E-5

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Information compiled from several different sources
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	China
	Metric 3:	Applicability	High	× 2	2	in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2016
	Metric 5:	Sample Size	Low	× 1	3	characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 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 Determination[†]			Medium		1.9	

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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:	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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3350476

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS Foam
Release Source:	All releases were modeled from previous risk assessments, reports, and China's HBCD industry data
Release or Emission Factor:	6.9E-6 to 1.7E-5

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Information compiled from several different sources
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	China
	Metric 3:	Applicability	High	× 2	2	in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2016
	Metric 5:	Sample Size	Low	× 1	3	characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 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 Determination†			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:	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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3350476				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Textiles
Release Source:	All releases were modeled from previous risk assessments, reports, and China's HBCD industry data
Release or Emission Factor:	7.0E-6 to 7.3E-6

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Medium	× 1	2	Information compiled from several different sources
Domain 2: Representative					
	Metric 2: Geographic Scope	Low	× 1	3	China
	Metric 3: Applicability	Unacceptable	× 2	8	Out of scope
	Metric 4: Temporal Representativeness	High	× 2	2	2016
	Metric 5: Sample Size	Low	× 1	3	characterized by no statistics.
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Medium	× 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 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

† 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:	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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;			
Hero ID	3350476			

EXTRACTION

Parameter	Data
Life Cycle Stage:	Consumer Use
Life Cycle Description (Subcategory of Use):	EPS, XPS, or textiles
Release Source:	All releases were modeled from previous risk assessments, reports, and China's HBCD industry data
Release or Emission Factor:	5.8E-8 to 1.4E-4

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Medium	× 1	2	Information compiled from several different sources
Domain 2: Representative					
	Metric 2: Geographic Scope	Low	× 1	3	China
	Metric 3: Applicability	Unacceptable	× 2	8	Non-occupational scenario (consumer use of textiles). No associated industrial /commercial information.
	Metric 4: Temporal Representativeness	High	× 2	2	2016
	Metric 5: Sample Size	Low	× 1	3	characterized by no statistics.
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Medium	× 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 Determination[†]		Unacceptable		4	Metric Mean Score: 2.6.

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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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3350476

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

† 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:	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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3350476

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Demolition, recycling, landfill, or incineration of products containing HBCD
Release Source:	All releases were modeled from previous risk assessments, reports, and China's HBCD industry data
Release or Emission Factor:	1.0E-6 to 9.0E-5

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Medium	× 1	2	Information compiled from several different sources
Domain 2: Representative					
	Metric 2: Geographic Scope	Low	× 1	3	China
	Metric 3: Applicability	High	× 2	2	in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2016
	Metric 5: Sample Size	Low	× 1	3	characterized by no statistics.
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Medium	× 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 Determination[†]		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:	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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	2343703

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	EPS and XPS insulation
Release Source:	EPS and XPS materials were respectively blended with refuse derived fuel (RDF) as input wastes for incineration. Concentrations of HBCDs contained in the EPS- and XPS-added RDFs, were 140 and 1100 mg kg 1, respectively.
Disposal /Treatment Method:	Incineration destruction experiment
Waste Treatment Method:	During the incineration experiments with EPS and XPS, primary and secondary combustion zones were maintained at temperatures of 840 C and 900 C. The residence times of waste in the primary combustion zone and flue gas in the secondary combustion zone was 30 min and three seconds, respectively.
P2 Control & percent Efficiency:	Concentration levels of the total HBCDs in the bag filter exit gas for the two experiments with EPS and XPS were 0.7 and 0.6 ng/m3, respectively. HBCDs were also not detected (<0.2 ng/g) in the bottom and fly ash samples. From the obtained results, it was calculated that HBCDs were sufficiently destroyed in the whole incineration process with destruction efficiencies of more than 99.9999 for both of EPS and XPS cases.

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	Japan
	Metric 3:	Applicability	High	× 2	2	in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2014

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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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	2343703				

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
	Metric 5: Sample Size	High	× 1	1	Study contains all sampling data results, from which statistics can be surmised
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	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:	Stubbings, W. A.,Kajiwara, N.,Takigami, H.,Harrad, S.. 2016. Leaching behaviour of hexabromocyclododecane from treated curtains. Chemosphere.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3162362

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Textiles
Release Source:	HBCD into leachate
Disposal /Treatment Method:	landfill
Release Estimation Method:	Concentration of HBCD in leachate in which textiles were submerged was measured over time
Annual Release Quantity (kg/yr):	310,000 tonnes of textiles are disposed of by householders annually

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	Japan
	Metric 3:	Applicability	High	× 2	2	This disposal scenario is in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2016
	Metric 5:	Sample Size	High	× 1	1	Study contains all sampling data results, from which statistics can be surmised
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	well characterized
Overall Quality Determination†			High		1.1	

Source Citation:	Stubbings, W. A.,Kajiwara, N.,Takigami, H.,Harrad, S.. 2016. Leaching behaviour of hexabromocyclododecane from treated curtains. Chemosphere.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3162362

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

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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:	Guerra, P.,De La Cal, A.,Marsh, G.,Eljarrat, E.,Barcelo, D.. 2009. Transfer of hexabromocyclododecane from industrial effluents to sediments and biota: Case study in Cinca river (Spain). Journal of Hydrology.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	3575325

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS resin mfg
Environmental Media:	surface water
Release or Emission Factor:	2 ug HBCD/L wastewater effluent
Release Estimation Method:	sampled in WW effluent

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Medium	× 1	2	does not cover all release sources at the site
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	Spain
	Metric 3: Applicability	Unacceptable	× 2	8	This use is out of scope
	Metric 4: Temporal Representativeness	High	× 2	2	2009
	Metric 5: Sample Size	Low	× 1	3	characterized by no statistics.
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Low	× 1	3	includes release media but no other metadata
Domain 4: Variability and Uncertainty					
	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

† 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:	Oecd,. 2007. SIDS initial assessment profile: Hexabromocyclododecane (HBCDD).
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3809146

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Release Estimation Method:	EUSES model
Waste Treatment Method:	wastewater treatment
P2 Control & percent Efficiency:	overall HBCD removal at WWTP of 80 percent ; The major part is expected to be adsorbed to the sludge

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	Medium	× 1	2	EU
	Metric 3: Applicability	Medium	× 2	4	Information is not from a particular scenario, but can be applied to in-scope uses
	Metric 4: Temporal Representativeness	Medium	× 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	× 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	

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Source Citation:	Oecd,. 2007. SIDS initial assessment profile: Hexabromocyclododecane (HBCDD).
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3809146

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:	Priddy, D. B.,et al.,. 2000. Kirk-Othmer Encyclopedia of Chemical TechnologyStyrene plastics.
Type of Data Source	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3981049

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	Styrene Plastics
Release Source:	Does not mention HBCD but describes the chemical and physical properties of styrene plastics in detail.

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	High	× 1	1	US
	Metric 3: Applicability	Unacceptable	× 2	8	Toxicity information is relevant to the Risk Assessment, but is not utilized by the engineering assessors
	Metric 4: Temporal Representativeness	Low	× 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: 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†		Unacceptable		4	Metric Mean Score: 2.8.

** 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

† 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,. 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	Releases to the Environment; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3809166				

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Release Source:	Summarizes releases that are presented in the EURAR (HERO ID 3970747)

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	Multiple European countries
	Metric 3: Applicability	Medium	× 2	4	Provides infomration on both in-scope and out of scope uses.
	Metric 4: Temporal Representativeness	High	× 2	2	2009
	Metric 5: Sample Size	Medium	× 1	2	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	fully transparent.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	discussion of variability or uncertainty
Overall Quality Determination†		High		1.4	

* 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:	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.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	5079146

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Release Source:	Life cycle analysis with releases from multiple stages.
Release or Emission Factor:	Refer to figure 1
Release Estimation Method:	Life cycle analysis

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	The release data methodology is known or expected to be accurate (e.g., trusted source) but not fully explicit
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Japan
	Metric 3:	Applicability	High	× 2	2	Contains multiple conditions of use that are in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2009
	Metric 5:	Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	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	× 1	1	discussion of variability or uncertainty
Overall Quality Determination†			High		1.6	

Source Citation:	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.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	5079146

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:	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.				
Type of Data Source	Releases to the Environment; Environmental Release Data;				
Hero ID	1927966				

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Release Source:	Life cycle analysis with releases from multiple stages.
Release or Emission Factor:	Refer to figure 4
Release Estimation Method:	Life cycle analysis

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Medium	× 1	2	The release data methodology is known or expected to be accurate (e.g., trusted source) but not fully explicit
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	Sweden
	Metric 3: Applicability	High	× 2	2	Contains multiple conditions of use that are in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	Metric 5: Sample Size	Low	× 1	3	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/Clarity					
	Metric 6: 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	× 1	1	discussion of variability or uncertainty
Overall Quality Determination†		High		1.6	

Source Citation:	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.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	1927966

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:	U.S. Environmental Protection Agency. 1998. Characterization of building-related construction and demolition debris in the United States.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	6388491

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Constuction and Demolition disposal
Release Source:	Disposal of construction and demolition waste
Disposal /Treatment Method:	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
Release or Emission Factor:	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 recovery); 30 to 40 percent is to MSW landfills, unpermitted landfills, combustion facilities and other sites
Release Estimation Method:	based on 1996 life cycle analysis (see page 51)
Annual Release Quantity (kg/yr):	136 million tons/yr (1996)
Number of Sites:	1800 C&D recycling facilities (in 1996); 3500 C&D recyclers (1998)

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	Medium	× 1	2	The release data methodology is known or expected to be accurate (e.g., trusted source) but not fully explicit
Domain 2: Representative					
Metric 2:	Geographic Scope	High	× 1	1	United States
Metric 3:	Applicability	High	× 2	2	Construction and demolition are in scope
Metric 4:	Temporal Representativeness	Low	× 2	6	1996-1998
Metric 5:	Sample Size	Medium	× 1	2	characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity					
Metric 6:	Metadata Completeness	Low	× 1	3	Release data include release media but no other metadata

Source Citation:	U.S. Environmental Protection Agency. 1998. Characterization of building-related construction and demolition debris in the United States.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	6388491

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	$\times\ 1$	1	addresses variability in the determinants of release
Overall Quality Determination†		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:	U.S. Environmental Protection Agency. 2003. unadjusted data for United States.	
Type of Data Source	Releases to the Environment; Environmental Release Data;	
Hero ID	6388382	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Constuction and Demolition disposal
Release Source:	Disposal of construction and demolition waste
Disposal /Treatment Method:	construction and demolition (C&D) landfill, recovered - reuse, recycling, and combustion with energy recovery
Release or Emission Factor:	52 percent of C&D materials were disposed of (mostly to C&D landfills, some to MSW landfills and other sites); 48 percent recovered (reuse, recycling, and combustion with energy recovery) (likely an overestimate due to the inclusion of non-C&D waste)
Release Estimation Method:	based on 2003 state data
Annual Release Quantity (kg/yr):	170 million tons/yr (2003)
Number of Sites:	1900 C&D landfills (2002); 1500 C&D landfills (2004)

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Methodology is known and explicit (state-specific data provided)
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	United States
	Metric 3: Applicability	High	× 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 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					

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Source Citation:	U.S. Environmental Protection Agency. 2003. unadjusted data for United States.				
Type of Data Source	Releases to the Environment; Environmental Release Data;				
Hero ID	6388382				

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	addresses variability in the determinants of release
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:	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	Releases to the Environment; Published Models for Exposures or Releases;
Hero ID	6388403

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Constuction and Demolition disposal
Release Source:	Disposal of construction and demolition waste
Disposal /Treatment Method:	construction and demolition (C&D) landfill, recovered - reuse, recycling, and combustion with energy recovery
Release or Emission Factor:	70 percent of C&D waste goes to landfill (excludes concrete and asphalt, which sway the numbers); 30 percent processed for reuse, recycling, or energy recovery
Release Estimation Method:	material flow analysis using 2014 state data
Annual Release Quantity (kg/yr):	540 metric tons (2014)

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	model is free of mathematical errors and is based on scientifically sound approaches or methods
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	United States
	Metric 3:	Applicability	High	× 2	2	Construction and demolition are in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	based on 2014 data
	Metric 5:	Sample Size	N/A		N/A	not applicable to this data source
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Model approach, equations, and choice of parameter values are transparent and clear and can be evaluated
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	addresses variability in the determinants of release

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	Releases to the Environment; Published Models for Exposures or Releases;
Hero ID	6388403

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Overall Quality Determination†		High		1.0	

⋆ 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:	Texas Commission on Environmental Quality. 2017. Study on the economic impacts of recycling, final report.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	6388402

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Constuction and Demolition disposal
Release Source:	Disposal of construction and demolition waste
Disposal /Treatment Method:	disposal and recycling
Release or Emission Factor:	33 percent is recycled in texas
Release Estimation Method:	2015 data from voluntary surveys
Annual Release Quantity (kg/yr):	C&D waste disposed of = 6,359,056C&D recycled = 3,136,727
Number of Sites:	10 landfills, 8 transfer stations, 22 C&D processing facilties, 18 unknown

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Methodology is known and explicit (state-specific data provided)
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	United States
	Metric 3:	Applicability	High	× 2	2	Construction and demolition are in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	based on 2015 data
	Metric 5:	Sample Size	Low	× 1	3	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†			High		1.4	

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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:	U.S. Environmental Protection Agency. 2018. Sustainable management of construction and demolition materials.	
Type of Data Source	Releases to the Environment; Environmental Release Data;	
Hero ID	6388385	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Constuction and Demolition disposal
Release Source:	Disposal of construction and demolition waste
Disposal /Treatment Method:	disposal and recycling
Release or Emission Factor:	36 percent recycled; 64 percent disposed of (landfill)
Release Estimation Method:	based on 2011 data and extrapolation

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	× 1	1	Methodology is known and explicit (state-specific data provided)
Domain 2: Representative					
Metric 2:	Geographic Scope	High	× 1	1	United States
Metric 3:	Applicability	High	× 2	2	Construction and demolition are in scope
Metric 4:	Temporal Representativeness	High	× 2	2	based on 2011 data
Metric 5:	Sample Size	Medium	× 1	2	characterized by a range with uncertain statistics
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†		High		1.3	

* 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:	U.S. Environmental Protection Agency. 2018. Advancing sustainable materials management: 2015 fact sheet.
Type of Data Source	Releases to the Environment; Environmental Release Data;
Hero ID	6388383

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal
Life Cycle Description (Subcategory of Use):	Municipal Solid Waste
Release Source:	disposal of municipal solid waste (MSW)
Disposal /Treatment Method:	landfill, combustion with energy recovery, recycling, composting
Release or Emission Factor:	12.8 percent energy to recovery; 52.5 percent landfill; 25.8 recycle; 8.9 percent composting
Release Estimation Method:	based on 2015 data

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Methodology is known and explicit (state-specific data provided)
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	United States
	Metric 3: Applicability	Low	× 2	6	Disposal of MSW not in scope but may be related to disposal of C&D waste
	Metric 4: Temporal Representativeness	High	× 2	2	based on 2015 data
	Metric 5: Sample Size	Medium	× 1	2	characterized by a range with uncertain statistics
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†		Medium		1.8	

* 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.

Occupational Exposure

Source Citation:	Thomsen, C.,Molander, P.,Daae, H. L.,Janák, 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	Occupational Exposure; Monitoring Data;
Hero ID	787728

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS Resin production
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	1.0 ug/m3 - 150 ug/m3
Number of Samples:	24
Number of Sites:	1
Type of Measurement or Method:	8-hr TWA
Worker Activity:	reactor work (reactor), including weighing and addition of HBCD to the PS granulates in the reactor, and subsequent washing, centrifugation, sifting, and transfer of the product to a silo container
Number of Workers:	10 total for all activities
Type of Sampling:	Personal breathing zone
Sampling Location:	Reactor (24 samples)
Exposure Duration:	8-hr
Exposure Frequency:	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 products not containing HBCD are produced.
Bulk and Dust Particle Size Distribution:	20 nm to 2 mm HBCD particles were added to EPS

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Per article "This methodology is validated and is in routine use at the National Institute of Occupational Health...A certified occupationalhygienist from the company"s Occupational-Health Service executed the practical air sampling accordingto a detailed protocol."

Source Citation:	Thomsen, C.,Molander, P.,Daae, H. L.,JanÃ¡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	Occupational Exposure; Monitoring Data;				
Hero ID	787728				

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	A Scandanavian Industrial Plant. Since all scandanavian countries (Sweden, Denmark, Finland, Norway, Iceland) are in OECD this score is a 2.
	Metric 3: Applicability	Medium	× 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	× 2	4	The report was published in 2007 (> 10 years ago)
	Metric 5: Sample Size	High	× 1	1	Discrete sample points provided
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	All pertinent monitoring data is provided.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		Medium		1.8	

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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:	Thomsen, C.,Molander, P.,Daae, H. L.,JanÃ¡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	Occupational Exposure; Monitoring Data;
Hero ID	787728

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS Resin production
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	0.24 ug/m3 - 0.86 ug/m3
Number of Samples:	6
Number of Sites:	1
Type of Measurement or Method:	8-hr TWA
Worker Activity:	mixing procedures (mixer), a closed automated processexcluding potential contact with neat HBCD
Number of Workers:	10 total for all activities
Type of Sampling:	Personal breathing zone
Sampling Location:	Mixer (6 samples)
Exposure Duration:	8-hr
Exposure Frequency:	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 products not containing HBCD are produced.
Bulk and Dust Particle Size Distribution:	20 nm to 2 mm HBCD particles were added to EPS

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Per article "This methodology is validated and is in routine use at the National Institute of Occupational Health...A certified occupationalhygienist from the company"s Occupational-Health Service executed the practical air sampling accordingto a detailed protocol."

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Source Citation:	Thomsen, C.,Molander, P.,Daae, H. L.,JanÃ¡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	Occupational Exposure; Monitoring Data;				
Hero ID	787728				

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	A Scandanavian Industrial Plant. Since all scandanavian countries (Sweden, Denmark, Finland, Norway, Iceland) are in OECD this score is a 2.
	Metric 3:	Applicability	Medium	× 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	× 2	4	The report was published in 2007 (> 10 years ago)
	Metric 5:	Sample Size	High	× 1	1	Discrete sample points provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	All pertinent monitoring data is provided.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†			Medium		1.8	

* 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:	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	Occupational Exposure; Monitoring Data;	
Hero ID	1079114	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Consumer Use
Life Cycle Description (Subcategory of Use):	Insulation products in Homes
Physical Form:	settled dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	67 - 1,300 pg/m3 (mean - 250 pg/m3)
Number of Sites:	33
Type of Measurement or Method:	TWA
Worker Activity:	Modeled data based on HBCD concentration in dust. No associated worker activity.
Sampling Location:	Homes

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Medium	× 1	2	Describes how the data was modeled from the HBCD dust concentrations
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	UK
	Metric 3: Applicability	Unacceptable	× 2	8	Non-occupational scenario (settled dust in homes). No associated worker activites.
	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 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 analytical-protocols, as well as statistical summaries of concentrationsof individual HBCD in eachsample are available online as well

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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	Occupational Exposure; Monitoring Data;
Hero ID	1079114

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.3.

** 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

† 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:	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	Occupational Exposure; Monitoring Data;
Hero ID	1079114

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commerical Use
Life Cycle Description (Subcategory of Use):	Insulation products in Offices
Physical Form:	settled dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	70 - 460 pg/m3 (mean - 180 pg/m3)
Number of Sites:	25
Type of Measurement or Method:	TWA
Worker Activity:	Modeled data based on HBCD concentration in dust. No associated worker activity.
Sampling Location:	Offices

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Describes how the data was modeled from the HBCD dust concentrations
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	UK
	Metric 3:	Applicability	Unacceptable	× 2	8	Occupational scenario (use of insulation in offices). No associated worker activities.
	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 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 analyticalprotocols, as well as statistical summaries of concentrationsof individual HBCD in eachsample are available online as well

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	Occupational Exposure; Monitoring Data;
Hero ID	1079114

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.3.

** 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.

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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	Occupational Exposure; Monitoring Data;
Hero ID	1079114

EXTRACTION

Parameter	Data
Life Cycle Stage:	Consumer Use
Life Cycle Description (Subcategory of Use):	Insulation products in indoor public microenvironments
Physical Form:	settled dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	820- 960 pg/m3 (mean - 900 pg/m3)
Number of Sites:	4
Type of Measurement or Method:	TWA
Worker Activity:	Modeled data based on HBCD concentration in dust. No associated worker activity.
Sampling Location:	Public Microenvironments

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Describes how the data was modeled from the HBCD dust concentrations
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	UK
	Metric 3:	Applicability	Unacceptable	× 2	8	Non-occupational scenario (settled dust in gen pop areas). No associated worker activites.
	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 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 analytical-protocols, as well as statistical summaries of concentrationsof individual HBCD in eachsample are available online as well

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	Occupational Exposure; Monitoring Data;
Hero ID	1079114

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.3.

** 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

† 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:	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	Occupational Exposure; Monitoring Data;
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 pg/m3 (mean - 37 pg/m3)
Number of Sites:	5
Type of Measurement or Method:	TWA
Worker Activity:	Modeled data based on HBCD concentration in dust. No associated worker activity.
Sampling Location:	Outdoor Air

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Medium	× 1	2	Describes how the data was modeled from the HBCD dust concentrations
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	UK
	Metric 3: Applicability	Unacceptable	× 2	8	Non-occupational scenario (outdoor air dust in gen pop areas). No associated worker activites.
	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 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 analytical-protocols, as well as statistical summaries of concentrationsof individual HBCD in eachsample are available online as well

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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	Occupational Exposure; Monitoring Data;
Hero ID	1079114

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.3.

