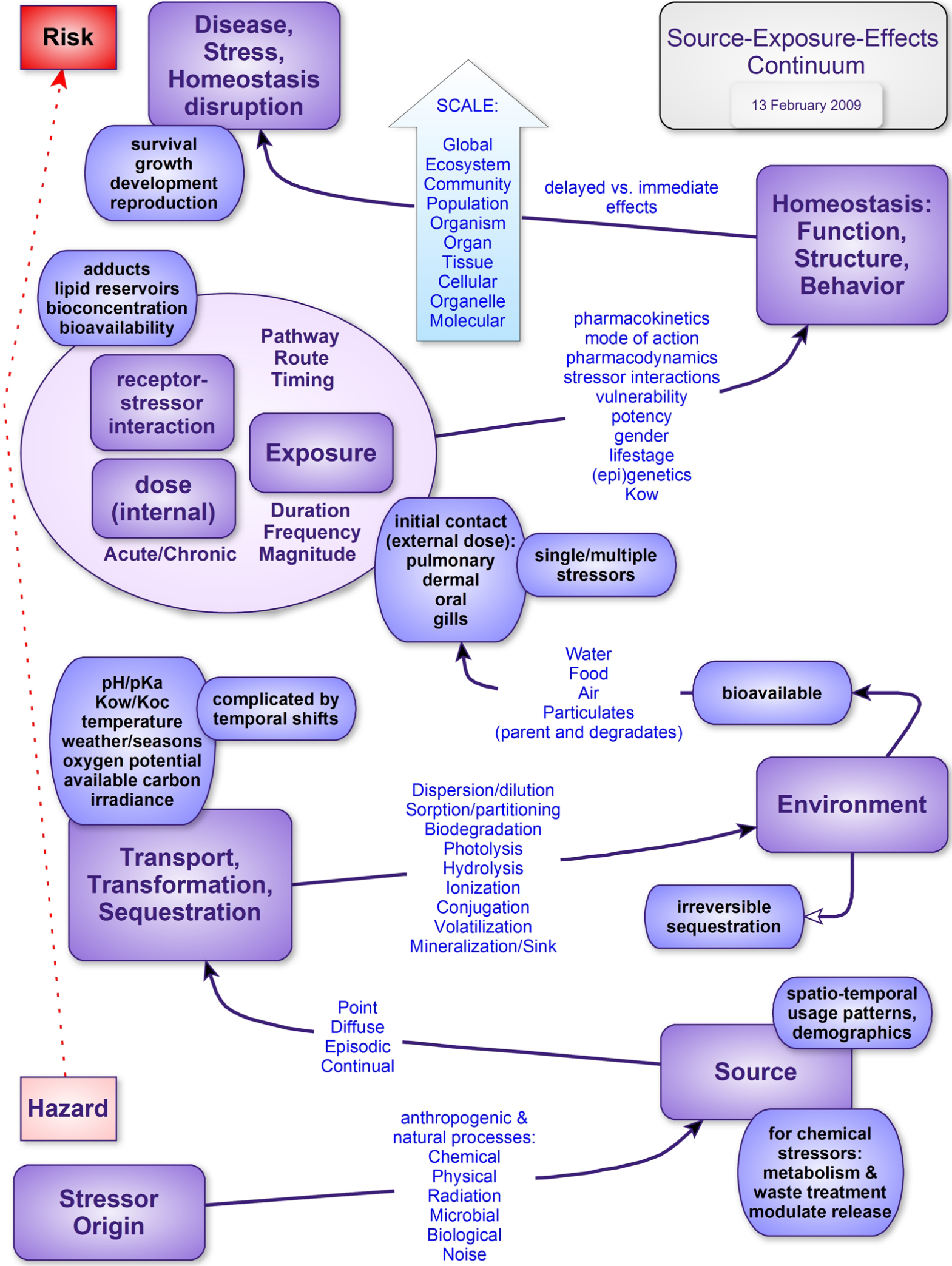
Source-Exposure-Effects Continuum
13 February 2009
Risk
Disease, Stress, Homeostasis disruption
survival
growth
development
reproduction
SCALE:
Global
Ecosystem
Community
Population
Organism
Organ
Tissue
Cellular
Organelle
Molecular
delayed vs. immediate effects
Homeostasis: Function, Structure, Behavior
adducts
lipid reservoirs
bioconcentration
bioavailability
Pathway
Route
Timing
receptor-stressor interaction
Exposure
dose (internal)
Acute/Chronic
Duration
Frequency
Magnitude
pharmacokinetics
mode of action
pharmacodynamics
stressor interactions
vulnerability
potency
gender
lifestage
(epi)genetics
Kow
initial contact (external dose):
pulmonary
dermal
oral
gills
single/multiple stressors
Water
Food
Air
Particulates
(parent and degradates)
bioavailable
pH/pKa
Kow/Koc
temperature
weather/seasons
oxygen potential
available carbon
irradiance
complicated by temporal shifts
Environment
Transport, Transformation, Sequestration
Dispersion/dilution
Sorption/partitioning
Biodegradation
Photolysis
Hydrolysis
Ionization
Conjugation
Volatilization
Mineralization/Sink
irreversible sequestration
Point
Diffuse
Episodic
Continual
spatio-temporal usage patterns, demographics
Source
Hazard
anthropogenic & natural processes:
Chemical
Physical
Radiation
Microbial
Biological
Noise
for chemical stressors: metabolism & waste treatment modulate release
Stressor Origin