



USGS Mineral Science and Information for Decision-Making

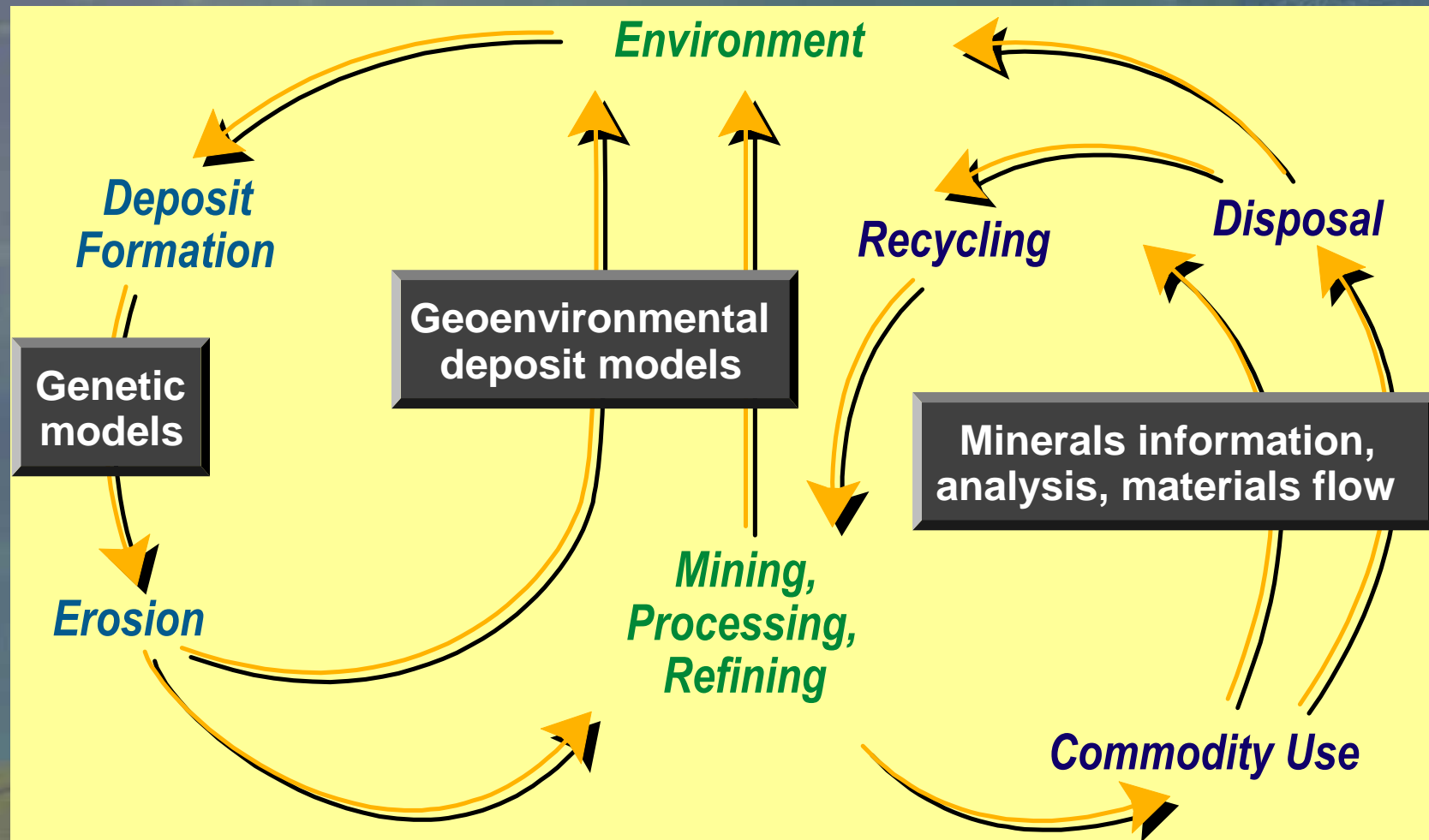
Technology and Rare Earth Metals for National Security and Clean Energy 2010