** 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

† 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:	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	Occupational Exposure; Monitoring Data;
Hero ID	1079114

EXTRACTION

Parameter	Data
Life Cycle Stage:	Consumer Use
Life Cycle Description (Subcategory of Use):	Indoor Air
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	90 ng/g - 140,000 ng/g (mean - 8,300 ng/g)
Number of Sites:	97
Type of Measurement or Method:	Concentration in dust
Worker Activity:	HBCDs found from several products used in indoor environments. No associated worker activity.

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Medium	× 1	2	Describes how the data was modeled from the HBCD dust concentrations
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	UK
	Metric 3: Applicability	Unacceptable	× 2	8	Non-occupational scenario (outdoor air dust in gen pop areas). No associated worker activites.
	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 number of samples at each location. However, provides several statistics of the sample size.
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					

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	Occupational Exposure; Monitoring Data;				
Hero ID	1079114				

EVALUATION

Domain	Metric	Rating	MWF*	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

† 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:	ToxNet Hazardous Substances Data, Bank. 2017. HSDB: Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970277

EXTRACTION

Parameter	Data
Life Cycle Stage:	Import
Life Cycle Description (Subcategory of Use):	Import
Worker Activity:	Workers at importation and manufacturing sites per 2012 CDR
Number of Workers:	<10 to 25-49 workers per site

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	High	× 1	1	US
	Metric 3: Applicability	High	× 2	2	Importation is in scope
	Metric 4: Temporal Representativeness	High	× 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: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Information is all clearly cited
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	Report addresses CBI claims, but not much else
Overall Quality Determination[†]		High		1.2	

[*] 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:	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:	Commerical Use
Life Cycle Description (Subcategory of Use):	Insulation products in Offices
Physical Form:	settled dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Mean = 1400 ug/kg dust, Median = 650 ug/kg dust (UK); Mean = 592 ug/kg dust, Median = 367 ug/kg dust (Belgium)
Number of Samples:	16
Number of Sites:	Unknown (>10)
Type of Measurement or Method:	HBCD concentration in dust was measured and exposure was calculated with assumptions. See assumptions on page 59.
Worker Activity:	Office workers. No associated worker activity.

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Information collected from journal studies
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	UK, Belgium
	Metric 3: Applicability	Unacceptable	× 2	8	Occupational scenario (use of insulation in offices). No associated worker activities.
	Metric 4: Temporal Representativeness	High	× 2	2	2008-2010
	Metric 5: Sample Size	Medium	× 1	2	Mean and median provided, no other statistics. 16 samples, unknown # of sites
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	Medium	× 1	2	Limited discussion on uncertainty and variability

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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				

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination†		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

† 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:	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:	Import
Life Cycle Description (Subcategory of Use):	Import
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	0.20.5 mg/m3 (typical); 0.55 mg/m3 (worst case)
Type of Measurement or Method:	Modelled (section 6.4)
Worker Activity:	repackaging into smaller pack sizes or in the event of an accident or spill

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Based on accepted model from Europe
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	Australia
	Metric 3: Applicability	High	× 2	2	Use in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2012
	Metric 5: Sample Size	High	× 1	1	Model - uncertainty provided, distribution of results provided
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	Uncertainty and variability discussion provided
Overall Quality Determination†		High		1.1	

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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:	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:	Import
Life Cycle Description (Subcategory of Use):	Import
Physical Form:	Dust
Route of Exposure:	Dermal
Exposure Concentration (Unit):	57570 ?g/kg bw/d (powder); 29290 ?g/kg bw/d (granules)
Type of Measurement or Method:	Modelled (section 6.4)
Worker Activity:	repackaging into smaller pack sizes or in the event of an accident or spill

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Based on accepted model from Europe
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	Australia
	Metric 3: Applicability	High	× 2	2	Use in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2012
	Metric 5: Sample Size	High	× 1	1	Model - uncertainty provided, distribution of results provided
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	Uncertainty and variability discussion provided
Overall Quality Determination[†]		High		1.1	

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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:	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:	Processing
Life Cycle Description (Subcategory of Use):	EPS compounding
Physical Form:	Dust
Type of Measurement or Method:	respondents from survey
Worker Activity:	Adding HBCD to the mixture
Number of Workers:	1
Exposure Duration:	10 min/day
Exposure Frequency:	180 days/yr
Bulk and Dust Particle Size Distribution:	2 mm granules or 50-60 um powder
Engineering Control & percent Exposure Reduction:	LEV
PPE:	Overalls, safety glasses, leather or chemical resistant gloves, dust masks and respirators

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Information collected from surevey respondents
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Australia
	Metric 3:	Applicability	Medium	× 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	× 2	2	2012
	Metric 5:	Sample Size	Medium	× 1	2	Results from 1 respndent
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	Low	× 1	3	No discussion

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				

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
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.

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:	Processing
Life Cycle Description (Subcategory of Use):	EPS compounding
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	2.89-21.5 mg/m3
Number of Samples:	12
Number of Sites:	2
Type of Measurement or Method:	Short-term
Worker Activity:	Adding HBCD powder to the mixture
Type of Sampling:	personal
Exposure Duration:	13-56 mins

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Results extracted from a study in Scotland
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	Scotland
	Metric 3: Applicability	Medium	× 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	× 2	4	2005
	Metric 5: Sample Size	High	× 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
Domain 4: Variability and Uncertainty					

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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

EVALUATION

Domain		Metric	Rating	MWF⋆	Score	Comments
	Metric 7:	Metadata Completeness	High	× 1	1	Uncertainty and variability discussion provided
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:	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:	Processing
Life Cycle Description (Subcategory of Use):	EPS compounding
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	0.12-3.36 mg/m3
Number of Samples:	12
Number of Sites:	2
Type of Measurement or Method:	8 hr TWA
Worker Activity:	Adding HBCD powder to the mixture
Type of Sampling:	personal
Exposure Duration:	480 mins

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Results extracted from a study in Scotland
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	Scotland
	Metric 3: Applicability	Medium	× 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	× 2	4	2005
	Metric 5: Sample Size	High	× 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
Domain 4: Variability and Uncertainty					

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				

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	Uncertainty and variability discussion provided
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:	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:	Processing
Life Cycle Description (Subcategory of Use):	EPS compounding
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	0.07-14.7 mg/m3
Number of Samples:	18
Number of Sites:	3
Type of Measurement or Method:	full-shift
Worker Activity:	Adding HBCD powder to the mixture
Type of Sampling:	personal
Exposure Duration:	275-504 mins

EVALUATION

Domain		Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Results extracted from a study in Scotland
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Scotland
	Metric 3:	Applicability	Medium	× 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	× 2	4	2005
	Metric 5:	Sample Size	High	× 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
Domain 4: Variability and Uncertainty						

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				

EVALUATION

Domain	Metric	Rating	MWF[*]	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	Uncertainty and variability discussion provided
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:	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:	Processing
Life Cycle Description (Subcategory of Use):	EPS compounding
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	4.35-12.1 mg/m3
Number of Samples:	4
Number of Sites:	2
Type of Measurement or Method:	full-shift
Worker Activity:	Weighing HBCD powder before addition
Type of Sampling:	personal
Exposure Duration:	124-350 mins

EVALUATION

Domain		Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Results extracted from a study in Scotland
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Scotland
	Metric 3:	Applicability	Medium	× 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	× 2	4	2005
	Metric 5:	Sample Size	High	× 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
Domain 4: Variability and Uncertainty						

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				

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	Uncertainty and variability discussion provided
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:	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:	Processing
Life Cycle Description (Subcategory of Use):	XPS production
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	2-880 ug/m3
Number of Samples:	17
Number of Sites:	6
Type of Measurement or Method:	full-shift
Worker Activity:	area sampling at feed deck
Type of Sampling:	area
Sampling Location:	feed deck
Exposure Duration:	4.4-23.9 hours

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: Geographic Scope	Medium	× 1	2	Europe
	Metric 3: Applicability	High	× 2	2	Use in scope
	Metric 4: Temporal Representativeness	Medium	× 2	4	2001
	Metric 5: Sample Size	High	× 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
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	Limited discussion on uncertainty

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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				

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Overall Quality Determination†		High		1.4	

⋆ 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:	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:	Processing
Life Cycle Description (Subcategory of Use):	XPS production
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	3-15 ug/m3
Number of Samples:	9
Number of Sites:	6
Type of Measurement or Method:	Short-term
Worker Activity:	routine work
Type of Sampling:	personal
Exposure Duration:	3-7.3 hrs

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: Geographic Scope	Medium	× 1	2	Europe
	Metric 3: Applicability	High	× 2	2	Use in scope
	Metric 4: Temporal Representativeness	Medium	× 2	4	2001
	Metric 5: Sample Size	High	× 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
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	Limited discussion on uncertainty

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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

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination[†]		High		1.4	

* 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:	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:	Processing
Life Cycle Description (Subcategory of Use):	XPS production
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	40 ug/m3
Number of Samples:	6
Number of Sites:	6
Type of Measurement or Method:	Short-term
Worker Activity:	cleaning feed deck
Type of Sampling:	personal
Exposure Duration:	1 hr

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:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	High	× 2	2	Use in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2001
	Metric 5:	Sample Size	High	× 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
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Limited discussion on uncertainty

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				

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination[†]		High		1.4	

* 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:	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:	Processing
Life Cycle Description (Subcategory of Use):	EPS converting
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Mean = 0.5 ug/m3
Number of Samples:	6
Number of Sites:	1
Type of Measurement or Method:	full-shift
Number of Workers:	3/shift
Type of Sampling:	area
Sampling Location:	mixer room
Exposure Duration:	8 hr

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:	Geographic Scope	Medium	× 1	2	Norway
	Metric 3:	Applicability	High	× 2	2	Use in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2007
	Metric 5:	Sample Size	High	× 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
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Uncertainty and variability discussion provided

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

EVALUATION

Domain	Metric	Rating	MWF[*]	Score	Comments
Overall Quality Determination[†]		High		1.3	

[*] 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:	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:	Processing
Life Cycle Description (Subcategory of Use):	EPS converting
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Mean = 15.1 ug/m3
Number of Samples:	24
Number of Sites:	1
Type of Measurement or Method:	full-shift
Number of Workers:	3/shift
Type of Sampling:	area
Sampling Location:	reactor room
Exposure Duration:	8 hr

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:	Geographic Scope	Medium	× 1	2	Norway
	Metric 3:	Applicability	High	× 2	2	Use in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2007
	Metric 5:	Sample Size	High	× 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
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Uncertainty and variability discussion provided

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

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Overall Quality Determination†		High		1.3	

⋆ 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:	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:	Processing
Life Cycle Description (Subcategory of Use):	XPS compounding
Physical Form:	Dust
Route of Exposure:	dermal
Exposure Concentration (Unit):	0.11 mg/cm2/d.
Type of Measurement or Method:	Modelled (section 6.5)
Worker Activity:	direct handling and intermittent, non-dispersive use

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Based on accepted model from Europe
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Australia
	Metric 3:	Applicability	High	× 2	2	Use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2012
	Metric 5:	Sample Size	High	× 1	1	Model - uncertainty provided, distribution of results provided
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	Uncertainty and variability discussion provided
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:	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:	Processing
Life Cycle Description (Subcategory of Use):	Polymer processing
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Typical: 2 to 5Worst-case: 5 to 50 mg/m3
Type of Measurement or Method:	Modelled (section 6.5)
Worker Activity:	addition and weighing
Exposure Duration:	8 hr

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Based on accepted model from Europe
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Australia
	Metric 3:	Applicability	High	× 2	2	Use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2012
	Metric 5:	Sample Size	High	× 1	1	Model - uncertainty provided, distribution of results provided
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	Uncertainty and variability discussion provided
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:	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:	Processing
Life Cycle Description (Subcategory of Use):	Polymer processing
Physical Form:	Granules
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Typical: 0.2 to 0.5Worst-case: 0.5 to 5
Type of Measurement or Method:	Modelled (section 6.5)
Worker Activity:	addition and weighing
Exposure Duration:	8 hr

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Based on accepted model from Europe
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	Australia
	Metric 3: Applicability	High	× 2	2	Use in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2012
	Metric 5: Sample Size	High	× 1	1	Model - uncertainty provided, distribution of results provided
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	Uncertainty and variability discussion provided
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:	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 Description (Subcategory of Use):	HBCD in dust
Physical Form:	Dust
Route of Exposure:	Oral to dust
Exposure Concentration (Unit):	1.9 (typical) to 12 (worst case) ng/kg-day
Type of Measurement or Method:	Modelled (section 6.5.5)
Worker Activity:	Exposure to HBCD in indoor soil and dust

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Based on accepted model from Europe
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Australia
	Metric 3:	Applicability	Low	× 2	6	Non-occupational exposure that can be applied to occupational
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2003
	Metric 5:	Sample Size	High	× 1	1	Model - uncertainty provided, distribution of results provided
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	Uncertainty and variability discussion provided
Overall Quality Determination†			Medium		1.8	

* 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:	Haz, Map. 2017. Haz-Map: Agent name: 1,2,5,6,9,10-Hexabromocyclododecane.				
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3970257				

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Worker Activity:	worker esitmate across entire lifecycle
Number of Workers:	100 to 999

EVALUATION

Domain	Metric	Rating	MWF[*]	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Low	× 1	3	Unknown
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	US
	Metric 3: Applicability	Medium	× 2	4	Captures all possible stages, some of which are not in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2016
	Metric 5: Sample Size	Low	× 1	3	Unknown
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Unacceptable	× 1	4	Unknown
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion
Overall Quality Determination[†]		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

[†] 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.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Physical Form:	dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	0.00028 - 0.0285 mg/m3
Number of Samples:	3
Number of Sites:	1
Type of Measurement or Method:	short-term, 51-120 mins
Worker Activity:	Occasional sampling at the reactor. Worker activity may or may not be occurring during the measurement.
Type of Sampling:	area
Sampling Location:	reactor

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	Unacceptable	× 2	8	Manufacture is not in scope and data cannot be applied to other conditions of use
Metric 4:	Temporal Representativeness	High	× 2	2	2008
Metric 5:	Sample Size	High	× 1	1	All data points provided
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					

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Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.				
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;				
Hero ID	3970747				

EVALUATION

Domain	Metric	Rating	MWF*	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 Determination†		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

† 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.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Physical Form:	dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	0.0094-0.097 mg/m3
Number of Samples:	2
Number of Sites:	1
Type of Measurement or Method:	short-term, 88 mins
Worker Activity:	filling of 25 kg or 1 ton bags
Type of Sampling:	area
Exposure Duration:	88 mins
Bulk and Dust Particle Size Distribution:	20-150 ?m

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	Medium	× 2	4	Manufacture is not in scope but filling of bags can be applied to Import
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	Metric 5: Sample Size	High	× 1	1	All data points provided
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					

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Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.				
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;				
Hero ID	3970747				

EVALUATION

Domain	Metric	Rating	MWF*	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 Determination†		High		1.3	

* 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.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Physical Form:	dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	4.0-4.5 mg/m3
Number of Samples:	unknown
Type of Measurement or Method:	unknown
Worker Activity:	Bagging HBCD product
Type of Sampling:	unknown

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	Medium	× 2	4	Manufacture is not in scope but filling of bags can be applied to Import
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	Metric 5: Sample Size	Medium	× 1	2	Range
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.

Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination†		High		1.4	

* 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.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Physical Form:	dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Mean: 1.23Median: 0.8990th percentile: 1.89Max: 3 mg/m3
Number of Samples:	10
Number of Sites:	1
Type of Measurement or Method:	8-hr TWA
Worker Activity:	During sample measurement, worker activity may include packing, compactation, process operations, and working in the warehouse
Type of Sampling:	personal

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	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						

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Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.				
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;				
Hero ID	3970747				

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
	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	

* 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.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Physical Form:	dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Mean: 23 90th percentile: 35 mg/m3
Number of Samples:	4
Number of Sites:	1
Type of Measurement or Method:	8-hr TWA
Worker Activity:	Not specified. Worker activity may include several different tasks.
Type of Sampling:	personal

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	Unacceptable	× 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	× 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.

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Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.				
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;				
Hero ID	3970747				

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 1.9.

** 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

† 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.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Physical Form:	dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	1.9 mg/m3
Number of Samples:	1
Number of Sites:	1
Type of Measurement or Method:	300 min
Worker Activity:	Transfer of the HBCD in the hammer-mill to 28 drums
Type of Sampling:	personal

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	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	High	× 1	1	Discrete data point provided
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.

Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination†		High		1.3	

* 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.	
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;	
Hero ID	3970747	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
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

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	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.

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Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.				
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;				
Hero ID	3970747				

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination†		High		1.4	

* 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.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Physical Form:	dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	0.0102 - 0.0283 mg/m3
Number of Samples:	14
Number of Sites:	unknown
Type of Measurement or Method:	unknown
Worker Activity:	Weighing and mixing
Type of Sampling:	personal

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	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.

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Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination[†]		High		1.4	

* 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.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Physical Form:	dust
Route of Exposure:	Dermal
Exposure Concentration (Unit):	1 to 5 mg/cm2/day
Type of Measurement or Method:	Modelled by EASE
Worker Activity:	filling of 25 kg or 1 ton bags

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	Medium	× 2	4	Manufacture is not in scope but filling of bags can be applied to Import
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	Metric 5: Sample Size	Medium	× 1	2	characterized by a range uncertain 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.
Overall Quality Determination†		High		1.4	

* 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.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS masterbatch
Physical Form:	granule
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Max 7.5 (for 2 hours)Mean: 1.89Median: 0.8390th percentile: 5.4 mg/m3
Number of Samples:	10
Type of Measurement or Method:	short-term
Worker Activity:	mixing and weighing
Type of Sampling:	area
Exposure Duration:	Measurements range from 19 to 295 minutes.

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	× 2	4	2005
	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.

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Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Overall Quality Determination[†]		High		1.4	

⋆ 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.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS masterbatch
Physical Form:	granule
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	0.88 (mean), 1.36 (90th) mg/m3
Number of Samples:	10
Type of Measurement or Method:	8-hr TWA
Worker Activity:	mixing and weighing
Type of Sampling:	personal
Exposure Duration:	19-295 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 2:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	High	× 2	2	In scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2005
	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.

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Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination[†]		High		1.4	

* 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.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS masterbatch
Physical Form:	granule
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Mean: 0.12Median: 0.100.16 mg/m3 (90th)
Number of Samples:	4
Type of Measurement or Method:	unknown
Worker Activity:	extruder operator
Type of Sampling:	personal
Exposure Duration:	5 hours

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	× 2	4	2005
	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.

Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination[†]		High		1.4	

* 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.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS masterbatch
Physical Form:	unknown
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	negligible
Number of Samples:	3
Number of Sites:	1
Type of Measurement or Method:	unknown
Worker Activity:	Automated handling of HBCD
Type of Sampling:	unknown
Exposure Duration:	unknown

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	× 2	4	2005
	Metric 5: Sample Size	Low	× 1	3	Qualitative
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.

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Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EVALUATION

Domain	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:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
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:	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 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.

Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination[†]		High		1.4	

* 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.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS masterbatch
Physical Form:	powder
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Range: 0.0002-0.0009Mean: 0.0005 Median: 0.0005 mg/m3
Number of Samples:	30
Type of Measurement or Method:	unknown
Worker Activity:	mixer operator
Type of Sampling:	personal
Exposure Duration:	8-hr

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	× 2	4	2007
	Metric 5: Sample Size	Medium	× 1	2	unknown if TWA, unknown worker activities
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.

Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Overall Quality Determination[†]		High		1.4	

⋆ 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.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS masterbatch
Physical Form:	granules
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Range 0.005-0.9Mean: 0.2490th percentile: 0.47(excluding 16 ND samples)
Number of Samples:	43 (16 ND)
Type of Measurement or Method:	varies, 60 -2435 minutes
Worker Activity:	Feed deck near typical operator positions
Type of Sampling:	Mostly area and some personal breathing zone
Exposure Duration:	60 1435 minutes

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	× 2	4	2001
	Metric 5:	Sample Size	Medium	× 1	2	unknown if TWA, unknown worker activities
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.

Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Overall Quality Determination†		High		1.4	

⋆ 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.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS masterbatch
Physical Form:	granules
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Mean: 0.0000390th percentile: 0.00004
Number of Samples:	12
Type of Measurement or Method:	8-hr TWA
Worker Activity:	Logistics, extruding, and laboratory
Type of Sampling:	Area
Exposure Duration:	8-hr TWA

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	Norway
	Metric 3: Applicability	High	× 2	2	In scope
	Metric 4: Temporal Representativeness	Medium	× 2	4	2005
	Metric 5: Sample Size	Medium	× 1	2	unknown if TWA, unknown worker activities
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.

Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination†		High		1.4	

* 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.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Manufacture of EPS resin beads
Physical Form:	Respirable DustInhalable Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Respirable dust: <0.5 Total Inhalable dust: 2.0 mg/m3Not specific to HBCD
Number of Samples:	5
Type of Measurement or Method:	8-hr TWA
Worker Activity:	Addition of HBCDD to reactor or the supervising of the addition.
Type of Sampling:	personal
Exposure Duration:	8-hr TWA

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	Medium	× 2	4	Condition of use is out of scope, but data may be applicable to other conditions of use
	Metric 4:	Temporal Representativeness	Medium	× 2	4	Original data from 1999
	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						

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Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
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.

Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS masterbatch
Physical Form:	granule
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	ND to 0.88 mg/m3
Number of Samples:	32
Number of Sites:	6
Type of Measurement or Method:	unknown
Worker Activity:	unknown
Type of Sampling:	area and personal
Exposure Duration:	40-1435 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 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	unknown if TWA, unknown worker activities
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.

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Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.				
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;				
Hero ID	3970747				

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination[†]		High		1.4	

* 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.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	cutting of XPS boards
Physical Form:	solid
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	0.22 mg/m3 (90th)
Number of Samples:	42
Number of Sites:	3
Type of Measurement or Method:	unknown
Worker Activity:	unknown
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 Representativeness	Medium	× 2	4	2005
	Metric 5:	Sample Size	Medium	× 1	2	unknown if TWA, unknown worker activities
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.

Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Overall Quality Determination[†]		High		1.4	

⋆ 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.	
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;	
Hero ID	3970747	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS masterbatch
Physical Form:	powder
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	mean 15 ?g/m3, median 2.7 ?g/m3
Number of Samples:	30
Type of Measurement or Method:	unknown
Worker Activity:	reactor operator
Type of Sampling:	personal
Exposure Duration:	8-hr

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	Norway
	Metric 3: Applicability	High	× 2	2	In scope
	Metric 4: Temporal Representativeness	Medium	× 2	4	2007
	Metric 5: Sample Size	Medium	× 1	2	unknown if TWA, unknown worker activities
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.

Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination†		High		1.4	

* 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.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS Resin production
Physical Form:	powder
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Mean: 1.290 percent -ile: 1.1 mg/m3
Type of Measurement or Method:	8-hr TWA
Worker Activity:	adding to vessel
Type of Sampling:	personal
PPE:	Most workers were reported to use gloves, overall, eye protection, and disposable respirator.

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	Medium	× 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	× 2	4	2005
	Metric 5:	Sample Size	High	× 1	1	Fully characterized
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.

Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EVALUATION

Domain	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:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS Resin production
Physical Form:	powder
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Mean: 7.290 percent -ile: 10.6 mg/m3
Type of Measurement or Method:	8-hr TWA
Worker Activity:	Weighing HBCD powder before addition
Type of Sampling:	personal
PPE:	Most workers were reported to use gloves, overall, eye protection, and disposable respirator.

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	Medium	× 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	× 2	4	2005
	Metric 5: Sample Size	High	× 1	1	Fully characterized
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.

Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EVALUATION

Domain	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:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS compounding
Physical Form:	powder
Route of Exposure:	Dermal
Exposure Concentration (Unit):	0-0.1 mg/cm2/day
Type of Measurement or Method:	Modelled by EASE

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	High	× 2	2	2008
	Metric 5: Sample Size	Medium	× 1	2	characterized by a range uncertain 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.
Overall Quality Determination[†]		High		1.2	

[*] 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:	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; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3809277				

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Number of Workers:	<2100

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	High	× 1	1	US
	Metric 3: Applicability	Medium	× 2	4	Captures releases from all possible stages, some of which are not in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2012
	Metric 5: Sample Size	Medium	× 1	2	characterized by a range with uncertain 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.
Overall Quality Determination†		High		1.3	

⋆ 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:	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 Data;
Hero ID	3809277

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture or Processing
Life Cycle Description (Subcategory of Use):	Manufacture, Processing EPS or XPS
Physical Form:	dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	0.1 to 2.5 mg/m3
Type of Measurement or Method:	taken from 2008 EU assessment (HERO 3970747)
Worker Activity:	handling standard grade HBCD powder at sites for the manufacture or processing

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:	Geographic Scope	Medium	× 1	2	Europe
Metric 3:	Applicability	Medium	× 2	4	EPS compounding and MFG not in scope, but other scenarios are
Metric 4:	Temporal Representativeness	High	× 2	2	2008
Metric 5:	Sample Size	Medium	× 1	2	characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity					
Metric 6:	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: Variability and Uncertainty					
Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.

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 Data;
Hero ID	3809277

EVALUATION

Domain	Metric	Rating	MWF[*]	Score	Comments
Overall Quality Determination[†]		Medium		1.8	

[*] 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:	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 Data;
Hero ID	3809277

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture or Processing
Life Cycle Description (Subcategory of Use):	Manufacture, Processing EPS or XPS
Physical Form:	solid
Route of Exposure:	Dermal
Exposure Concentration (Unit):	84 to 840 mg/day
Type of Measurement or Method:	taken from 2008 EU assessment (HERO 3970747)
Worker Activity:	handling standard grade HBCD powder at sites for the manufacture or processing

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:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	Medium	× 2	4	EPS compounding and MFG not in scope, but other scenarios are
	Metric 4:	Temporal Representativeness	High	× 2	2	2008
	Metric 5:	Sample Size	Medium	× 1	2	characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	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: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.

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 Data;
Hero ID	3809277

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination[†]		Medium		1.8	

* 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:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970756

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Physical Form:	Fine powder (via micronisation)
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Worst case = 10 mg/m3; typical = 5 mg/m3
Type of Measurement or Method:	from monitoring data or modelled
Worker Activity:	Filling of bags at the production of HBCDD
Bulk and Dust Particle Size Distribution:	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						
	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 filling of bags can be applied to Import
	Metric 4:	Temporal Representativeness	High	× 2	2	2008
	Metric 5:	Sample Size	Medium	× 1	2	characterized by a range with uncertain 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	Medium	× 1	2	limited discussion
Overall Quality Determination†			High		1.6	

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Source Citation:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970756

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:	2008. Summary risk assessment report: Hexabromocyclododecane.	
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;	
Hero ID	3970756	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Physical Form:	Fine powder (via micronisation)
Route of Exposure:	Dermal
Exposure Concentration (Unit):	4200 mg/day
Type of Measurement or Method:	from monitoring data or modelled
Worker Activity:	Filling of bags at the production of HBCDD
Bulk and Dust Particle Size Distribution:	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						
	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 filling of bags can be applied to Import
	Metric 4:	Temporal Representativeness	High	× 2	2	2008
	Metric 5:	Sample Size	Medium	× 1	2	characterized by a range with uncertain 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	Medium	× 1	2	limited discussion
Overall Quality Determination†			High		1.6	

Source Citation:	2008. Summary risk assessment report: Hexabromocyclododecane.				
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;				
Hero ID	3970756				

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:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970756

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Physical Form:	powder
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Worst case = 1.9 mg/m3; typical = 0.95 mg/m3
Type of Measurement or Method:	from monitoring data or modelled
Worker Activity:	Filling of bags at the production of HBCDD
Bulk and Dust Particle Size Distribution:	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						
	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 filling of bags can be applied to Import
	Metric 4:	Temporal Representativeness	High	× 2	2	2008
	Metric 5:	Sample Size	Medium	× 1	2	characterized by a range with uncertain 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	Medium	× 1	2	limited discussion
Overall Quality Determination†			High		1.6	

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Source Citation:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970756

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:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970756

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Physical Form:	granule
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Worst case = 0.19 mg/m3; typical = 0.1 mg/m3
Type of Measurement or Method:	from monitoring data or modelled
Worker Activity:	Filling of bags at the production of HBCDD
Bulk and Dust Particle Size Distribution:	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						
	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 filling of bags can be applied to Import
	Metric 4:	Temporal Representativeness	High	× 2	2	2008
	Metric 5:	Sample Size	Medium	× 1	2	characterized by a range with uncertain 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	Medium	× 1	2	limited discussion
Overall Quality Determination†			High		1.6	

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Source Citation:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970756

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:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970756

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Physical Form:	powder
Route of Exposure:	Dermal
Exposure Concentration (Unit):	840 mg/day
Type of Measurement or Method:	from monitoring data or modelled
Worker Activity:	Filling of bags at the production of HBCDD
Bulk and Dust Particle Size Distribution:	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						
	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 filling of bags can be applied to Import
	Metric 4:	Temporal Representativeness	High	× 2	2	2008
	Metric 5:	Sample Size	Medium	× 1	2	characterized by a range with uncertain 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	Medium	× 1	2	limited discussion
Overall Quality Determination†			High		1.6	

Source Citation:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970756

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:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970756

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Physical Form:	granule
Route of Exposure:	Dermal
Exposure Concentration (Unit):	84 mg/day
Type of Measurement or Method:	from monitoring data or modelled
Worker Activity:	Filling of bags at the production of HBCDD
Bulk and Dust Particle Size Distribution:	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					
	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 filling of bags can be applied to Import
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	Metric 5: Sample Size	Medium	× 1	2	characterized by a range with uncertain 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	Medium	× 1	2	limited discussion
Overall Quality Determination†		High		1.6	

Source Citation:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970756

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:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970756

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Formulation of XPS
Physical Form:	Fine powder (via micronisation)
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Worst case = 3.1 mg/m3; typical = 1.55 mg/m3
Type of Measurement or Method:	from monitoring data or modelled
Worker Activity:	Adding HBCD to process
Bulk and Dust Particle Size Distribution:	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					
	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	High	× 2	2	2008
	Metric 5: Sample Size	Medium	× 1	2	characterized by a range with uncertain 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	Medium	× 1	2	limited discussion
Overall Quality Determination†		High		1.3	

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Source Citation:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970756

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:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970756

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Formulation of XPS
Physical Form:	Fine powder (via micronisation)
Route of Exposure:	Dermal
Exposure Concentration (Unit):	120 mg/day
Type of Measurement or Method:	from monitoring data or modelled
Worker Activity:	Adding HBCD to process
Bulk and Dust Particle Size Distribution:	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					
	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	High	× 2	2	2008
	Metric 5: Sample Size	Medium	× 1	2	characterized by a range with uncertain 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	Medium	× 1	2	limited discussion
Overall Quality Determination†		High		1.3	

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Source Citation:	2008. Summary risk assessment report: Hexabromocyclododecane.				
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;				
Hero ID	3970756				

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:	2008. Summary risk assessment report: Hexabromocyclododecane.	
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;	
Hero ID	3970756	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Formulation of XPS
Physical Form:	powder
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Worst case = 2.5 mg/m3; typical = 1.25 mg/m3
Type of Measurement or Method:	from monitoring data or modelled
Worker Activity:	Adding HBCD to process
Bulk and Dust Particle Size Distribution:	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					
	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	High	× 2	2	2008
	Metric 5: Sample Size	Medium	× 1	2	characterized by a range with uncertain 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	Medium	× 1	2	limited discussion
Overall Quality Determination†		High		1.3	

Source Citation:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970756

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:	2008. Summary risk assessment report: Hexabromocyclododecane.	
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;	
Hero ID	3970756	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Formulation of XPS
Physical Form:	granule
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Worst case = 0.22 mg/m3; typical = 0.11 mg/m3
Type of Measurement or Method:	from monitoring data or modelled
Worker Activity:	Adding HBCD to process
Bulk and Dust Particle Size Distribution:	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						
	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	High	× 2	2	2008
	Metric 5:	Sample Size	Medium	× 1	2	characterized by a range with uncertain 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	Medium	× 1	2	limited discussion
Overall Quality Determination†			High		1.3	

Source Citation:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970756

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:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970756

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Formulation of XPS
Physical Form:	powder
Route of Exposure:	Dermal
Exposure Concentration (Unit):	84 mg/day
Type of Measurement or Method:	from monitoring data or modelled
Worker Activity:	Adding HBCD to process
Bulk and Dust Particle Size Distribution:	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					
	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	High	× 2	2	2008
	Metric 5: Sample Size	Medium	× 1	2	characterized by a range with uncertain 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	Medium	× 1	2	limited discussion
Overall Quality Determination†		High		1.3	

Continued on next page

Source Citation:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970756

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:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	3970756

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Formulation of XPS
Physical Form:	granule
Route of Exposure:	Dermal
Exposure Concentration (Unit):	8.4 mg/day
Type of Measurement or Method:	from monitoring data or modelled
Worker Activity:	Adding HBCD to process
Bulk and Dust Particle Size Distribution:	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						
	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	High	× 2	2	2008
	Metric 5:	Sample Size	Medium	× 1	2	characterized by a range with uncertain 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	Medium	× 1	2	limited discussion
Overall Quality Determination†			High		1.3	

Source Citation:	2008. Summary risk assessment report: Hexabromocyclododecane.				
Type of Data Source	Occupational Exposure; Completed Exposure or Risk Assessments;				
Hero ID	3970756				

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:	Echa,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970759

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Physical Form:	powder
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	0.18 mg/m3 of HBCD in dust (respirable); 1.23 mg/m3 HBCD in dust (total)
Type of Measurement or Method:	measured
Worker Activity:	Packaging of powders

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: 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	× 2	2	2008
	Metric 5: Sample Size	Medium	× 1	2	characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Unacceptable	× 1	4	Monitoring data do not include any needed metadata to understand what the data represent and are not usable in the risk evaluation
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	limited discussion
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.1.

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Source Citation:	Echa,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970759

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

† 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,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970759

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Physical Form:	powder
Route of Exposure:	Dermal
Exposure Concentration (Unit):	170 mg/day
Type of Measurement or Method:	modelled with EASE
Worker Activity:	Packaging of powders

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	approved modelling approach
Domain 2: Representative						
	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	× 2	2	2008
	Metric 5:	Sample Size	Medium	× 1	2	characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Enough metadata to be used
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	limited discussion
Overall Quality Determination†			Medium		1.8	

* 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,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970759

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Physical Form:	granule
Route of Exposure:	Dermal
Exposure Concentration (Unit):	17 mg/day
Type of Measurement or Method:	modelled with EASE
Worker Activity:	Packaging of powders

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	approved modelling approach
Domain 2: Representative						
	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	× 2	2	2008
	Metric 5:	Sample Size	Medium	× 1	2	characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Enough metadata to be used
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	limited discussion
Overall Quality Determination†			Medium		1.8	

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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:	Echa,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.	
Type of Data Source	Occupational Exposure; Monitoring Data;	
Hero ID	3970759	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS formulation
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	mean 0.01 mg/m3 (respirable), 0.03 mg/m3 (total)
Type of Measurement or Method:	measured

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: Geographic Scope	Medium	× 1	2	Europe
	Metric 3: Applicability	High	× 2	2	In scope
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	Metric 5: Sample Size	Medium	× 1	2	characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Unacceptable	× 1	4	Monitoring data do not include any needed metadata to understand what the data represent and are not usable in the risk evaluation
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	limited discussion
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 1.9.

Source Citation:	Echa,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.				
Type of Data Source	Occupational Exposure; Monitoring Data;				
Hero ID	3970759				

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

† 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,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970759

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS, HIPS, production of textile coating
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	mean total dust 1.18 to 1.89 mg/m3; mean respirable dust 0.12 to 0.33 mg/m3
Type of Measurement or Method:	measured

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:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	Medium	× 2	4	These compounding processes are not in scope but may provide baseline for other scenarios
	Metric 4:	Temporal Representativeness	High	× 2	2	2008
	Metric 5:	Sample Size	Medium	× 1	2	characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Unacceptable	× 1	4	Monitoring data do not include any needed metadata to understand what the data represent and are not usable in the risk evaluation
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	limited discussion
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.1.

Source Citation:	Echa,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970759

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

† 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,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3970759

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	HBCDD use for XPS, EPS andHIPS
Physical Form:	Solid
Route of Exposure:	Dermal
Exposure Concentration (Unit):	17 mg/day
Type of Measurement or Method:	modelled

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	approved modelling approach
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	Europe
	Metric 3: Applicability	Medium	× 2	4	XPS in scope but others are not
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	Metric 5: Sample Size	Medium	× 1	2	characterized by a range with uncertain statistics
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Low	× 1	3	Enough metadata to be used
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	limited discussion
Overall Quality Determination†		Medium		1.8	

* 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:	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	Occupational Exposure; Monitoring Data;
Hero ID	1927552

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commerical Use
Life Cycle Description (Subcategory of Use):	Insulation products in offices
Physical Form:	dust captured on indoor air filters
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	27.3 - 2,274 pg/m3 (mean - 1,001 pg/m3)
Number of Samples:	56 (1 per site)
Number of Sites:	56
Type of Measurement or Method:	TWA
Worker Activity:	Modeled data based on HBCD concentration in dust. No associated worker activity.
Type of Sampling:	Cenral air conditioner filter dusts were collected as particulate phase of indoor air (PPIA)
Sampling Location:	Offices
Bulk and Dust Particle Size Distribution:	PM2.5 (Paricle Size 0.4 - 2.2 um)

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Medium	× 1	2	Describes how the data was modeled from the HBCD dust concentrations
Domain 2: Representative					
	Metric 2: Geographic Scope	Low	× 1	3	China (non-OECD country)
	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	2013
	Metric 5: Sample Size	High	× 1	1	Indicates number of locations and provides several statistics of the sample size.

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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 Environment.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1927552

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Monitoring data include all associated metadata.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		Medium		2.0	

* 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:	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	Occupational Exposure; Monitoring Data;
Hero ID	1927552

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commerical Use
Life Cycle Description (Subcategory of Use):	Insulation products in offices
Physical Form:	dust captured on indoor air filters
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	13.5 - 1,099 pg/m3 (mean - 235 pg/m3)
Number of Samples:	56 (1 per site)
Number of Sites:	56
Type of Measurement or Method:	TWA
Worker Activity:	Modeled data based on HBCD concentration in dust
Type of Sampling:	Cenral air conditioner filter dusts were collected as particulate phase of indoor air (PPIA)
Sampling Location:	Offices
Bulk and Dust Particle Size Distribution:	PM10 (Paricle Size 2.5 - 8.9 um)

EVALUATION

Domain		Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Describes how the data was modeled from the HBCD dust concentrations
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	China (non-OECD country)
	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	2013
	Metric 5:	Sample Size	High	× 1	1	Indicates number of locations and provides several statistics of the sample size.
Domain 3: Accessibility/Clarity						

Source Citation:	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	Occupational Exposure; Monitoring Data;				
Hero ID	1927552				

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
	Metric 6: Metadata Completeness	High	× 1	1	Monitoring data include all associated metadata.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		Medium		2.0	

* 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:	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	Occupational Exposure; Monitoring Data;
Hero ID	1927552

EXTRACTION

Parameter	Data
Life Cycle Stage:	Consumer Use
Life Cycle Description (Subcategory of Use):	Insulation products in indoor public microenvironments
Physical Form:	settled dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	90 ng/g - 140,000 ng/g (mean - 8,300 ng/g)
Number of Sites:	97
Type of Measurement or Method:	Concentration in dust
Worker Activity:	HBCDs found from several products used in indoor environments. No associated worker activity.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Low	× 1	3	Does not specify releases since mostly measure dust concentration for exposure modeling
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 exposure) that is similar to an occupational scenario (service life) 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 number of samples at each location. However, provides several statistics of the sample size.
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						

Source Citation:	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	Occupational Exposure; Monitoring Data;				
Hero ID	1927552				

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		Low		2.4	

* 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:	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

EXTRACTION

Parameter	Data
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	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: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty

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 Determination†		Medium		2.2	

* 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:	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

EXTRACTION

Parameter	Data
Life Cycle Stage:	Consumer Use
Life Cycle Description (Subcategory of Use):	Insulation products in homes
Physical Form:	settled dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	2 - 2,800 ng/g HBCD in dust
Number of Sites:	13
Type of Measurement or Method:	Concentration in dust
Worker Activity:	HBCD in dust collected from homes. 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 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: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty

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 Determination[†]		Medium		2.2	

⋆ 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:	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 Data;
Hero ID	1005148

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commerical Use
Life Cycle Description (Subcategory of Use):	Insulation products in offices
Physical Form:	settled dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	31,000 ?PBDEs/g
Type of Measurement or Method:	Concentration in dust
Worker Activity:	Average concentrations of polybrominated diphenyl ethers (PBDEs) in dust in 18 offices. No associated worker activities.

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Methodology is well described
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 exposure) that is similar to an occupational scenario (service life) within the scope of the risk evaluation
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	Metric 5: Sample Size	High	× 1	1	Indicates number of locations and provides several statistics of the sample size.
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	Include necessary metadata
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.

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 Data;
Hero ID	1005148

EVALUATION

Domain	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:	Nicnas,. 2001. Polybrominated flame retardants (PBFRs): Priority existing chemical assessment report no. 20.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	1443962

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Formulation of XPS and converting of XPS
Worker Activity:	Workers in the formulation industry, that is those involved in the formulation of flame retarded resins, have the greatest risk of exposure since they weigh, transfer and mix the solid powder or liquid resins containing 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*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Information from trusted sources
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Australia
	Metric 3:	Applicability	High	× 2	2	In-scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2001
	Metric 5:	Sample Size	N/A		N/A	This metric is not applicable to this data type
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.

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Source Citation:	Nicnas,. 2001. Polybrominated flame retardants (PBFRs): Priority existing chemical assessment report no. 20.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	1443962

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
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	

⋆ 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:	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	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Consumer Use
Life Cycle Description (Subcategory of Use):	Insulation products in homes
Physical Form:	settled dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	6 - 2000 ng HBCD/g dust
Type of Measurement or Method:	Concentration in dust
Worker Activity:	Average concentrations of HBCD in homes. No associated worker activity.

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Methodology is well described
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	US
	Metric 3: Applicability	Unacceptable	× 2	8	Non-occupational scenario (settled dust in homes). No associated worker activites.
	Metric 4: Temporal Representativeness	High	× 2	2	2017
	Metric 5: Sample Size	High	× 1	1	Indicates number of locations and provides several 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.

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 Determination[†]		Unacceptable		4	Metric Mean Score: 1.7.

[**] 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

[†] 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:	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	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	1927576

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS Thermal Cutting
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	89.0 ug/m3
Worker Activity:	Modeled personal area breathing zone based on closed glovebox sampling system
Number of Workers:	1
Type of Sampling:	personal
Sampling Location:	Thermal cutting operation
Exposure Duration:	1 hour

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	Switzerland
	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	Information is all clearly cited
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty

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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	Occupational Exposure; Completed Exposure or Risk Assessments;				
Hero ID	1927576				

EVALUATION

Domain	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:	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	Occupational Exposure; Completed Exposure or Risk Assessments;	
Hero ID	1927576	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS Thermal Cutting
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	57.3 ug/m3
Worker Activity:	Modeled personal area breathing zone based on closed glovebox sampling system
Number of Workers:	1
Type of Sampling:	personal
Sampling Location:	Thermal cutting operation
Exposure Duration:	1 hour

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	Switzerland
	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	Information is all clearly cited
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty

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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	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	1927576

EVALUATION

Domain	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:	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	Occupational Exposure; Monitoring Data;
Hero ID	1927633

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal /Recycling
Life Cycle Description (Subcategory of Use):	Disposal of Waste of Electric and Electronic Equipment (WEEE)
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Mean at 4 sites = 8-50 ng HBCD/m3 (before exposure control improvements); Mean at 4 sites = LOQ to 23 (after improvements)
Number of Samples:	45
Number of Sites:	4
Worker Activity:	The workers were either sorters or dismantlers,or both, or process controllers. Manual disassembly and sorting. Some mechanical separations.Samples were taken before and after improvements to exposure controls (LEV addition to sorting areas, better cleaning of work areas).
Number of Workers:	34
Type of Sampling:	personal
Exposure Duration:	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 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).
Analytic Method:	Occupational Health and Safety Administration (OSHA) versatile sampler; GC-MS

EVALUATION

Domain	Metric	Rating	MWF*	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.

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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	Occupational Exposure; Monitoring Data;
Hero ID	1927633

EVALUATION

Domain		Metric	Rating	MWF*	Score	Comments
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Finland
	Metric 3:	Applicability	High	× 2	2	Worker exposure during electronics recycling is in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2011
	Metric 5:	Sample Size	Medium	× 1	2	Indicates number of samples and provides ranges of arithmetic means, but discrete values are not provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 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	

* 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:	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	Occupational Exposure; Monitoring Data;
Hero ID	1927633

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal /Recycling
Life Cycle Description (Subcategory of Use):	Disposal of Waste of Electric and Electronic Equipment (WEEE)
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Site A: 2008 =14 - 47 ng HBCD/m3, 27 (median), 29 (arithmetic mean); 2009 = ND - 8.5, 1.3 (median), 2.9 (arith. mean). Additional results available for Sites B, C, and D in the same format (range, arethmetic mean, and median)
Number of Samples:	45
Number of Sites:	4
Worker Activity:	same as row 87 (supplemental file to 1927633)
Number of Workers:	34
Type of Sampling:	personal
Exposure Duration:	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 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).
Analytic Method:	Occupational Health and Safety Administration (OSHA) versatile sampler; GC-MS

EVALUATION

Domain	Metric	Rating	MWF*	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					

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	Occupational Exposure; Monitoring Data;				
Hero ID	1927633				

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
	Metric 2:	Geographic Scope	Medium	× 1	2	Finland
	Metric 3:	Applicability	High	× 2	2	Worker exposure during electronics recycling is in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2011
	Metric 5:	Sample Size	Medium	× 1	2	Indicates number of samples and provides ranges of arithmetic means, but discrete values are not provided
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 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	

* 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:	Saito, I.,Onuki, A.,Seto, H.. 2007. Indoor organophosphate and polybrominated flame retardants in Tokyo. Indoor Air.	
Type of Data Source	Occupational Exposure; Monitoring Data;	
Hero ID	1927779	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Consumer Use
Life Cycle Description (Subcategory of Use):	Insulation products in homes
Physical Form:	settled dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	up to 24 ng/m3
Number of Samples:	18
Type of Measurement or Method:	Concentration in dust
Worker Activity:	HBCD in dust collected from homes. No associated worker activity.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Methodology is well described
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Japan
	Metric 3:	Applicability	Unacceptable	× 2	8	Non-occupational scenario (settled dust in homes). No associated worker activites.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2006
	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	× 1	3	Does not provide worker activites, sample time
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	limited discussion
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.4.

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Source Citation:	Saito, I.,Onuki, A.,Seto, H.. 2007. Indoor organophosphate and polybrominated flame retardants in Tokyo. Indoor Air.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1927779

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

† 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:	Saito, I.,Onuki, A.,Seto, H.. 2007. Indoor organophosphate and polybrominated flame retardants in Tokyo. Indoor Air.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1927779

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commerical Use
Life Cycle Description (Subcategory of Use):	Insulation products in offices
Physical Form:	settled dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	up to 29.5 ng/m3
Number of Samples:	14
Type of Measurement or Method:	Concentration in dust
Worker Activity:	HBCD in dust collected from offices. No associated worker activities.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Methodology is well described
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Japan
	Metric 3:	Applicability	Unacceptable	× 2	8	Occupational scenario (use of insulation in offices). No associated worker activities.
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2006
	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	× 1	3	Does not provide worker activites, sample time
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	limited discussion
Overall Quality Determination[†]			Unacceptable		4	Metric Mean Score: 2.4.

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Source Citation:	Saito, I.,Onuki, A.,Seto, H.. 2007. Indoor organophosphate and polybrominated flame retardants in Tokyo. Indoor Air.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	1927779

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

† 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:	Strid, A.,Smedje, G.,Athanassiadis, I.,Lindgren, T.,Lundgren, H.,Jakobsson, K.,Bergman, A.. 2014. Brominated flame retardant exposure of aircraft personnel. Chemosphere.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2343686

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commerical Use
Life Cycle Description (Subcategory of Use):	Insulation products in airplanes
Physical Form:	dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	<LOD to 1500 pmol/m3
Number of Samples:	6
Type of Measurement or Method:	Concentration in dust
Worker Activity:	sampled during maintenancework
Type of Sampling:	personal

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Methodology is well described
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Sweden
	Metric 3:	Applicability	Medium	× 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	× 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	× 1	3	Does not provide worker activites, sample time
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.

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Source Citation:	Strid, A.,Smedje, G.,Athanassiadis, I.,Lindgren, T.,Lundgren, H.,Jakobsson, K.,Bergman, A.. 2014. Brominated flame retardant exposure of aircraft personnel. Chemosphere.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2343686

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
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.

Source Citation:	Strid, A.,Smedje, G.,Athanassiadis, I.,Lindgren, T.,Lundgren, H.,Jakobsson, K.,Bergman, A.. 2014. Brominated flame retardant exposure of aircraft personnel. Chemosphere.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2343686

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commerical Use
Life Cycle Description (Subcategory of Use):	Insulation products in airplanes
Physical Form:	dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	0.49 to 490 pmol/m3
Number of Samples:	9
Type of Measurement or Method:	Concentration in dust
Worker Activity:	sampled during maintenancework - locations in Table 1
Type of Sampling:	area

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Methodology is well described
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Sweden
	Metric 3:	Applicability	Medium	× 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	× 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	× 1	3	Does not provide worker activites, sample time
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.

Source Citation:	Strid, A.,Smedje, G.,Athanassiadis, I.,Lindgren, T.,Lundgren, H.,Jakobsson, K.,Bergman, A.. 2014. Brominated flame retardant exposure of aircraft personnel. Chemosphere.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2343686

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
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.

Source Citation:	Strid, A.,Smedje, G.,Athanassiadis, I.,Lindgren, T.,Lundgren, H.,Jakobsson, K.,Bergman, A.. 2014. Brominated flame retardant exposure of aircraft personnel. Chemosphere.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2343686

EXTRACTION

Parameter	Data
Life Cycle Stage:	Consumer Use
Life Cycle Description (Subcategory of Use):	Insulation products in homes
Physical Form:	settled dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	median = 6 ng HBCD/g dust
Worker Activity:	HBCD in dust collected from homes. No associated worker activity.

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Methodology is well described
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	Egypt
	Metric 3:	Applicability	Unacceptable	× 2	8	Non-occupational scenario (settled dust in homes). No associated worker activites.
	Metric 4:	Temporal Representativeness	High	× 2	2	2015
	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	× 1	3	Does not provide worker activites, sample time
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†			Unacceptable		4	Metric Mean Score: 2.2.

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Source Citation:	Strid, A.,Smedje, G.,Athanassiadis, I.,Lindgren, T.,Lundgren, H.,Jakobsson, K.,Bergman, A.. 2014. Brominated flame retardant exposure of aircraft personnel. Chemosphere.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2343686

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

† 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:	Strid, A.,Smedje, G.,Athanassiadis, I.,Lindgren, T.,Lundgren, H.,Jakobsson, K.,Bergman, A.. 2014. Brominated flame retardant exposure of aircraft personnel. Chemosphere.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2343686

EXTRACTION

Parameter	Data
Life Cycle Stage:	Commerical Use
Life Cycle Description (Subcategory of Use):	Insulation products in offices
Physical Form:	settled dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	median = 19 ng HBCD/g dust
Worker Activity:	HBCD in dust collected from offices. No associated worker activities.

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Methodology is well described
Domain 2: Representative					
	Metric 2: Geographic Scope	Low	× 1	3	Egypt
	Metric 3: Applicability	Unacceptable	× 2	8	Occupational scenario (use of insulation in offices). No associated worker activities.
	Metric 4: Temporal Representativeness	High	× 2	2	2015
	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	× 1	3	Does not provide worker activites, sample time
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†		Unacceptable		4	Metric Mean Score: 2.2.

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Source Citation:	Strid, A.,Smedje, G.,Athanassiadis, I.,Lindgren, T.,Lundgren, H.,Jakobsson, K.,Bergman, A.. 2014. Brominated flame retardant exposure of aircraft personnel. Chemosphere.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2343686

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.

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High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Strid, A.,Smedje, G.,Athanassiadis, I.,Lindgren, T.,Lundgren, H.,Jakobsson, K.,Bergman, A.. 2014. Brominated flame retardant exposure of aircraft personnel. Chemosphere.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2343686

EXTRACTION

Parameter	Data
Life Cycle Stage:	Consumer Use
Life Cycle Description (Subcategory of Use):	Insulation products in cars
Physical Form:	settled dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	median = 37 ng HBCD/g dust
Worker Activity:	HBCD in dust collected from cars. No associated worker activities.

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Methodology is well described
Domain 2: Representative					
	Metric 2: Geographic Scope	Low	× 1	3	Egypt
	Metric 3: Applicability	Unacceptable	× 2	8	Non-occupational scenario (settled dust in cars). No associated worker activites.
	Metric 4: Temporal Representativeness	High	× 2	2	2015
	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	× 1	3	Does not provide worker activites, sample time
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†		Unacceptable		4	Metric Mean Score: 2.2.

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Source Citation:	Strid, A.,Smedje, G.,Athanassiadis, I.,Lindgren, T.,Lundgren, H.,Jakobsson, K.,Bergman, A.. 2014. Brominated flame retardant exposure of aircraft personnel. Chemosphere.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	2343686

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

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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	Occupational Exposure; Monitoring Data;
Hero ID	3350480

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal /Recycling
Life Cycle Description (Subcategory of Use):	Disposal of Waste of Electric and Electronic Equipment (WEEE)
Physical Form:	Dust
Route of Exposure:	N/A - dust taken from floors
Exposure Concentration (Unit):	555700 ng HBCD/g dust (mean concentration range); ND - 57,000 ng HBCD/g dust (range)
Number of Samples:	48
Number of Sites:	4
Type of Measurement or Method:	HBCD in dust collected from floors of e-waste facilities
Worker Activity:	dismantling e-waste and renovating e-waste components
Type of Sampling:	surface sampling
Analytic Method:	scanning electron microscope (SEM)

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Not an OSHA or NIOSH method, but methodology is well described and appears acceptable
Domain 2: Representative						
	Metric 2:	Geographic Scope	Low	× 1	3	China (non-OECD country)
	Metric 3:	Applicability	High	× 2	2	Worker exposure during electronics recycling is in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2016
	Metric 5:	Sample Size	Medium	× 1	2	Indicates number of samples and provides ranges and means; discrete samples not available
Domain 3: Accessibility/Clarity						

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	Occupational Exposure; Monitoring Data;				
Hero ID	3350480				

EVALUATION

Domain	Metric	Rating	MWF*	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: 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†		Medium		1.7	

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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	Occupational Exposure; Completed Exposure or Risk Assessments;	
Hero ID	1937209	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Consumer Use
Life Cycle Description (Subcategory of Use):	Insulation in homes
Physical Form:	settled dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	<4.5 to 130,200 ng/g dust (geomean 354)
Number of Samples:	16
Type of Measurement or Method:	Measurements - notes this RA presents additional data that is already included in this XLS for other HERO IDs
Worker Activity:	HBCD in dust collected from homes. No associated worker activity.

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	Unacceptable	× 2	8	Non-occupational scenario (settled dust in homes). No associated worker activites.
	Metric 4: Temporal Representativeness	High	× 2	2	2011
	Metric 5: Sample Size	Medium	× 1	2	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
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.

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	Occupational Exposure; Completed Exposure or Risk Assessments;				
Hero ID	1937209				

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Overall Quality Determination†		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.

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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	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	1937209

EXTRACTION

Parameter	Data
Life Cycle Stage:	Consumer Use
Life Cycle Description (Subcategory of Use):	Insulation in homes
Physical Form:	settled dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	110 to 4000 ng/g dust (mean 810)
Number of Samples:	13
Type of Measurement or Method:	Measurements - notes this RA presents additional data that is already included in this XLS for other HERO IDs
Worker Activity:	HBCD in dust collected from homes. No associated worker activity.

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	Unacceptable	× 2	8	Non-occupational scenario (settled dust in homes). No associated worker activites.
	Metric 4:	Temporal Representativeness	High	× 2	2	2011
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
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.

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	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	1937209

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 1.8.

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High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

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	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	1937209

EXTRACTION

Parameter	Data
Life Cycle Stage:	Consumer Use
Life Cycle Description (Subcategory of Use):	Insulation in homes
Physical Form:	settled dust
Route of Exposure:	oral
Exposure Concentration (Unit):	2.5 mg/day
Type of Measurement or Method:	taken from 2008 EU assessment (HERO 3970747)
Worker Activity:	Assume 10 kg child eating all dust generated from 2 sofas, 4 m2 textile area, pica behaviour, thus 2.5 mg/day. No associated worker activities.

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	Unacceptable	× 2	8	Non-occupational scenario (settled dust in homes). No associated worker activites.
	Metric 4: Temporal Representativeness	High	× 2	2	2011
	Metric 5: Sample Size	Medium	× 1	2	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
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.

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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	Occupational Exposure; Completed Exposure or Risk Assessments;
Hero ID	1937209

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 1.8.

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High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	Velsicol 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	Occupational Exposure; Monitoring Data;
Hero ID	1928232

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacturing
Life Cycle Description (Subcategory of Use):	HBCD manufacture
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	1.9 mg/m3
Number of Sites:	1
Type of Measurement or Method:	Industrial hygiene survey sample
Worker Activity:	Transfer of the HBCD in the hammer-mill to 28 drums
Number of Workers:	1
Exposure Duration:	300 minutes (5 hours)
PPE:	Respiratory protection but no other dermal and eye protection (such as goggles or gloves) were worn

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	US
	Metric 3:	Applicability	Medium	× 2	4	Manufacturing is out of scope, but this information may be applicable to import
	Metric 4:	Temporal Representativeness	Low	× 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: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Metadata provided

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Source Citation:	Velsicol 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	Occupational Exposure; Monitoring Data;
Hero ID	1928232

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		Medium		2.1	

* MWF = Metric Weighting Factor

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  High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

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

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	HBCD Production
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	10.2 ug/m3 to 28.3 ug/m3
Number of Sites:	14
Number of Workers:	23 to 37

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	Low	× 1	3	China
	Metric 3:	Applicability	Medium	× 2	4	Manufacturing is out of scope, but this information may be applicable to import
	Metric 4:	Temporal Representativeness	High	× 2	2	2016
	Metric 5:	Sample Size	Low	× 1	3	characterized by no statistics.
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[†]			Medium		2.1	
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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

⋆ 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.,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	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS formulation
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	3.62 ug/m3 to 35.5 ug/m3
Number of Sites:	520
Number of Workers:	520 to 1,040

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	Low	× 1	3	China
	Metric 3:	Applicability	High	× 2	2	in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2016
	Metric 5:	Sample Size	Low	× 1	3	characterized by no statistics.
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†			Medium		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	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3350493

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments

⋆ MWF = Metric Weighting Factor

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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

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS formulation
Physical Form:	Dust
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	16 ug/m3 to 26.7 ug/m3
Number of Sites:	65
Number of Workers:	71 to 136

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	Low	× 1	3	China
	Metric 3:	Applicability	Medium	× 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	High	× 2	2	2016
	Metric 5:	Sample Size	Low	× 1	3	characterized by no statistics.
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[†]			Medium		2.1	

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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

⋆ 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:	ToxNet Hazardous Substances Data, Bank. 2017. HSDB: 1,2,5,6,9,10-Hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970278

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Worker Activity:	Provides toxicity data on HBCD. No information extracted.

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	High	× 1	1	US
	Metric 3: Applicability	Unacceptable	× 2	8	Toxicity information is relevant to the Risk Assessment, but is not utilized by the engineering assessors
	Metric 4: Temporal Representativeness	High	× 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	× 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†		Unacceptable		4	Metric Mean Score: 2.2.

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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:	Echa,. 2017. Hexabromocyclododecane, Part 2.				
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3970760				

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Worker Activity:	Provides toxicity data on HBCD. No information extracted.

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	High	× 1	1	US
	Metric 3: Applicability	Unacceptable	× 2	8	Toxicity information is relevant to the Risk Assessment, but is not utilized by the engineering assessors
	Metric 4: Temporal Representativeness	High	× 2	2	2016
	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					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.2.

⋆⋆ Consistent with our *Application of Systematic Review in TSCA Risk 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

† 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:	NIOSH,. 2014. International chemical safety cards (ICSC): Hexabromocyclododecane (mixture of isomers).
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978153

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Worker Activity:	Provides toxicity and other SDS data on HBCD. No information extracted.

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	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	No information regarding HBCD exposure
	Metric 4:	Temporal Representativeness	High	× 2	2	2016
	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						
	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.2.

** Consistent with our *Application of Systematic Review in TSCA Risk 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

† 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,. 2017. Guidance on safe use: hexabromocyclododecane.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970743

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Worker Activity:	Provides toxicity and other SDS data on HBCD. No information extracted.

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	High	× 1	1	US
	Metric 3: Applicability	Unacceptable	× 2	8	Toxicity information is relevant to the Risk Assessment, but is not utilized by the engineering assessors
	Metric 4: Temporal Representativeness	Medium	× 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: 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†		Unacceptable		4	Metric Mean Score: 2.5.

** 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

† 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,. 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	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3809166				

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Type of Measurement or Method:	Presents exposure data that is presented in EURAR (HERO ID 3970747)

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	Multiple European countries
Metric 3:	Applicability	Medium	× 2	4	Provides information on both in-scope and out of scope uses.
Metric 4:	Temporal Representativeness	High	× 2	2	2009
Metric 5:	Sample Size	Medium	× 1	2	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/Clarity					
Metric 6:	Metadata Completeness	High	× 1	1	fully transparent.
Domain 4: Variability and Uncertainty					
Metric 7:	Metadata Completeness	High	× 1	1	discussion of variability or uncertainty
Overall Quality Determination[†]		High		1.4	

* 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,. 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	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3809166

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	MFG of XPS foam from XPS Masterbatch
Exposure Concentration (Unit):	0.02 - 0.22 mg/3
Number of Samples:	42
Number of Sites:	4
Type of Measurement or Method:	see Table 2.15
Worker Activity:	Potential exposure to HBCDD during XPS manufacture occurs when it is added to a hopper that feeds into the polystyrene melt. Further potential exposure to HBCDDcontained within polystyrene dust may also occur during secondary processing of XPS and during the shredding and reprocessing of process waste.

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	Multiple European countries
	Metric 3: Applicability	Medium	× 2	4	Provides information on both in-scope and out of scope uses.
	Metric 4: Temporal Representativeness	High	× 2	2	2009
	Metric 5: Sample Size	Medium	× 1	2	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	fully transparent.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	discussion of variability or uncertainty
Continued on next page					

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	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3809166

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination†		High		1.4	

* 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:	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	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	6388404

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Demolition/Disposal
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	crystalline silica: 0.02 - 0.17 mg/m3
Worker Activity:	Cutting Fiber-Cement Siding

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	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	× 2	4	Cites source from 2004
	Metric 5: Sample Size	Medium	× 1	2	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
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. (may be stated in original source)
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 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 Safety and Health. 2013. Reducing hazardous dust exposure when cutting fiber-cement siding. NIOSH Publication Number 2013-128.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	6388404

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

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* MWF = Metric Weighting Factor

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High: ≥ 1 to < 1.7; Medium: ≥ 1.7 to < 2.3; Low: ≥ 2.3 to ≤ 3.

Source Citation:	National Institute for Occupational Safety and Health. 2013. Criteria for a recommended standard occupational exposure to hexavalent chromium.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	6388406

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Construction
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	hexavalent chromium: 0.04-0.42 ?g/m3
Number of Samples:	7
Worker Activity:	Stick, MIG welding on steel, galvanized piping and sheet metal (construction)

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	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	× 2	4	Cites source from 2007
	Metric 5: Sample Size	Medium	× 1	2	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
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. (may be stated in original source)
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.4.

Source Citation:	National Institute for Occupational Safety and Health. 2013. Criteria for a recommended standard occupational exposure to hexavalent chromium.
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

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Source Citation:	National Institute for Occupational Safety and Health. 2013. Criteria for a recommended standard occupational exposure to hexavalent chromium.	
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;	
Hero ID	6388406	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Demolition/Disposal
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	hexavalent chromium: < 0.02-0.03 ?g/m3
Number of Samples:	4
Worker Activity:	Crushing and recycling of concrete from demolition

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	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	× 2	4	Cites source from 2007
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
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. (may be stated in original source)
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination[†]			Unacceptable		4	Metric Mean Score: 2.4.

Source Citation:	National Institute for Occupational Safety and Health. 2013. Criteria for a recommended standard occupational exposure to hexavalent chromium.
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

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† 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:	National Institute for Occupational Safety and Health. 2013. Criteria for a recommended standard occupational exposure to hexavalent chromium.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	6388406

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Construction
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	hexavalent chromium: 0.10-1.3 ?g/m3
Number of Samples:	2
Worker Activity:	Remove Chromate-containing paint by abrasive blasting

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	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	× 2	4	Cites source from 2007
	Metric 5:	Sample Size	Medium	× 1	2	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
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. (may be stated in original source)
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Limited discussion on variability (provides mean for dataset)
Overall Quality Determination[†]			Unacceptable		4	Metric Mean Score: 2.3.

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Source Citation:	National Institute for Occupational Safety and Health. 2013. Criteria for a recommended standard occupational exposure to hexavalent chromium.
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 TSCA Risk 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

† 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:	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	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	6388407

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Construction (Renovation)
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	PCBs: 81 ppm
Worker Activity:	Dust inside ventilation systems (renovating schools)

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	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	× 2	4	Cites source from 1998
	Metric 5:	Sample Size	Low	× 1	3	characterized by no statistics.
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. (may be stated in original source)
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination[†]			Unacceptable		4	Metric Mean Score: 2.6.

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	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	6388407

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

† 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:	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 Source	Occupational Exposure; Monitoring Data;
Hero ID	498521

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	All
Physical Form:	Powder
Route of Exposure:	Dermal
Exposure Concentration (Unit):	Typical case exposure: 900 mg
Number of Samples:	19
Type of Measurement or Method:	Cotton gloves
Worker Activity:	Loading mixer with powder
Exposure Duration:	2-20 min
Engineering Control & percent Exposure Reduction:	local exhaust ventilation

EVALUATION

Domain		Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Information from peer-reviewed journal
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	High	× 2	2	Exposure data can relate to multiple scenarios that involve loading of solids
	Metric 4:	Temporal Representativeness	Low	× 2	6	source states data is from 1996
	Metric 5:	Sample Size	Medium	× 1	2	Some statistics provided, others unknown
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Monitoring data include all associated metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty

Source Citation:	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 Source	Occupational Exposure; Monitoring Data;
Hero ID	498521

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination[†]		Medium		1.9	

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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:	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 Source	Occupational Exposure; Monitoring Data;
Hero ID	498521

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	All
Physical Form:	Powder
Route of Exposure:	Dermal
Exposure Concentration (Unit):	Typical case exposure: 450 mg
Number of Samples:	12
Type of Measurement or Method:	Cotton gloves
Worker Activity:	Gathering closed bags of powder

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Information from peer-reviewed journal
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	High	× 2	2	Exposure data can relate to multiple scenarios that involve loading of solids
	Metric 4:	Temporal Representativeness	Low	× 2	6	source states data is from 1996
	Metric 5:	Sample Size	Medium	× 1	2	Some statistics provided, others unknown
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Monitoring data include all associated metadata.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†			Medium		1.9	

Continued on next page

Source Citation:	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 Source	Occupational Exposure; Monitoring Data;
Hero ID	498521

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:	Kenneth W. Fent; GPH; Sean DeCrane. 2015. Firefighters" Perspective on Flame Retardants.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	6766298

EXTRACTION

Parameter	Data
Life Cycle Stage:	End Use
Life Cycle Description (Subcategory of Use):	Firefighting
Physical Form:	Vapor, particulate
Route of Exposure:	Dermal, inhalation
Worker Activity:	Exterior operations (deploying hose, forcible entry), overhaul operations, PPE ensembles could also become contaminated with these compounds and then transferred to the skin. Because some flame retardants, dioxins, and furans are highly persistent, they could accumulate on gear over time and transfer to the skin of firefighters where they may be dermally absorbed or ingested. Another possible exposure pathway is from the particulate and vapors produced during a fire that may penetrate or permeate the protective barriers of the turnout gear and directly contact the skin. Studies have demonstrated that neck and hands are particularly vulnerable to this exposure pathway
PPE:	Firefighters generally wear a self-contained breathing apparatus (SCBA), but do not always wear SCBA during exterior operations (deploying hose, forcible entry, outside vent) or during overhaul operations

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	Medium	× 1	2	Information is generally from frequently used sources (NIOSH studies, peer reviewed articles), but not always.
Domain 2: Representative					
Metric 2:	Geographic Scope	High	× 1	1	U.S.
Metric 3:	Applicability	High	× 2	2	Exposure scenario is in scope
Metric 4:	Temporal Representativeness	High	× 2	2	2015
Metric 5:	Sample Size	N/A		N/A	Not applicable to this data type

Continued on next page

Source Citation:	Kenneth W. Fent; GPH; Sean DeCrane. 2015. Firefighters" Perspective on Flame Retardants.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	6766298

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Medium	× 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 Determination†		High		1.5	

* 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:	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, dibenzofurans, polybrominated diphenyl ethers) available in Table 1. Measured 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:	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 toxicity...Tentative TEQs calculated for PBDD/Fs suggested that these compounds may contribute substantially to dioxin-like toxicity 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 suggestive of significant occupational exposure to these compounds during firefighting.
Number of Workers:	12
Type of Sampling:	serum concentrations
Analytic Method:	high resolution gas chromatography-high resolution mass spectrometry (HRGC-HRMS)

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

Continued on next page

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[*]	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Methods are well described and appear to be equivalent to approved OSHA or NIOSH method
Domain 2: Representative						
	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	× 2	2	2013
	Metric 5:	Sample Size	Medium	× 1	2	Characterized by mean, median, standard deviation, and range. Other statistics are uncertain.
Domain 3: Accessibility/Clarity						
	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: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Variability addressed in standard deviation and through sampling of multiple firefighters of differing demographics. Uncertainty discussed in results and conclusions.
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:	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.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	3463474

EXTRACTION

Parameter	Data
Life Cycle Stage:	End Use
Life Cycle Description (Subcategory of Use):	Firefighting
Physical Form:	Solid
Route of Exposure:	Dermal
Exposure Concentration (Unit):	See table 2 - 4 - Every clothing sample, including an unused hood and all three layers of an unused glove, held a detectable concentration of at least one PBDE.
Number of Samples:	4 hoods, 1 coat, and 3 glove samples
Type of Measurement or Method:	Samples approximately 10 cm square were cut from the clothing and one half was weighed and then sent to the analytical laboratory for analysis.
Worker Activity:	Samples were taken from used and unused firefighter protective clothing, including gloves, hoods and a coat wristlet
Type of Sampling:	surface sampling
Sampling Location:	PPE
PPE:	gloves, hoods and a coat wristlet
Analytic Method:	were extracted with methylene chloride and analyzed by EPA method 8270D Specific Ion Method (SIM) for polybrominated diphenyl ethers (PBDEs)

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Methods are well described and appear to be equivalent to approved OSHA or NIOSH method
Domain 2: Representative						
	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.

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		Source Citation:	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.
		Type of Data Source	Occupational Exposure; Monitoring Data;
		Hero ID	3463474

EVALUATION

Domain		Metric	Rating	MWF*	Score	Comments
	Metric 4:	Temporal Representativeness	High	× 2	2	2016
	Metric 5:	Sample Size	High	× 1	1	All sample results are provided such that statistics can be calculated.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Data are surface samples - metadata include sample type but associated exposure information (duration, frequency, route are unknown)
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Variability addressed through sampling of multiple types of PPE, used and unused. Uncertainty discussed in discussion section.
Overall Quality Determination†			High		1.4	

* 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:	Health, MDo. 2016. Flame Retardants and Firefighter Exposure and Health.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	6766303

EXTRACTION

Parameter	Data
Life Cycle Stage:	End Use
Life Cycle Description (Subcategory of Use):	Firefighting
Physical Form:	Vapor, particulate
Route of Exposure:	inhalation, dermal absorption, and ingestion
Exposure Concentration (Unit):	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.
Worker Activity:	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⋆	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Medium	× 1	2	Information is generally from frequently used sources (NIOSH studies, peer reviewed articles), but not always.
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	U.S.
	Metric 3: Applicability	High	× 2	2	Exposure scenario is in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2016
	Metric 5: Sample Size	N/A		N/A	Not applicable to this data type

Source Citation:	Health, MDo. 2016. Flame Retardants and Firefighter Exposure and Health.
Type of Data Source	Occupational Exposure; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	6766303

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Medium	× 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 Determination†		High		1.5	

* 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:	Kenneth W. Fent; GPH; Sean DeCrane; Gavin P. Horn; SK; Kenneth W. Fent. 2016. Interim Report: Cardiovascular & Chemical Exposure Risks in Modern Firefighting.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	6766299

EXTRACTION

Parameter	Data
Life Cycle Stage:	End Use
Life Cycle Description (Subcategory of Use):	Firefighting
Physical Form:	Vapor, particulate
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Table 7 contains area air concentraions, Table 12 has surface contamination levels on PPE (PBDEs, TBBPA, TPP, and other flame retardants)
Number of Samples:	12 area; 90 PPE wipe
Number of Sites:	1
Type of Measurement or Method:	generally descibed but methods not mentioned
Worker Activity:	Fire supression and overhaul
Type of Sampling:	area, wipe
Sampling Location:	Living room, bedroom (source of fire)
PPE:	SCBA, gloves

EVALUATION

Domain		Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Methods are generally described but not specific enough to determine if NIOSH or OSHA (or equivalent)
Domain 2: Representative						
	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	× 2	2	2016
	Metric 5:	Sample Size	Low	× 1	3	Source provides single result per coumpound but does not indicate if this is the mean, median, or some other statistic.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Monitoring data include sample type but no other metadata.

Source Citation:	Kenneth W. Fent; GPH; Sean DeCrane; Gavin P. Horn; SK; Kenneth W. Fent. 2016. Interim Report: Cardiovascular & Chemical Exposure Risks in Modern Firefighting.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	6766299

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata 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 Determination†		Medium		1.8	

* 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:	Alexander C. Mayer; KWF; Stephen Bertke. 2019. Firefighter hood contamination: Efficiency of laundering to remove PAHs and FRs". Journal of Occupational and Environmental Hygiene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	6766304

EXTRACTION

Parameter	Data
Life Cycle Stage:	End Use
Life Cycle Description (Subcategory of Use):	Firefighting
Physical Form:	Solid
Route of Exposure:	Dermal
Exposure Concentration (Unit):	Results are in Figure 1C and 2C and Table 3. HBCD was not detected in any laundered or unlaundered hoods.
Number of Samples:	10
Type of Measurement or Method:	Samples were cut from the clothing then sent to the analytical laboratory for analysis.
Worker Activity:	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 overhaul and attack.
Number of Workers:	40
Type of Sampling:	surface sampling
Sampling Location:	PPE
PPE:	SCBA, hoods
Analytic Method:	NIOSH Method 5506; ultra-performance liquid chromatography (UPLC) atmospheric pressure photoionization (APPI) tandem mass spectrometry

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	NIOSH methods were used
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	U.S.
	Metric 3: Applicability	High	× 2	2	Exposure scenario is in scope and data is available for HBCD

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	Source Citation:	Alexander C. Mayer; KWF; Stephen Bertke. 2019. Firefighter hood contamination: Efficiency of laundering to remove PAHs and FRs". Journal of Occupational and Environmental Hygiene.
	Type of Data Source	Occupational Exposure; Monitoring Data;
	Hero ID	6766304

EVALUATION

Domain		Metric	Rating	MWF*	Score	Comments
	Metric 4:	Temporal Representativeness	High	× 2	2	2019
	Metric 5:	Sample Size	Medium	× 1	2	Results provided as mean and standard deviation. Other statistics are uncertain.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Low	× 1	3	Data are surface samples - metadata include sample type but associated exposure information (duration, frequency, route are unknown)
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Variability addressed in standard deviation and through sampling of hoods used for various activities and both laundered and unlaundered. Uncertainty discussed in the discussion.
Overall Quality Determination†			High		1.3	

* 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:	Beverly Shen, TPW. 2018. Organophosphate flame retardants in dust collected from United States fire Stations. Environment International.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	6766302

EXTRACTION

Parameter	Data
Life Cycle Stage:	End Use
Life Cycle Description (Subcategory of Use):	Firefighting
Physical Form:	particulate (dust)
Route of Exposure:	inhalation, dermal absorption, and ingestion
Exposure Concentration (Unit):	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.
Number of Samples:	26
Number of Sites:	26
Type of Measurement or Method:	dust collected from vacuum-cleaner bags
Worker Activity:	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.
Analytic Method:	high-resolution gas chromatographymassspectrometry operated in electron impact ionization mode

EVALUATION

Domain		Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Methods are well described and appear to be equivalent to approved OSHA or NIOSH method
Domain 2: Representative						
	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	× 2	2	2018
	Metric 5:	Sample Size	Medium	× 1	2	Results provided as min, median, mean, and max. Other statistics are uncertain.

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Source Citation:	Beverly Shen, TPW. 2018. Organophosphate flame retardants in dust collected from United States fire Stations. Environment International.				
Type of Data Source	Occupational Exposure; Monitoring Data;				
Hero ID	6766302				

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 3: Accessibility/Clarity					
	Metric 6: 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: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	Variability addressed by sampling different firestations in different states. Uncertainties discussed in the Limitations section.
Overall Quality Determination†		High		1.4	

* 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:	Kenneth W. Fent; DEE; Kelsey Babik. 2018. Airborne contaminants during controlled residential fires. Journal of Occupational and Environmental Hygiene.
Type of Data Source	Occupational Exposure; Monitoring Data;
Hero ID	6766300

EXTRACTION

Parameter	Data
Life Cycle Stage:	End Use
Life Cycle Description (Subcategory of Use):	Firefighting
Physical Form:	Vapor, particulate
Route of Exposure:	Inhalation
Exposure Concentration (Unit):	Results in Table 3 (personal) and Table 4 (area). Sampled compounds included polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), hydrogen cyanide (HCN), acid gases (e.g., hydrogen bromide), and particulate (area air sampling only).
Number of Samples:	10 (HBr); 11 particulate
Type of Measurement or Method:	Study performed with collaboration from NIOSH - methods in Table 1 and 2 per analyte
Worker Activity:	Area air measurements were collected from the structure during active fire and overhaul (post suppression) and on the fireground where personnel were operating without any respiratory protection. Personal air measurements were collected from firefighters assigned to fire attack, victim search, overhaul, outside ventilation, and command/pump operator positions.
Number of Workers:	12
Type of Sampling:	area and personal
Analytic Method:	Table 1 (area), Tablee 2 (particulate), and NIOSH method 1501 (personal - VOCs)

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	× 1	1	NIOSH methods were used
Domain 2: Representative					
Metric 2:	Geographic Scope	High	× 1	1	U.S.

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Source Citation:	Kenneth W. Fent; DEE; Kelsey Babik. 2018. Airborne contaminants during controlled residential fires. Journal of Occupational and Environmental Hygiene.				
Type of Data Source	Occupational Exposure; Monitoring Data;				
Hero ID	6766300				

EVALUATION

Domain	Metric		Rating	MWF[*]	Score	Comments
	Metric 3:	Applicability	High	× 2	2	Exposure scenario is in scope and data for hydrogen bromide and particulates are directly applicable to HBCD
	Metric 4:	Temporal Representativeness	High	× 2	2	2018
	Metric 5:	Sample Size	Medium	× 1	2	Results provided as median and range. Other statistics are uncertain.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Article provides sample type, sample duration, and worker activity or location.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	Variability addressed by sampling different activities and locations. Uncertainty discussed in the discussion.
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.

Facility

Source Citation:	Thomsen, C.,Molander, P.,Daae, H. L.,JanÃ¡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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	787728

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Manufacture of EPS containing HBCD
Process Description:	HBCD particles (from 20 nm to 2 mm) are added to EPS batches. 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 products not containing HBCD are produced.
Number of Sites:	1
Operating Days per Year and Batches per Day:	112 to 140 days/year (8-10 production periods; each production period lasts 14 days)
Possible Physical Form:	Solid
Chemical Concentration:	0.7 wt percent HBCD in EPS

EVALUATION

Domain		Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Information is from a published journal article
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	A Scandanavian Industrial Plant. Since all scandanavian countries (Sweden, Denmark, Finland, Norway, Iceland) are in OECD, this score is a 2.
	Metric 3:	Applicability	Medium	× 2	4	EPS compounding not in scope but may provide insight into EPS particle size and wt frac
	Metric 4:	Temporal Representativeness	Medium	× 2	4	The report was published in 2007 (> 10 years ago)
	Metric 5:	Sample Size	N/A		N/A	Not applicable for this information
Domain 3: Accessibility/Clarity						

Source Citation:	Thomsen, C.,Molander, P.,Daae, H. L.,JanÃ¡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	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	787728				

EVALUATION

Domain	Metric		Rating	MWF⋆	Score	Comments
	Metric 6:	Metadata Completeness	High	× 1	1	Article clearly identifies data source and methods used for the study
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†			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:	ToxNet Hazardous Substances Data, Bank. 2017. HSDB: Hexabromocyclododecane.				
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3970277				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Import
Life Cycle Description (Subcategory of Use):	Manufacturing and importation of HBCD
Process Description:	See pg 90 for manufacturing description.
Total Annual U.S. Volume (and percent of PV):	10 -50 million pounds
Number of Sites:	3 - 2 import, 1 MFG (2012 CDR)
Chemical Concentration:	40 to 100 percent in manufactured or imported substance

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	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Importation is in scope
	Metric 4:	Temporal Representativeness	High	× 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: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	Information is all clearly cited
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Report addresses CBI claims, but not much else
Overall Quality Determination[†]			High		1.2	

* 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:	Nicnas,. 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3978355

EXTRACTION

Parameter	Data
Life Cycle Stage:	Import
Life Cycle Description (Subcategory of Use):	Importation of HBCD
Process Description:	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 bags. Same for imported resins. [pg 44]
Total Annual U.S. Volume (and percent of PV):	Australia = 0 for solid; 0.69 tonnes for liquid; 45 tonnes for EPS resin; 9.9 tonnes for XPS
Possible Physical Form:	liquid; solid; EPS; XPS
Chemical Concentration:	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:	Geographic Scope	Medium	× 1	2	Australia
	Metric 3:	Applicability	High	× 2	2	Use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2012
	Metric 5:	Sample Size	Medium	× 1	2	Infromation from limited number of outside sources
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	Medium	× 1	2	Limited discussion on uncertainty and variability
Overall Quality Determination†			High		1.3	

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Source Citation:	Nicnas,. 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34.				
Type of Data Source	Facility; Completed Exposure or Risk Assessments;				
Hero ID	3978355				

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:	Nicnas,. 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34.				
Type of Data Source	Facility; Completed Exposure or Risk Assessments;				
Hero ID	3978355				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Production of EPS resin
Process Description:	See section 4.6.1 for detailed process description
Total Annual U.S. Volume (and percent of PV):	>88 percent used for insulation (EPS and XPS)
Number of Sites:	1

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:	Geographic Scope	Medium	× 1	2	Australia
	Metric 3:	Applicability	Medium	× 2	4	EPS compounding not in scope but may provide insight into EPS use rate
	Metric 4:	Temporal Representativeness	High	× 2	2	2012
	Metric 5:	Sample Size	Medium	× 1	2	Infromation from limited number of outside sources
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	Medium	× 1	2	Limited discussion on uncertainty and variability
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:	Nicnas,. 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3978355

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Panels from EPS
Process Description:	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 can be shaped in factories using hot wire cutting techniques.
Total Annual U.S. Volume (and percent of PV):	>88 percent used for insulation (EPS and 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: Geographic Scope	Medium	× 1	2	Australia
	Metric 3: Applicability	High	× 2	2	Use in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2012
	Metric 5: Sample Size	Medium	× 1	2	Infromation from limited number of outside sources
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	Medium	× 1	2	Limited discussion on uncertainty and variability
Overall Quality Determination†		High		1.3	

⋆ 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:	Nicnas,. 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3978355

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	XPS Foam board
Process Description:	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):	>88 percent used for insulation (EPS and XPS)
Possible Physical Form:	solid - foam
Chemical Concentration:	<3 percent

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: Geographic Scope	Medium	× 1	2	Australia
	Metric 3: Applicability	High	× 2	2	Use in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2012
	Metric 5: Sample Size	Medium	× 1	2	Infromation from limited number of outside sources
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	Medium	× 1	2	Limited discussion on uncertainty and variability
Overall Quality Determination†		High		1.3	

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Source Citation:	Nicnas,. 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3978355

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

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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:	Nicnas,. 2012. Priority existing chemical assessments: Hyexabromocyclododecane (HBCD)- PEC34.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3978355

EXTRACTION

Parameter	Data
Life Cycle Stage:	Recycling
Life Cycle Description (Subcategory of Use):	XPS Foam Recycling
Process Description:	A small percentage (<5 percent) is recovered for reuse at the end of a building"s life (estimated at 20 years) [pg 45].
Possible Physical Form:	solid - foam
Chemical Concentration:	<3 percent

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:	Geographic Scope	Medium	× 1	2	Australia
Metric 3:	Applicability	High	× 2	2	Use in scope
Metric 4:	Temporal Representativeness	High	× 2	2	2012
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	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[†]		High		1.3	

* 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,. 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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970749

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS Resin
Process Description:	HBCD is added to a 50/50 suspension of monomeric Styrene and water, together with other additives (catalysts, nucleation agents, etc.). HBCD dissolves in the styrene which is polymerized into the small Polystyrene beads. During polymerization a blowing agent is added.
Total Annual U.S. Volume (and percent of PV):	HBCD demand (2015) = 2,200 metric ton
Chemical Concentration:	0.5 percent -1.0 percent

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Medium	× 1	2	Data from manufacturer, who is also the author of the report
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 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: Temporal Representativeness	High	× 2	2	2014
	Metric 5: Sample Size	Low	× 1	3	Qualitative
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Medium	× 1	2	Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	The report does not address variability or uncertainty.
Overall Quality Determination†		Medium		2.0	

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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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970749

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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970749

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS Compounding /Masterbatch
Process Description:	The XPS process makes use of a two-step extrusion process. It starts from polystyrene which is blended with the flame retardant in a first step and the addition of a blowing agent in a second step. Leaving the second extruder, the product expands into sheets which are cut in shape.
Chemical Concentration:	1.5 -2.5 percent

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	Medium	× 1	2	Data from manufacturer, who is also the author of the report
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	High	× 2	2	Use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2014
	Metric 5:	Sample Size	Low	× 1	3	Qualitative
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	Medium	× 1	2	Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Low	× 1	3	The report does not address variability or uncertainty.
Overall Quality Determination†			Medium		1.8	

* 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.				
Type of Data Source	Facility; Completed Exposure or Risk Assessments;				
Hero ID	3970747				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS Resin
Process Description:	Section 2.2.3.1
Total Annual U.S. Volume (and percent of PV):	See Table 2-3 for European Value
Number of Sites:	See Table 2-3 for European Value

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: Geographic Scope	Medium	× 1	2	Europe (Sweden)
	Metric 3: Applicability	Medium	× 2	4	EPS compounding not in scope but may provide insight into EPS use rate
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	Metric 5: Sample Size	Low	× 1	3	Distribution 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.
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:	Echa,. 2008. Risk assessment: hexabromocyclododecane.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS Foam from Resin
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 2-3 for European Value

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: Geographic Scope	Medium	× 1	2	Europe (Sweden)
	Metric 3: Applicability	High	× 2	2	Use in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	Metric 5: Sample Size	Low	× 1	3	Distribution 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.
Overall Quality Determination†		High		1.3	

* 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.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS Compounding /Masterbatch
Process Description:	Section 2.2.4.1
Total Annual U.S. Volume (and percent of PV):	See Table 2-3 for European Value
Number of Sites:	See Table 2-3 for European Value

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: Geographic Scope	Medium	× 1	2	Europe (Sweden)
	Metric 3: Applicability	High	× 2	2	Use in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	Metric 5: Sample Size	Low	× 1	3	Distribution 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.
Overall Quality Determination[†]		High		1.3	

* 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.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Production of XPS articles
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 2-3 for European Value

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: Geographic Scope	Medium	× 1	2	Europe (Sweden)
	Metric 3: Applicability	High	× 2	2	Use in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	Metric 5: Sample Size	Low	× 1	3	Distribution 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.
Overall Quality Determination†		High		1.3	

* 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.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970747

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing /Use
Life Cycle Description (Subcategory of Use):	HIPS (plastics for electronic devices)
Process Description:	HBCD is used in HIPS, which are used in electric and electronic parts such as video and stereo equipment, distribution boxes for electrical lines, and video cassette housings. Process descriptions for the formulation and use of HIPS in Section 2.2.5. The mobility of HBCDD in HIPS is assumed to be greater than in XPS and EPS (pg. 375).
Total Annual U.S. Volume (and percent of PV):	>210 tonnes (Europe)
Number of Sites:	3 HIPS formulation sits and unknown use /assembly sites in Europe
Chemical Concentration:	1-7 percent

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: Geographic Scope	Medium	× 1	2	Europe (Sweden)
	Metric 3: Applicability	Medium	× 2	4	The processing /use of HIPS is not in scope; however, information on concentrion of HBCD in HIPS may be useful for in-scope use (worker exposure during recycling of electronics)
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	Metric 5: Sample Size	Low	× 1	3	Concentration is provided in a range 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					

Source Citation:	Echa,. 2008. Risk assessment: hexabromocyclododecane.				
Type of Data Source	Facility; Completed Exposure or Risk Assessments;				
Hero ID	3970747				

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination†		High		1.6	

⋆ 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:	Echa,. 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970748

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS articles from beads
Process Description:	EPS pellets are converted to expanded beads using steam. The expanded beads can then be moulded into boards and shapes (e.g. insulation boards). The temperature softens the beads and the expansion of blowing agent they contain (i.e. pentane) causes the pellets/beads to expand up to 50 times their original size. More details in Section 9.3.1.1
Total Annual U.S. Volume (and percent of PV):	10 percent of EU tonnage
Operating Days per Year and Batches per Day:	?230 days/yr
Site Daily Throughput:	?391 kg/day; ?90 tonnes/yr (of HBCDD, equivalent to approximately 13 000 tonnes EPS)
Possible Physical Form:	Solid (within polymer matrix)

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:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	High	× 2	2	Use in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2009?
	Metric 5:	Sample Size	Low	× 1	3	Distribution 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						

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Source Citation:	Echa,. 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970748

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination†		High		1.3	

* 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,. 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970748

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	use of flame-retarded expanded polystyrene articles.
Process Description:	In construction applications, use of FR EPS reduces costs in transport, handling and overall construction time to insulate buildings.
Total Annual U.S. Volume (and percent of PV):	20 percent of EU tonnage
Operating Days per Year and Batches per Day:	250
Site Daily Throughput:	3.2 kg/d; 0.8 t/a
Possible Physical Form:	Solid (within polymer matrix)

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: Geographic Scope	Medium	× 1	2	Europe
	Metric 3: Applicability	High	× 2	2	Use in scope
	Metric 4: Temporal Representativeness	High	× 2	2	sources are 2009 - 2012
	Metric 5: Sample Size	Low	× 1	3	Distribution 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.
Overall Quality Determination†		High		1.3	

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Source Citation:	Echa,. 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970748

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:	Echa,. 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified, Part 2.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970753

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	formulation of EPS beads
Process Description:	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 incorporated 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 (and percent of PV):	24 percent for EU
Operating Days per Year and Batches per Day:	?330 days
Site Daily Throughput:	?2.91 t/d; ?960 t/y
Chemical Concentration:	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:	Geographic Scope	Medium	× 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:	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						

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Source Citation:	Echa,. 2017. Chemical safety report: Hexabromocyclododecane and all major diastereoisomers identified, Part 2.				
Type of Data Source	Facility; Completed Exposure or Risk Assessments;				
Hero ID	3970753				

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination†		High		1.6	

* 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:	Echa,. 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified.				
Type of Data Source	Facility; Completed Exposure or Risk Assessments;				
Hero ID	3970750				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	formulation of EPS beads
Total Annual U.S. Volume (and percent of PV):	5,300 Tonnes/yr (EU)
Number of Sites:	22
Chemical Concentration:	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:	Geographic Scope	Medium	× 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:	Temporal Representativeness	High	× 2	2	2008
	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	Medium	× 1	2	limited discussion
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.

Source Citation:	Echa,. 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970750

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	formulation of XPS
Total Annual U.S. Volume (and percent of PV):	5,900 Tonnes/yr (EU)
Number of Sites:	56
Chemical Concentration:	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: 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: 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	Medium	× 1	2	limited discussion
Overall Quality Determination†		High		1.4	

⋆ 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,. 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified.	
Type of Data Source	Facility; Completed Exposure or Risk Assessments;	
Hero ID	3970750	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS converting
Number of Sites:	600
Chemical Concentration:	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: Geographic Scope	Medium	× 1	2	Europe
	Metric 3: Applicability	High	× 2	2	Use is in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2009
	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	Medium	× 1	2	limited discussion
Overall Quality Determination†		High		1.4	

* 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,. 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970750

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing /Use
Life Cycle Description (Subcategory of Use):	HIPS (plastics for electronic devices)
Process Description:	Note: Information is cited from 3970747. The use of HBCDD in HIPS is mainly for video and stereo equipment, distribution boxes for electrical lines in the construction sector and refrigerator lining. An undetermined but increasing proportion of waste generated from HIPS and textile articles is recycled. The rest goes to landfill or incineration.
Total Annual U.S. Volume (and percent of PV):	200 tonnes/yr (Europe)
Number of Sites:	3 HIPS formulators (Europe)
Chemical Concentration:	1-7 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: Geographic Scope	Medium	× 1	2	Europe
	Metric 3: Applicability	Medium	× 2	4	The processing /use of HIPS is not in scope; however, information on concentrion of HBCD in HIPS may be useful for in-scope use (worker exposure during recycling of electronics)
	Metric 4: Temporal Representativeness	High	× 2	2	2009
	Metric 5: Sample Size	Low	× 1	3	Concentration is provided in a range 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	Medium	× 1	2	limited discussion

Source Citation:	Echa,. 2009. Background document for hexabromocyclododecane and all major diastereoisomers identified.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970750

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
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.

Source Citation:	Ineos Styrenics. 2017. Analysis of alternatives: HBCDD use in EPS for building applications.	
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;	
Hero ID	3970752	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS bead production
Process Description:	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.
Chemical Concentration:	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: Geographic Scope	Medium	× 1	2	Europe
	Metric 3: Applicability	Medium	× 2	4	EPS compounding not in scope but may provide insight into EPS wt frac
	Metric 4: Temporal Representativeness	Medium	× 2	4	Sources are 2003 or more recent
	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, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	Addresses variability and uncertainty in the results. Uncertainty is well characterized.

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Source Citation:	Ineos Styrenics. 2017. Analysis of alternatives: HBCDD use in EPS for building applications.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970752

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination†		High		1.6	

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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:	Ineos Styrenics. 2017. Analysis of alternatives: HBCDD use in EPS for building applications.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970752

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS foam from pellets
Process Description:	The EPS pellets are converted to expanded beads using steam. The expanded beads can then be moulded into boards and shapes (e.g. insulation boards, specific shapes for packaging). The steps are further described in Section 2.1.3.
Chemical Concentration:	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: Geographic Scope	Medium	× 1	2	Europe
	Metric 3: Applicability	High	× 2	2	Use is in scope
	Metric 4: Temporal Representativeness	Medium	× 2	4	Sources are 2003 or more recent
	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, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	Addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination†		High		1.4	

* 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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3809277				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing/Use
Life Cycle Description (Subcategory of Use):	EPS boards
Process Description:	Used for interior insulation
Total Annual U.S. Volume (and percent of PV):	45 percent
Chemical Concentration:	0.5

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	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Use is 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						
	Metric 7:	Metadata Completeness	High	× 1	1	Addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination†			High		1.2	

* 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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3809277				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing/Use
Life Cycle Description (Subcategory of Use):	XPS boards
Process Description:	XPS foam board is used mainly for roofing applications and architectural molding
Total Annual U.S. Volume (and percent of PV):	51 percent
Chemical Concentration:	0.5 to 1

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	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Use is 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						
	Metric 7:	Metadata Completeness	High	× 1	1	Addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination†			High		1.2	

* 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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3809277

EXTRACTION

Parameter	Data
Life Cycle Stage:	Import
Life Cycle Description (Subcategory of Use):	Importation of HBCD (not in articles)
Total Annual U.S. Volume (and percent of PV):	92,270 pounds imported
Number of Sites:	5 sites manufacture or import

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	High	× 1	1	US
	Metric 3: Applicability	High	× 2	2	Use is 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					
	Metric 7: Metadata Completeness	High	× 1	1	Addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination†		High		1.2	

⋆ 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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3809277

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture
Total Annual U.S. Volume (and percent of PV):	4.54E+06 to 2.29E+07 kg/yr
Number of Sites:	3
Operating Days per Year and Batches per Day:	250

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	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	Manufacture is not in scope but information could possibly be applied to import /repackaging
	Metric 4:	Temporal Representativeness	High	× 2	2	2012
	Metric 5:	Sample Size	Medium	× 1	2	characterized by a range with uncertain 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	Addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination†			High		1.3	

⋆ 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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3809277

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS resin
Total Annual U.S. Volume (and percent of PV):	2.043E+06 to 1.031E+07 kg/yr
Number of Sites:	1 to 4
Operating Days per Year and Batches per Day:	250

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	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: 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						
	Metric 7:	Metadata Completeness	High	$\times$ 1	1	Addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination†			High		1.3	

* 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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3809277

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS converting
Total Annual U.S. Volume (and percent of PV):	2.043E+06 to 1.031E+07 kg/yr
Number of Sites:	5 to 15
Operating Days per Year and Batches per Day:	250

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	High	× 1	1	US
	Metric 3: Applicability	High	× 2	2	Use is in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2012
	Metric 5: Sample Size	Medium	× 1	2	characterized by a range with uncertain 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	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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3809277

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	manufacture of XPS using HBCD powder (not masterbatch)
Total Annual U.S. Volume (and percent of PV):	2.316.E+06 to 1.168.E+07 kg/yr
Number of Sites:	6 to 18
Operating Days per Year and Batches per Day:	250

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	High	× 1	1	US
	Metric 3: Applicability	High	× 2	2	Use is in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2012
	Metric 5: Sample Size	Medium	× 1	2	characterized by a range with uncertain 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	Addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination†		High		1.1	

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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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;	
Hero ID	3809277	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	compounding of polystyrene resin to produce XPS masterbatch containing HBCD
Total Annual U.S. Volume (and percent of PV):	2.316.E+06 to 1.168.E+07 kg/yr
Number of Sites:	10 to 29
Operating Days per Year and Batches per Day:	250

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	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Use is in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2012
	Metric 5:	Sample Size	Medium	× 1	2	characterized by a range with uncertain 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	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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3809277

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS converting
Total Annual U.S. Volume (and percent of PV):	2.316.E+06 to 1.168.E+07 kg/yr
Number of Sites:	10 to 24
Operating Days per Year and Batches per Day:	250

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	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Use is in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2012
	Metric 5:	Sample Size	Medium	× 1	2	characterized by a range with uncertain 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	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:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970756

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Formulation of flame-retarded PS compound for XPS
Process Description:	taken from 2008 EU assessment (HERO 3970747)
Total Annual U.S. Volume (and percent of PV):	1700 tons/yr
Number of Sites:	>14
Chemical Concentration:	40 percent in compound

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	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: 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	Medium	× 1	2	limited discussion
Overall Quality Determination†		High		1.4	

* 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:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970756

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Formulation of flame-retarded EPS beads
Process Description:	taken from 2008 EU assessment (HERO 3970747)
Total Annual U.S. Volume (and percent of PV):	3400 tons/yr
Number of Sites:	>18
Chemical Concentration:	0.7 percent in EPS beads

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	Medium	× 2	4	EPS compounding not in scope but may provide insight into EPS wt frac and use rate
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	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	Medium	× 1	2	limited discussion
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.

Source Citation:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970756

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Industrial use of EPS beads to produce flameretardedEPS
Process Description:	taken from 2008 EU assessment (HERO 3970747)
Total Annual U.S. Volume (and percent of PV):	3400 tons/yr
Number of Sites:	hundreds
Chemical Concentration:	0.7 percent in foam

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	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: 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	Medium	× 1	2	limited discussion
Overall Quality Determination†		High		1.4	

* 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:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970756

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Industrial use of HBCDD in PS compound to produce flame-retarded XPS
Process Description:	taken from 2008 EU assessment (HERO 3970747)
Total Annual U.S. Volume (and percent of PV):	1700 tons/yr
Number of Sites:	17
Chemical Concentration:	1 to 3 percent in foam

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	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: 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	Medium	× 1	2	limited discussion
Overall Quality Determination†			High		1.4	

* 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:	2008. Summary risk assessment report: Hexabromocyclododecane.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970756

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Industrial use of HBCDD as powder to produce flame-retarded XPS
Process Description:	taken from 2008 EU assessment (HERO 3970747)
Total Annual U.S. Volume (and percent of PV):	3200 tons/yr
Number of Sites:	18
Chemical Concentration:	0.5 to 3 percent in foam

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	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: 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	Medium	× 1	2	limited discussion
Overall Quality Determination†		High		1.4	

* 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,. 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	Facility; Completed Exposure or Risk Assessments;	
Hero ID	3970757	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	EPS foam for construction
Process Description:	taken from 2008 EU assessment (HERO 3970747)
Total Annual U.S. Volume (and percent of PV):	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

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	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: 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	Medium	× 1	2	limited discussion
Overall Quality Determination†			High		1.4	

* 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,. 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	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970757

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Formulation of flame-retarded PS compound for XPS
Process Description:	taken from 2008 EU assessment (HERO 3970747)
Total Annual U.S. Volume (and percent of PV):	1700 tons/yr
Number of Sites:	>14
Chemical Concentration:	40 percent in compound

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	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: 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	Medium	× 1	2	limited discussion
Overall Quality Determination†		High		1.4	

* 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,. 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	Facility; Completed Exposure or Risk Assessments;				
Hero ID	3970757				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Formulation of flame-retarded EPS beads
Process Description:	taken from 2008 EU assessment (HERO 3970747)
Total Annual U.S. Volume (and percent of PV):	3400 tons/yr
Number of Sites:	>18
Chemical Concentration:	0.7 percent in EPS beads

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	Medium	× 2	4	EPS compounding not in scope but may provide insight into EPS wt frac and use rate
	Metric 4:	Temporal Representativeness	High	× 2	2	2008
	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	Medium	× 1	2	limited discussion
Overall Quality Determination†			Medium		1.7	

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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:	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	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970757

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Industrial use of EPS beads to produce flameretardedEPS
Process Description:	taken from 2008 EU assessment (HERO 3970747)
Total Annual U.S. Volume (and percent of PV):	3400 tons/yr
Number of Sites:	hundreds
Chemical Concentration:	0.7 percent in foam

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	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: 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	Medium	× 1	2	limited discussion
Overall Quality Determination†			High		1.4	

* 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,. 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	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970757

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Industrial use of HBCDD in PS compound to produce flame-retarded XPS
Process Description:	taken from 2008 EU assessment (HERO 3970747)
Total Annual U.S. Volume (and percent of PV):	1700 tons/yr
Number of Sites:	17
Chemical Concentration:	1 to 3 percent in foam

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	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: 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	Medium	× 1	2	limited discussion
Overall Quality Determination†			High		1.4	

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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:	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	Facility; Completed Exposure or Risk Assessments;
Hero ID	3970757

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Industrial use of HBCDD as powder to produce flame-retarded XPS
Process Description:	taken from 2008 EU assessment (HERO 3970747)
Total Annual U.S. Volume (and percent of PV):	3200 tons/yr
Number of Sites:	18
Chemical Concentration:	0.5 to 3 percent in foam

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	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: 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	Medium	× 1	2	limited discussion
Overall Quality Determination†			High		1.4	

* 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:	Nicnas,. 2001. Polybrominated flame retardants (PBFRs): Priority existing chemical assessment report no. 20.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	1443962

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS masterbatch
Process Description:	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

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	From trusted source
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	Australia
	Metric 3: Applicability	High	× 2	2	Information related to in-scope scenario
	Metric 4: Temporal Representativeness	Medium	× 2	4	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, 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.
Overall Quality Determination†		High		1.4	

Source Citation:	Nicnas,. 2001. Polybrominated flame retardants (PBFRs): Priority existing chemical assessment report no. 20.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	1443962

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:	Nicnas,. 2001. Polybrominated flame retardants (PBFRs): Priority existing chemical assessment report no. 20.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	1443962

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	Manufacture of XPS Using HBCD Powder
Process Description:	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.

EVALUATION

Domain		Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	From trusted source
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Australia
	Metric 3:	Applicability	High	× 2	2	Information related to in-scope scenario
	Metric 4:	Temporal Representativeness	Medium	× 2	4	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, assessment methods, results, and assumptions.

Source Citation:	Nicnas,. 2001. Polybrominated flame retardants (PBFRs): Priority existing chemical assessment report no. 20.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	1443962

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
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	

* 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,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970759

EXTRACTION

Parameter	Data
Life Cycle Stage:	Import
Life Cycle Description (Subcategory of Use):	Import
Process Description:	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 transformed.
Total Annual U.S. Volume (and percent of PV):	6,000 tonnes/yr (EU - 2007)

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Information is from trusted source (ECHA)
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Europe
	Metric 3:	Applicability	High	× 2	2	Use is in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2007
	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	Medium	× 1	2	limited discussion
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.

Source Citation:	Echa,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.				
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3970759				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS formulation
Total Annual U.S. Volume (and percent of PV):	5,301 tonnes per year (EU - 2006)
Number of Sites:	21

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Information is from trusted source (ECHA)
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 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: Temporal Representativeness	Medium	× 2	4	2006
	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	Medium	× 1	2	limited discussion
Overall Quality Determination†		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:	Echa,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970759

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS formulation
Total Annual U.S. Volume (and percent of PV):	5,859 tonnes /yr (EU - 2006)
Number of Sites:	28

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	× 1	1	Information is from trusted source (ECHA)
Domain 2: Representative					
Metric 2:	Geographic Scope	Medium	× 1	2	Europe
Metric 3:	Applicability	High	× 2	2	Use is in scope
Metric 4:	Temporal Representativeness	Medium	× 2	4	2006
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	Medium	× 1	2	limited discussion
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.

Source Citation:	Echa,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.		
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;		
Hero ID	3970759		

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS converting
Number of Sites:	35

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Information is from trusted source (ECHA)
Domain 2: Representative					
	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: 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	Medium	× 1	2	limited discussion
Overall Quality Determination†		High		1.4	

⋆ 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,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970759

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing /Use
Life Cycle Description (Subcategory of Use):	HIPS (plastics for electronic devices)
Process Description:	The use of HBCDD into HIPS is mainly for video and stereo equipment, distribution boxes for electrical lines in the construction sector and refrigerator 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 tonnes/yr (in Europe) is unused for HIPS but an unknown portion is recycled
Number of Sites:	An unknown number of recyclers of HIPS parts from electronic equipment.
Chemical Concentration:	1-7wt percent in HIPS

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Information is from trusted source (ECHA)
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	Europe
	Metric 3: Applicability	Medium	× 2	4	The processing /use of HIPS is not in scope; however, information on concentrion of HBCD in HIPS may be useful for in-scope use (worker exposure during recycling of electronics)
	Metric 4: Temporal Representativeness	High	× 2	2	2008
	Metric 5: Sample Size	Medium	× 1	2	Range of HBCD concentration in HIPS is provided; uncertain other 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

Source Citation:	Echa,. 2009. Prioritisation and Annex XIV background information: hexbromocyclododecane.				
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3970759				

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
	Metric 7: Metadata Completeness	Medium	× 1	2	limited discussion
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:	Pinfa,. 2016. Recycling of plastics containing hazardous substances.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982158

EXTRACTION

Parameter	Data
Life Cycle Stage:	Recycling
Life Cycle Description (Subcategory of Use):	Recycling EPS
Process Description:	(Recycling EPS by reomving HBCD; in EU, where HBCD is being regulated 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: Reliability					
	Metric 1: Methodology	High	× 1	1	From trusted source
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	Europe
	Metric 3: Applicability	Medium	× 2	4	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.
	Metric 4: Temporal Representativeness	High	× 2	2	2016
	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, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty

Continued on next page

Source Citation:	Pinfa,. 2016. Recycling of plastics containing hazardous substances.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982158

EVALUATION

Domain	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:	European Flame Retardants, Association. 2015. Keeping fire in check an introduction to flame retardants used in transport applications.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986543

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing /Use
Life Cycle Description (Subcategory of Use):	Compounding related to the manufacture of auto parts
Process Description:	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: Reliability					
	Metric 1: Methodology	High	× 1	1	From trusted source
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	Europe
	Metric 3: Applicability	High	× 2	2	Information related to in-scope scenario
	Metric 4: Temporal Representativeness	High	× 2	2	Unknown, but cites sources as recent as 2013
	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, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		High		1.4	

* 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:	European Brominated Flame Retardant Industry, Panel. 2008. EBFRIP statement RE UBA's publication on brominated flame retardant.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986544

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Demand in EU
Total Annual U.S. Volume (and percent of PV):	9,600 tonnes a year in EU

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
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 commentary.
Domain 2: Representative					
Metric 2:	Geographic Scope	Low	× 1	3	Europe
Metric 3:	Applicability	Unacceptable	× 2	8	Includes out of scope uses and is not applicable to the US
Metric 4:	Temporal Representativeness	High	× 2	2	2008
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, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty					
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, two 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

† 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:	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	Facility; Completed Exposure or Risk Assessments;
Hero ID	1937209

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	EPS and XPS foam
Total Annual U.S. Volume (and percent of PV):	Canadian values
Chemical Concentration:	0.5-1 percent

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Data from trusted source (Environment Canada & Health Canada)
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	Canada
	Metric 3: Applicability	High	× 2	2	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	× 2	2	2011
	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, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	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:	Remberger, M.,Sternbeck, J.,Palm, A.,Kaj, L.,StrÃ¶mberg, K.,BrorstrÃ¶m-LundÃ©n, E.. 2004. The environmental occurrence of hexabromocyclododecane in Sweden. Chemosphere.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	1927826

EXTRACTION

Parameter	Data
Life Cycle Stage:	Import
Life Cycle Description (Subcategory of Use):	HBCD (neat) import amount
Process Description:	Net imports. Contains the total tons per year of HBCD imported to Sweden from 1993 to 2000
Total Annual U.S. Volume (and percent of PV):	5 -120 tons HBCD per year (Sweden)

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Data from trusted source (Products Register,Swedish National Chemicals Inspectorate)
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 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: 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	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination[†]			Medium		1.8	

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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:	Remberger, M.,Sternbeck, J.,Palm, A.,Kaj, L.,StrÃ¶mberg, K.,BrorstrÃ¶m-LundÃ©n, E.. 2004. The environmental occurrence of hexabromocyclododecane in Sweden. Chemosphere.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	1927826

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	EPS or XPS Foam
Process Description:	Amount used per year in EU according to an EU Risk Assessment (The Chemical Inspectorate (KEMI), 2002)
Total Annual U.S. Volume (and percent of PV):	10,000 tons HBCD per year (85 percent of total used in EU)

EVALUATION

Domain	Metric	Rating	MWF[*]	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Data from trusted source (Products Register,Swedish National Chemicals Inspectorate)
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 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: 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	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination[†]		Medium		1.8	

[*] 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:	Remberger, M.,Sternbeck, J.,Palm, A.,Kaj, L.,StrÃ¶mberg, K.,BrorstrÃ¶m-LundÃ©n, E.. 2004. The environmental occurrence of hexabromocyclododecane in Sweden. Chemosphere.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	1927826

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Polymer matrices for cotton or cotton containing textile matrices
Process Description:	Amount used per year in EU according to an EU Risk Assessment (The Chemical Inspectorate (KEMI), 2002)
Total Annual U.S. Volume (and percent of PV):	1,000 tons HBCD per year (10 percent of total used in EU)

EVALUATION

Domain		Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Data from trusted source (Products Register,Swedish National Chemicals Inspectorate)
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Sweden
	Metric 3:	Applicability	Unacceptable	× 2	8	Use is out of scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2004
	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	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination[†]			Unacceptable		4	Metric Mean Score: 2.4.

Source Citation:	Remberger, M.,Sternbeck, J.,Palm, A.,Kaj, L.,StrÃ¶mberg, K.,BrorstrÃ¶m-LundÃ©n, E.. 2004. The environmental occurrence of hexabromocyclododecane in Sweden. Chemosphere.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	1927826

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

† 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:	Remberger, M.,Sternbeck, J.,Palm, A.,Kaj, L.,StrÃ¶mberg, K.,BrorstrÃ¶m-LundÃ©n, E.. 2004. The environmental occurrence of hexabromocyclododecane in Sweden. Chemosphere.
Type of Data Source	Facility; Completed Exposure or Risk Assessments;
Hero ID	1927826

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	HIPS (plastics for electronic devices)
Process Description:	Amount used per year in EU according to an EU Risk Assessment (The Chemical Inspectorate (KEMI), 2002)
Total Annual U.S. Volume (and percent of PV):	600 tons HBCD per year (5 percent of total used in EU)

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Data from trusted source (Products Register,Swedish National Chemicals Inspectorate)
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Sweden
	Metric 3:	Applicability	High	× 2	2	Use of HIPS is in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2004
	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	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†			Medium		1.8	

* 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:	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	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	HBCD
Process Description:	Amount manufactured annually in Canada, Netherlands, and UK for years 1996 to 2003
Total Annual U.S. Volume (and percent of PV):	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: Reliability					
	Metric 1: Methodology	High	× 1	1	Information is from trusted sources
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	UK
	Metric 3: Applicability	Unacceptable	× 2	8	Manufacture is not in scope and this information is not applicable to in-scope scenarios
	Metric 4: Temporal Representativeness	High	× 2	2	2013
	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	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination[†]		Unacceptable		4	Metric Mean Score: 2.2.

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

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

† 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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	1927601

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture/import
Process Description:	Note that this journal article measured HBCD concentrations in sediment 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 tonnes in US (2006)

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	US
	Metric 3:	Applicability	Medium	× 2	4	Manufacture is not in scope but information could possibly be applied to import
	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						
	Metric 7:	Metadata Completeness	Medium	× 1	2	limited discussion
Overall Quality Determination†			Medium		1.7	

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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	1927601

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:	JanÃ¡k, K.,Covaci, A.,Voorspoels, S.,Becher, G.. 2005. Hexabromocyclododecane in marine species from the Western Scheldt Estuary: diastereoisomer- and enantiomer-specific accumulation. Environmental Science and Technology.	
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;	
Hero ID	1927813	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	all polystyrene and textile applications
Process Description:	Note that this journal article measured HBCD concentrations in fish at a dutch estuary. Thus, no other data was extracted.
Total Annual U.S. Volume (and percent of PV):	16 700 tons World demand (2001)
Chemical Concentration:	0.8 - 4 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: Geographic Scope	Medium	× 1	2	Netherlands
	Metric 3: Applicability	Medium	× 2	4	Contains both in-scope and out of scope uses
	Metric 4: Temporal Representativeness	Medium	× 2	4	2001-2005
	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	well characterized
Overall Quality Determination†		Medium		1.8	

* 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:	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

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	EPS and XPS foam
Total Annual U.S. Volume (and percent of PV):	23000 tons worldwide
Possible Physical Form:	foam
Chemical Concentration:	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: Reliability						
	Metric 1:	Methodology	High	× 1	1	Information is from trusted sources
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Korea
	Metric 3:	Applicability	High	× 2	2	in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2014
	Metric 5:	Sample Size	High	× 1	1	Study contains all concentration sampling data results, from which statistics can be surmised
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	well characterized
Overall Quality Determination[†]			High		1.1	

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

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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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	2343703

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
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*	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	Japan
	Metric 3: Applicability	High	× 2	2	in scope
	Metric 4: Temporal 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	× 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	well characterized
Overall Quality Determination†		High		1.3	

* 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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;		
Hero ID	3350489		

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	EPS and XPS foam
Process Description:	Note this source only contains concentrations of HBCD in selected soil samples
Total Annual U.S. Volume (and percent of PV):	12,000 of 18,000 tons (2011 China)

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	Low	× 1	3	China
	Metric 3:	Applicability	High	× 2	2	in scope
	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	well characterized
Overall Quality Determination†			High		1.4	

⋆ 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:	Oecd,. 2007. SIDS initial assessment profile: Hexabromocyclododecane (HBCDD).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3809146

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture /import
Total Annual U.S. Volume (and percent of PV):	6,000 tonnes/yr MFG; 5,000 tonnes imported (EU15 - 2005)

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	SIDS profiles are a trusted source
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	SIDS profiles are prepared by OECD nations. US did not prepare this SIDS profile.
	Metric 3: Applicability	Medium	× 2	4	Manufacture is not in scope but information could possibly be applied to import
	Metric 4: Temporal Representativeness	Medium	× 2	4	2007
	Metric 5: Sample Size	Low	× 1	3	characterized by no statistics.
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†		Medium		2.2	

⋆ 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:	Oecd,. 2007. SIDS initial assessment profile: Hexabromocyclododecane (HBCDD).				
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3809146				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	EPS and XPS foam
Total Annual U.S. Volume (and percent of PV):	88 percent in EU used for EPS and XPS

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	× 1	1	SIDS profiles are a trusted source
Domain 2: Representative					
Metric 2:	Geographic Scope	Medium	× 1	2	SIDS profiles are prepared by OECD nations. US did not prepare this SIDS profile.
Metric 3:	Applicability	High	× 2	2	in scope
Metric 4:	Temporal Representativeness	Medium	× 2	4	2007
Metric 5:	Sample Size	Low	× 1	3	characterized by no statistics.
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†		Medium		2.0	

⋆ 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.,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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3350493

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	HBCD Production
Process Description:	Consists of large, medium, and small HBCD production plants
Number of Sites:	14
Operating Days per Year and Batches per Day:	5-10 bt/day
Site Daily Throughput:	6,000 to 7,500 tonnes/annum

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	Low	× 1	3	China
	Metric 3: Applicability	Unacceptable	× 2	8	Manufacture is not in scope and this information is not applicable to in-scope scenarios
	Metric 4: Temporal Representativeness	High	× 2	2	2016
	Metric 5: Sample Size	Low	× 1	3	characterized by no statistics.
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[†]		Unacceptable		4	Metric Mean Score: 2.6.

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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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3350493

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments

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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.,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	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3350493				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS formulation
Process Description:	Consists of XPS flame retardant plants
Number of Sites:	520
Site Daily Throughput:	1,500 to 1,900 t/a (not sure what these units are)

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	Low	× 1	3	China
	Metric 3: Applicability	High	× 2	2	in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2016
	Metric 5: Sample Size	Low	× 1	3	characterized by no statistics.
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†		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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3350493				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS formulation
Process Description:	Consists of EPS flame retardant plants
Number of Sites:	65
Site Daily Throughput:	50,000 t/a (not sure what these units are)

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	Low	× 1	3	China
	Metric 3:	Applicability	Unacceptable	× 2	8	EPS compounding not in scope and this information does not seem applicable to in-scope scenarios
	Metric 4:	Temporal Representativeness	High	× 2	2	2016
	Metric 5:	Sample Size	Low	× 1	3	characterized by no statistics.
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[†]			Unacceptable		4	Metric Mean Score: 2.6.

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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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3350493

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

† 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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3350517

EXTRACTION

Parameter	Data
Life Cycle Stage:	Recycling
Life Cycle Description (Subcategory of Use):	EPS and XPS foam
Process Description:	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.
Total Annual U.S. Volume (and percent of PV):	Indicates that 30 percent of EPS and XPS foam is recycled in the EU (source dated 2011

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	EU
	Metric 3:	Applicability	High	× 2	2	in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2015
	Metric 5:	Sample Size	Low	× 1	3	characterized by no statistics.
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†			Medium		1.8	

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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	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:	Morose, G.. 2006. An overview of alternatives to tetrabomobisphenol A (TBBPA) and hexabromocyclododecane (HBCD).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3809151

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	HBCD Global Market Demand
Process Description:	Brominated flame redardant global market demand
Total Annual U.S. Volume (and percent of PV):	16,700 metric tonnes globally in 2001 (2,800 metric tonnes in Americas in 2001)

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	High	× 1	1	US
	Metric 3:	Applicability	Medium	× 2	4	Contains both in-scope and out of scope uses
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2006
	Metric 5:	Sample Size	Low	× 1	3	characterized by no statistics.
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[†]			Medium		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:	U.S, E. P. A.. 2017. Preliminary information on manufacturing, processing, distribution, use, and disposal: Cyclic aliphatic bromide cluster (HBCD).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3827330

EXTRACTION

Parameter	Data
Life Cycle Stage:	Import/Processing/Use
Life Cycle Description (Subcategory of Use):	All lifecycle stages
Process Description:	Support document created for the docket by EPA's OCSPP in 2017. Provides a general discussion on the life cycle of HBCD in the U.S.

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	High	× 1	1	US
	Metric 3: Applicability	High	× 2	2	in scope
	Metric 4: Temporal Representativeness	High	× 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	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	well characterized
Overall Quality Determination†		High		1.0	

* 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:	2004. Kirk-Othmer Encyclopedia of Chemical Technology.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3859418

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture of HBCD
Process Description:	List of producers of HBCD is provided: Albermarle (US), DSBG (Israel), Great Lakes (US), ISC Chemicals, Ltd. (UK)
Number of Sites:	4

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	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Manufacture is not in scope and this information is not applicable to in-scope scenarios
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2004
	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						
	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination[†]			Unacceptable		4	Metric Mean Score: 2.5.

Source Citation:	2004. Kirk-Othmer Encyclopedia of Chemical Technology.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3859418

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

† 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:	Mack, A. G.. 2004. Flame retardants, halogenated.				
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3859419				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture of HBCD
Process Description:	List of producers and trade names of HBCD is provided

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	High	× 1	1	US
	Metric 3: Applicability	Unacceptable	× 2	8	Manufacture is not in scope and this information is not applicable to in-scope scenarios
	Metric 4: Temporal Representativeness	Medium	× 2	4	2004
	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					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination[†]		Unacceptable		4	Metric Mean Score: 2.5.

[**] 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

[†] 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:	Ashford, R. D.. 2001. Ashford's Dictionary of Industrial ChemicalsHexabromocyclododecane.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3860436

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Process Description:	Provides physical properties of HBCD

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	UK
	Metric 3:	Applicability	High	× 2	2	Physical properties are applicable to in scope uses
	Metric 4:	Temporal Representativeness	Medium	× 2	4	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	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†			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. Chemical data reporting: 1,2,5,6,9,10-hexabromo-cyclododecane.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3860462

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture and import
Life Cycle Description (Subcategory of Use):	Manufacture and import
Process Description:	CDR data pulled from Chemview. Import site imports with HBCD never at import site.
Total Annual U.S. Volume (and percent of PV):	CBI
Number of Sites:	1 site MFG; 1 site Import
Possible Physical Form:	Import site lists pellets as phys form. MFG site lists dry powder
Chemical Concentration:	<1 percent in Building/Construction Materials

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	High	$\times$ 1	1	US
	Metric 3: Applicability	High	$\times$ 2	2	import information is 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†		High		1.5	

Source Citation:	2017. Chemical data reporting: 1,2,5,6,9,10-hexabromo-cyclododecane.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3860462

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:	Pubchem,. 2017. PubChem: 1,2,5,6,9,10-Hexabromocyclododecane.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970249

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture of HBCD
Process Description:	PubChem data pulled form the Open Chemistry Database for HBCD.
Total Annual U.S. Volume (and percent of PV):	10 million to 50 million pounds in 2002

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	High	× 1	1	US
	Metric 3: Applicability	Unacceptable	× 2	8	Manufacture is not in scope and this information is not applicable to in-scope scenarios
	Metric 4: Temporal Representativeness	High	× 2	2	2010-2011
	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					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		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

† 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:	Pubchem,. 2017. Pubchem Compound: Hexabromocyclododecane.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970250

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Process Description:	Search results for HBCD in Pubchem Compound. Identifies compounds with HBCD in the name but provides no extractable information.

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	High	× 1	1	US
Metric 3:	Applicability	Unacceptable	× 2	8	This information cannot be applied to any in-scope uses
Metric 4:	Temporal Representativeness	High	× 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	× 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†		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

† 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,. 2017. Hexabromocyclododecane.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970735

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Process Description:	Search results of searching HBCD in ECHA and provides several trade names for HBCD.

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	UK
Metric 3:	Applicability	High	× 2	2	Trade names may be usefull for background information sections in the risk evaluation
Metric 4:	Temporal Representativeness	High	× 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	× 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†		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,. 2009. Proposal for harmonised classification and labelling: Substance name: Hexabromocyclododecane.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970751

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture and import
Life Cycle Description (Subcategory of Use):	Manufacture and import
Total Annual U.S. Volume (and percent of PV):	Table 2-1 lists import and MFG volumes for multiple countries
Possible Physical Form:	White odorless solid
Chemical Concentration:	90-100 percent HBCD; impurities in HBCDD are usualy less than 4 percent w/w.

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	Sweden
	Metric 3: Applicability	High	× 2	2	Information is directly related to Import
	Metric 4: Temporal Representativeness	High	× 2	2	2009
	Metric 5: Sample Size	Medium	× 1	2	Wt fraction and PV provided in ranges with no other statistics
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	High	× 1	1	clearly documents its data sources
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	Some discussion
Overall Quality Determination†		High		1.3	

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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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3970758				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Manufacture
Life Cycle Description (Subcategory of Use):	Manufacture of HBCD
Total Annual U.S. Volume (and percent of PV):	6,000 tonnes per year each MFG and imported in EU (2006/2007)
Number of Sites:	35 notifications from both producers and importers of articles.
Chemical Concentration:	amount of contaminants/unknown constituents varies (0-5 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:	Geographic Scope	Medium	× 1	2	EU
	Metric 3:	Applicability	Medium	× 2	4	Manufacture is not in scope but some info applies to import
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2006-2007
	Metric 5:	Sample Size	Low	× 1	3	characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	clearly documents its data sources
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Some discussion
Overall Quality Determination†			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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3970758				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	XPS compounding
Total Annual U.S. Volume (and percent of PV):	Number of sites and use rates same as 3970759

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	EU
	Metric 3:	Applicability	High	× 2	2	in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2006-2007
	Metric 5:	Sample Size	Low	× 1	3	characterized by no statistics.
Domain 3: Accessibility/Clarity						
	Metric 6:	Metadata Completeness	High	× 1	1	clearly documents its data sources
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Some discussion
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.

Source Citation:	Echa,. 2017. Uses at industrial sites: hexabromocyclododecane.				
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	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 use operations that are performed using HBCD. Only provides a short description. No data was extracted.

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	EU
	Metric 3: Applicability	Medium	× 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	× 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: 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†		Medium		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:	Echa,. 2017. Uses by professional workers: hexabromocyclododecane.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3970763

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Process Description:	Provides a general list of potential uses for HBCD containing articles. Only provides a short descriptions. No data was extracted.

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	EU
	Metric 3: Applicability	Medium	× 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	× 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: 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†		Medium		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,. 2017. Flame retardants: Frequently asked questions: Safety regulations.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978170

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Process Description:	Fact sheet on some questions about flame redardants and HBCD in the U.S. No data was extracted.

EVALUATION

Domain	Metric		Rating	MWF[*]	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Information is from trusted sources - American Chemistry Council
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Not detailed enough to provide data in scope.
	Metric 4:	Temporal Representativeness	Low	× 2	6	No date
	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						
	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination[†]			Unacceptable		4	Metric Mean Score: 2.8.

[**] 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

[†] 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:	Nicnas,. 2013. NICNAS: Hexabromocyclododecane (HBCD).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978354

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Process Description:	Provides general background information. No information was extracted.

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	High	× 1	1	US
Metric 3:	Applicability	Unacceptable	× 2	8	Not detailed enough to provide data in scope.
Metric 4:	Temporal Representativeness	High	× 2	2	2013
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					
Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination[†]		Unacceptable		4	Metric Mean Score: 2.2.

** Consistent with our *Application of Systematic Review in TSCA Risk 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

[†] 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:	Government of, Canada. 2016. Fact sheets & frequently asked questions: Cyclododecane, 1,2,5,6,9,10-hexabromo- (hexabromocyclododecane; HBCD).				
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3978365				

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

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	Canada
	Metric 3: Applicability	Unacceptable	× 2	8	Not detailed enough to provide data in scope.
	Metric 4: Temporal Representativeness	High	× 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	× 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†		Unacceptable		4	Metric Mean Score: 2.4.

Source Citation:	Government of, Canada. 2016. Fact sheets & frequently asked questions: Cyclododecane, 1,2,5,6,9,10-hexabromo-(hexabromocyclododecane; HBCD).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3978365

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

† 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:	Xpsa,. XPSA white paper " safety of FRs in energy-efficient XPS foam insulation.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3981024

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing and Consumer Use
Life Cycle Description (Subcategory of Use):	XPS Foam Insulation
Process Description:	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*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Information is from trusted sources
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	US
	Metric 3: Applicability	Unacceptable	× 2	8	Not detailed enough to provide data in scope.
	Metric 4: Temporal Representativeness	High	× 2	2	No Date (cites a soucce from 2013)
	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					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		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

† 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:	2012. XPS industry perspective on sustainability and environmental awareness.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3981025

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing and Consumer Use
Life Cycle Description (Subcategory of Use):	XPS Foam Insulation
Process Description:	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*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	High	× 1	1	Information is from trusted sources
Domain 2: Representative					
Metric 2:	Geographic Scope	High	× 1	1	US
Metric 3:	Applicability	Unacceptable	× 2	8	Not detailed enough to provide data in scope.
Metric 4:	Temporal Representativeness	High	× 2	2	2012
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					
Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		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

† 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:	Spin,. 2017. SPIN substances in preparations in nordic countries cyclododecane, 1, 2, 5, 6, 9, 10-hexabromo.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3981131

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Process Description:	A database for nordic countries HBCD use over the years in several life cycle stages. Note that most of the info is confidential.
Total Annual U.S. Volume (and percent of PV):	3 to 200.4 tonnes per year (in nordic countries - Finland, Denmark, Sweden, and Norway)

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	Sweden, Norway, Denmark, and Finland
Metric 3:	Applicability	Medium	× 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	× 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	× 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†		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:	European Flame Retardants, Association. 2006. Flame retardants fact sheet hexabromocyclododecane.				
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3981169				

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 the EU. No information was extracted.

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 (Belgium)
	Metric 3: Applicability	Unacceptable	× 2	8	Not detailed enough to provide data in scope.
	Metric 4: Temporal Representativeness	Medium	× 2	4	2006
	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					
	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

† 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:	European Flame Retardants, Association. 2016. EFRA members portal Private Transport.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3981173

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Process Description:	Fact sheet about the tranportation industry sectors that use several different flame retardants (including HBCD) in transport applications. No information was extracted.

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	Unacceptable	× 2	8	Not detailed enough to provide data in scope.
	Metric 4: Temporal Representativeness	High	× 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	× 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†		Unacceptable		4	Metric Mean Score: 2.4.

Continued on next page

Source Citation:	European Flame Retardants, Association. 2016. EFRA members portal Private Transport.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3981173

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

† 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:	European Flame Retardants, Association. 2016. EFRA members portal structural elements.	
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;	
Hero ID	3981174	

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Process Description:	Fact sheet about the use of flame retardants (including HBCD) in structural elements (e.g., foam insulation, electronics). No information was extracted.

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	Unacceptable	× 2	8	Not detailed enough to provide data in scope.
	Metric 4: Temporal Representativeness	High	× 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	× 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†		Unacceptable		4	Metric Mean Score: 2.4.

Source Citation:	European Flame Retardants, Association. 2016. EFRA members portal structural elements.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3981174

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

† 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:	European Brominated Flame Retardant Industry, Panel. 2008. ebfrip our substances, hexabromocyclododecane (HBCD).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3981176

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Process Description:	General discussion about the uses of HBCD. No information was extracted.

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	Unacceptable	× 2	8	Not detailed enough to provide data in scope.
	Metric 4: Temporal Representativeness	High	× 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	× 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†		Unacceptable		4	Metric Mean Score: 2.4.

** 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

† 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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982069

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Process Description:	Provides the 1999 Market Demand for HBCD in Europe, Americas, and Asia
Total Annual U.S. Volume (and percent of PV):	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: 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	This document includes all uses of HBCD. Some uses are in scope and some are out of scope.
Metric 4:	Temporal Representativeness	Medium	× 2	4	2004
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					
Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination[†]		Medium		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:	Pinfa,. 2016. Correction to article pinfa newsletter no64 ' recylcing of plastics containing hazardous substances'.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982156

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Process Description:	General discussion about the Phosphorous, Inorganic, & Nitrogen Flame Retardants Association. No information was extracted.

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	Unacceptable	× 2	8	Not detailed enough to provide data in scope.
	Metric 4: Temporal Representativeness	High	× 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	× 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†		Unacceptable		4	Metric Mean Score: 2.4.

⋆⋆ 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

† 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:	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

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal/Recycling
Life Cycle Description (Subcategory of Use):	Electronics
Process Description:	Source only contains generic information on electronics and electronics disposal /recycling: "According to the WEEE directive, plastics containing 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."
Chemical Concentration:	typically 10 to 20 percent halogenateed flame retardants for HIPS

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 (Belgium)
Metric 3:	Applicability	High	× 2	2	Electronics recycling is in scope
Metric 4:	Temporal Representativeness	High	× 2	2	2010
Metric 5:	Sample Size	Medium	× 1	2	Range of concentration of flame retardants in electronics is provided; uncertain other statistics
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

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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⋆	Score	Comments
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.

Source Citation:	Structural Insulated Panel, Association. 2017. Expanded polystyrene flame retardants.	
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;	
Hero ID	3982180	

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	EPS formulation
Process Description:	Fact sheet on flame retardants used in EPS . No information was extracted.

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	Unacceptable	× 2	8	Not detailed enough to provide data in scope.
	Metric 4: Temporal Representativeness	High	× 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	× 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†		Unacceptable		4	Metric Mean Score: 2.4.

** Consistent with our *Application of Systematic Review in TSCA Risk 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

† 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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982413

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Process Description:	IPC (Association Connecting Electronics Industries) comments on Norway's Prohibition on Certain Hazardous Substances in Consumer Products; Norway Notification Number 2007/9016/N under EU 98/34 Procedure

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	Unacceptable	× 2	8	Not detailed enough to provide data in scope.
	Metric 4: Temporal Representativeness	Medium	× 2	4	2007
	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					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.6.

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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982413

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.

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† 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:	Sipa,. 2012. Technical bulletin no. 6: SIPs and HBCD flame retardants.				
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3982469				

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Process Description:	Fact sheet about HBCD in the US and Canada. No information was extracted

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	High	× 1	1	US
Metric 3:	Applicability	Unacceptable	× 2	8	Not detailed enough to provide data in scope.
Metric 4:	Temporal Representativeness	High	× 2	2	2012
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					
Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.2.

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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:	Jpma,. 2016. Washington state chemical update.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3982479

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	HBCD in Children's products
Process Description:	News article about the restriction of HBCD in children's products in Washington state. No information was extracted.

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	High	× 1	1	US
	Metric 3:	Applicability	Unacceptable	× 2	8	Not detailed enough to provide data in scope.
	Metric 4:	Temporal Representativeness	High	× 2	2	2016
	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						
	Metric 7:	Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†			Unacceptable		4	Metric Mean Score: 2.2.

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Source Citation:	Orn, U.,Bergman, A.. 2004. An attempt to assess the present commercial production of brominated flame retardants.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986477

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Process Description:	Provides a list of brominated flame retardants that are commercially available. No information was extracted.

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	Sweden
	Metric 3: Applicability	Unacceptable	× 2	8	Not detailed enough to provide data in scope.
	Metric 4: Temporal Representativeness	Medium	× 2	4	2003
	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					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.6.

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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:	2012. Burning Questions, ENFIRO 2-day workshop.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986542

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Process Description:	Provides a compilation of abstracts from a flame retardant conference. Does not provide extractable information.

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	Brussels
	Metric 3: Applicability	Unacceptable	× 2	8	Not detailed enough to provide data in scope.
	Metric 4: Temporal Representativeness	High	× 2	2	2012
	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					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty
Overall Quality Determination†		Unacceptable		4	Metric Mean Score: 2.4.

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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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	3809166				

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	HBCD
Process Description:	Provides process descriptions that are taken from the EURAR (HERO ID 3970747)
Total Annual U.S. Volume (and percent of PV):	Provides european data on the market breakdown of HBCD use (Pages 2 - 3)

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	Multiple European countries
	Metric 3:	Applicability	Medium	× 2	4	Provides infomration on both in-scope and out of scope uses.
	Metric 4:	Temporal Representativeness	High	× 2	2	2009
	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	fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	High	× 1	1	discussion of variability or uncertainty
Overall Quality Determination†			High		1.4	

* 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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986667

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Auto replacement parts
Process Description:	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*	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 (industry association); 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	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	Medium	× 1	2	Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	N/A		N/A	This metric does not relate to this data type

Continued on next page

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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986667

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Overall Quality Determination†		High		1.3	

* 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:	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.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986785

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Auto replacement parts
Process Description:	Our members, in an effort to provide duediligence, have reviewed available data related to the use of HBCD and have not identified any ongoing uses inthe 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*	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 (industry association); 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	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	Medium	× 1	2	Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty						

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.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3986785

EVALUATION

Domain		Metric	Rating	MWF*	Score	Comments
	Metric 7:	Metadata Completeness	N/A		N/A	This metric does not relate to this data type
Overall Quality Determination†			High		1.3	

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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:	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.				
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	4135185				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Service life
Total Annual U.S. Volume (and percent of PV):	100 million pounds in service

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	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	Medium	× 1	2	Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty						
	Metric 7:	Metadata Completeness	Medium	× 1	2	Provides limited discussion
Overall Quality Determination†			High		1.4	

* 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:	ECB. 2003. Technical guidance document on risk assessment: Part II.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	196375

EXTRACTION

Parameter	Data
Life Cycle Stage:	Import
Life Cycle Description (Subcategory of Use):	Import
Operating Days per Year and Batches per Day:	B-tables for IC = 2: CHEMICAL INDUSTRY: BASIC CHEMICALS

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Low	× 1	3	The data sources for these tables are not transparently specified
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	European Union
	Metric 3: Applicability	Medium	× 2	4	The data in the report is for an occupational scenario that is similar to importation
	Metric 4: Temporal Representativeness	Medium	× 2	4	2003
	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	Medium	× 1	2	Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination†		Medium		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:	ECB. 2003. Technical guidance document on risk assessment: Part II.				
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	196375				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Processing
Life Cycle Description (Subcategory of Use):	All polymer processing operations
Operating Days per Year and Batches per Day:	B-tables for IC = 11: POLYMERS INDUSTRY

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Low	× 1	3	The data sources for these tables are not transparently specified
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	European Union
	Metric 3: Applicability	Medium	× 2	4	The data in the report is for an occupational scenario that is similar to importation
	Metric 4: Temporal Representativeness	Medium	× 2	4	2003
	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	Medium	× 1	2	Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination†		Medium		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:	ECB. 2003. Technical guidance document on risk assessment: Part II.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	196375

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Solder application
Operating Days per Year and Batches per Day:	B-tables for IC = 4: ELECTRICAL/ELECTRONIC INDUSTRY

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Low	× 1	3	The data sources for these tables are not transparently specified
Domain 2: Representative					
	Metric 2: Geographic Scope	Medium	× 1	2	European Union
	Metric 3: Applicability	Medium	× 2	4	The data in the report is for an occupational scenario that is similar to importation
	Metric 4: Temporal Representativeness	Medium	× 2	4	2003
	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	Medium	× 1	2	Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination†		Medium		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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3350607

EXTRACTION

Parameter	Data
Life Cycle Stage:	All
Life Cycle Description (Subcategory of Use):	All
Process Description:	The main use of HBCD is as a flame retardant in expanded polystyrene foam (EPS) and extruded polystyrene foam (XPS). There is little published information about the distribution of HBCD in the United States; however, data for the European Union (EU) market shows that about 96 percent of HBCD is used in EPS and XPS (ECHA, 2009). HBCD may also be used as a flame retardant in textiles. In addition, HBCD is used as a flame retardant in high impact polystyrene (HIPS) for electrical and electronic appliances.
Total Annual U.S. Volume (and 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 Concentration:	EPS boards contain approximately 0.5-0.7 percent HBCD by weight, while XPS insulation contains approximately 0.8-2.5 percent HBCD by weight (UNEP, 2011).

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	Medium	× 1	2	EPA is a trusted source.
Domain 2: Representative					
Metric 2:	Geographic Scope	High	× 1	1	United States
Metric 3:	Applicability	High	× 2	2	The report lists conditions of use of HBCD in the United States
Metric 4:	Temporal Representativeness	High	× 2	2	2016
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	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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	3350607

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Medium	× 1	2	The report provides limited discussion on the variability of these uses in the United States.
Overall Quality Determination†		High		1.3	

* 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:	U.S. Department of Housing and Urban Development. 2016. American housing survey, components of inventory change: 20112013.				
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	6386974				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Demolition and Disposal
Process Description:	Information on changes to the US housing market between 2011-2013 (number of houses lost to demolition or disaster)
Number of Sites:	470,000 houses lost between 2011-2013. Total of 132,419,000 houses present in 2011. Loss fraction of 0.00355.

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	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	in scope
	Metric 4:	Temporal Representativeness	High	× 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: 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	well characterized
Overall Quality Determination†			High		1.0	

⋆ 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:	U.S. Department of Housing and Urban Development. 2016. American housing survey, components of inventory change: 20112013.				
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	6386974				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Construction
Process Description:	Information on changes to the US housing market between 2011-2013 (newly constructed houses)
Number of Sites:	1,160,000 houses constructed between 2011-2013. Total of 132,419,000 houses present in 2011. Increase fraction of 0.00876.

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	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	in scope
	Metric 4:	Temporal Representativeness	High	× 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: 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	well characterized
Overall Quality Determination†			High		1.0	

* 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:	U.S. Census Bureau. 2019. Building permits survey, Table 1a: New privately owned housing units authorized.				
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	6387687				

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Demolition and Disposal
Process Description:	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: Reliability					
	Metric 1: Methodology	High	× 1	1	Information is from trusted sources
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					
	Metric 7: Metadata Completeness	Medium	× 1	2	No discussion of variability or uncertainty
Overall Quality Determination†		High		1.4	

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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:	Waste Business Journal. 2019. Directory of waste processing & disposal sites 2019 (US edition).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	6387396

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Demolition and Disposal
Process Description:	Information on number of different types of waste disposal facilities currently operating in US (full text not available, information taken from summary)
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	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					
	Metric 7: Metadata Completeness	Medium	× 1	2	No discussion of variability or uncertainty
Overall Quality Determination†		High		1.5	

Source Citation:	Waste Business Journal. 2019. Directory of waste processing & disposal sites 2019 (US edition).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	6387396

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:	Energy Recovery Council. 2018. 2018 Directory of waste-to-energy facilities.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	6387323

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Demolition and Disposal
Process Description:	Information on number of waste-to-energy facilities operating in the US and variation in number between 2001 - 2018
Number of Sites:	Between 75 - 97 facilities operating between 2001 - 2018. 75 active in 2018.

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	2018
	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, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	High	× 1	1	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:	U.S. Environmental Protection Agency. 2015. Incident waste decision support tool (I-WASTE DST).
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	6387324

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Demolition and Disposal
Process Description:	Waste tool that provides information on a variety of waste treatment and disposal facilities (count, location, capacity)
Number of Sites:	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					
Metric 1:	Methodology	High	× 1	1	Information is from trusted sources
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	Reporting years 2015 and 2016
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, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty					
Metric 7:	Metadata Completeness	High	× 1	1	well characterized
Overall Quality Determination†		High		1.0	

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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:	U.S. Environmental Protection Agency. 2008. Lifecycle construction resource guide.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	6388408

EXTRACTION

Parameter	Data
Life Cycle Stage:	Use
Life Cycle Description (Subcategory of Use):	Demolition and Disposal
Process Description:	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.
Number of Sites:	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.

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	High	× 1	1	US
	Metric 3: Applicability	High	× 2	2	in scope
	Metric 4: Temporal Representativeness	Medium	× 2	4	2008
	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, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	No discussion of variability or uncertainty with respect to these data
Overall Quality Determination[†]		High		1.5	

[*] 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:	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	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	1927802

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal/Recycling
Life Cycle Description (Subcategory of Use):	Waste of Electric and Electronic Equipment (WEEE)
Process Description:	Manual dismantling, automatic separation (crushing, sieving, magnetic/density/electrostatic separation). See process flow diagram in Figure 1.
Total Annual U.S. Volume (and percent of PV):	30,000 metric ton/yr at the studies site (in Switzerland); (7.6 percent) plastic objects contained detectable amounts of BFRs; 0.23 percent of the detected bromine was from HBCD
Chemical Concentration:	Mean concentration of HBCD in small WEEE = 17 mg HBCD/kg WEEE; Mean concentration in plastic components only = 60 mg HBCD/kg; Concentrations in specific WEEE in table 3

EVALUATION

Domain	Metric		Rating	MWF*	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Information is from peer-reviewed journal article
Domain 2: Representative						
	Metric 2:	Geographic Scope	Medium	× 1	2	Switzerland
	Metric 3:	Applicability	High	× 2	2	Electronics recycling is in scope
	Metric 4:	Temporal Representativeness	Medium	× 2	4	2005
	Metric 5:	Sample Size	Medium	× 1	2	Concentration data provided as means with uncertain other 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						

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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	Facility; Reports for Data or Information Other than Exposure or Release Data;				
Hero ID	1927802				

EVALUATION

Domain	Metric	Rating	MWF[*]	Score	Comments
	Metric 7: Metadata Completeness	High	× 1	1	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination[†]		High		1.4	

[*] 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:	U.S. Environmental Protection Agency. 2016. Implementation Study of the Electronics Recycling Standards: R2 and e-Stewards".
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	6558185

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal/Recycling
Life Cycle Description (Subcategory of Use):	Electronics recycling
Number of Sites:	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*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	High	× 1	1	Information is from an EPA publication
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	US
	Metric 3: Applicability	High	× 2	2	Electronics recycling is in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2016
	Metric 5: Sample Size	Low	× 1	3	One value is provided and is characterized by no statistics.
Domain 3: Accessibility/Clarity					
	Metric 6: Metadata Completeness	Medium	× 1	2	Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 1	3	The report does not address variability or uncertainty.
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:	U.S. Environmental Protection Agency. 2019. Durable Goods: Product-Specific Data.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	6558186

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal/Recycling
Life Cycle Description (Subcategory of Use):	Electronics recycling
Process Description:	The total number of tons of consumer electronics generated and recycled is provided.
Total Annual U.S. Volume (and percent of PV):	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⋆	Score	Comments
Domain 1: Reliability						
	Metric 1:	Methodology	High	× 1	1	Information is from an EPA website
Domain 2: Representative						
	Metric 2:	Geographic Scope	High	× 1	1	US
	Metric 3:	Applicability	High	× 2	2	Electronics recycling is in scope
	Metric 4:	Temporal Representativeness	High	× 2	2	2015
	Metric 5:	Sample Size	Low	× 1	3	One value per year is provided and is characterized by no statistics.
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	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.

Source Citation:	e-Stewards. 2020. http://e-stewards.org/data/list-recyclers/.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	6558187

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal/Recycling
Life Cycle Description (Subcategory of Use):	Electronics recycling
Number of Sites:	47 certified sites; 0 uncertified in the United States

EVALUATION

Domain	Metric	Rating	MWF*	Score	Comments
Domain 1: Reliability					
	Metric 1: Methodology	Low	× 1	3	The data, data sources, and/or techniques used in the assessment or report are not specified.
Domain 2: Representative					
	Metric 2: Geographic Scope	High	× 1	1	US
	Metric 3: Applicability	High	× 2	2	Electronics recycling is in scope
	Metric 4: Temporal Representativeness	High	× 2	2	2020
	Metric 5: Sample Size	High	× 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 transparent.
Domain 4: Variability and Uncertainty					
	Metric 7: Metadata Completeness	Low	× 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.

Source Citation:	Sustainable Electronics Recycling International. 2020. Find a Recycler. https://sustainableelectronics.org/recyclers.
Type of Data Source	Facility; Reports for Data or Information Other than Exposure or Release Data;
Hero ID	6558188

EXTRACTION

Parameter	Data
Life Cycle Stage:	Disposal/Recycling
Life Cycle Description (Subcategory of Use):	Electronics recycling
Number of Sites:	672 certified sites; 27 uncertified sites in the United States

EVALUATION

Domain	Metric	Rating	MWF⋆	Score	Comments
Domain 1: Reliability					
Metric 1:	Methodology	Low	× 1	3	The data, data sources, and/or techniques used in the assessment or report are not specified.
Domain 2: Representative					
Metric 2:	Geographic Scope	High	× 1	1	US
Metric 3:	Applicability	High	× 2	2	Electronics recycling is in scope
Metric 4:	Temporal Representativeness	High	× 2	2	2020
Metric 5:	Sample Size	High	× 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 transparent.
Domain 4: Variability and Uncertainty					
Metric 7:	Metadata Completeness	Low	× 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.