Linda Gundersen
USGS Chief Scientist for Geology

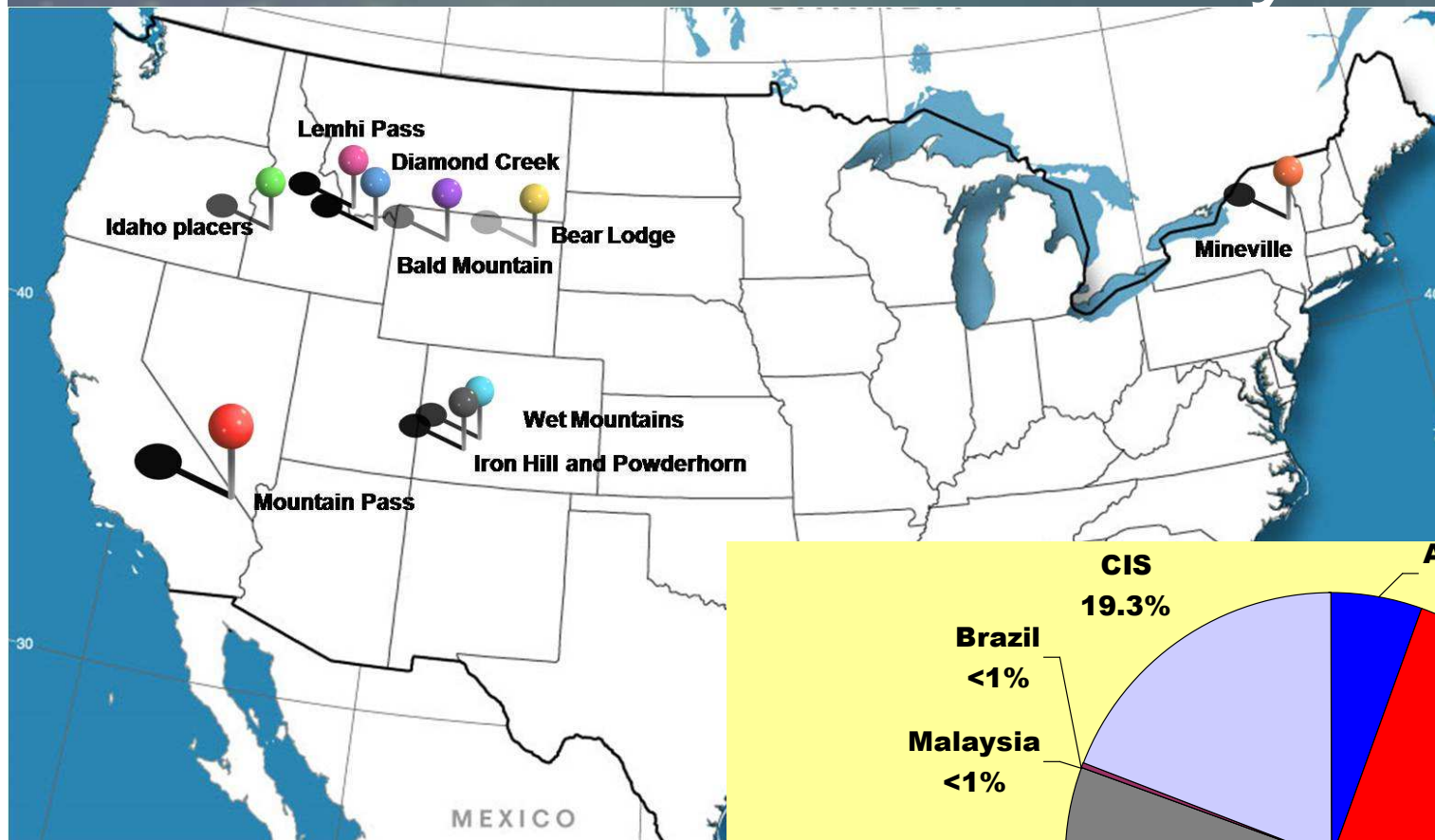
March 18, 2010

U.S. Department of the Interior
U.S. Geological Survey

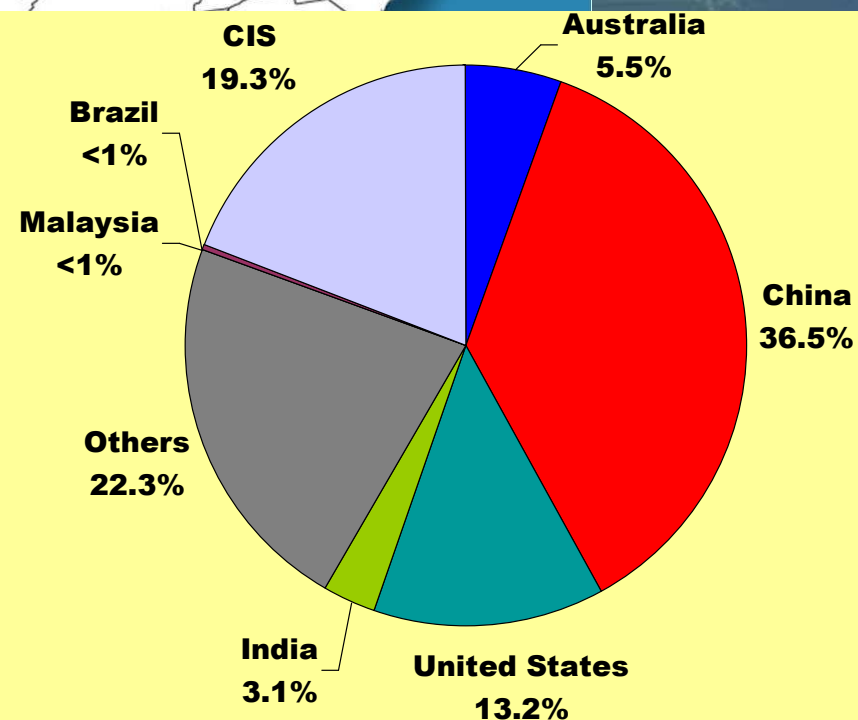
USGS Mineral Resources Program



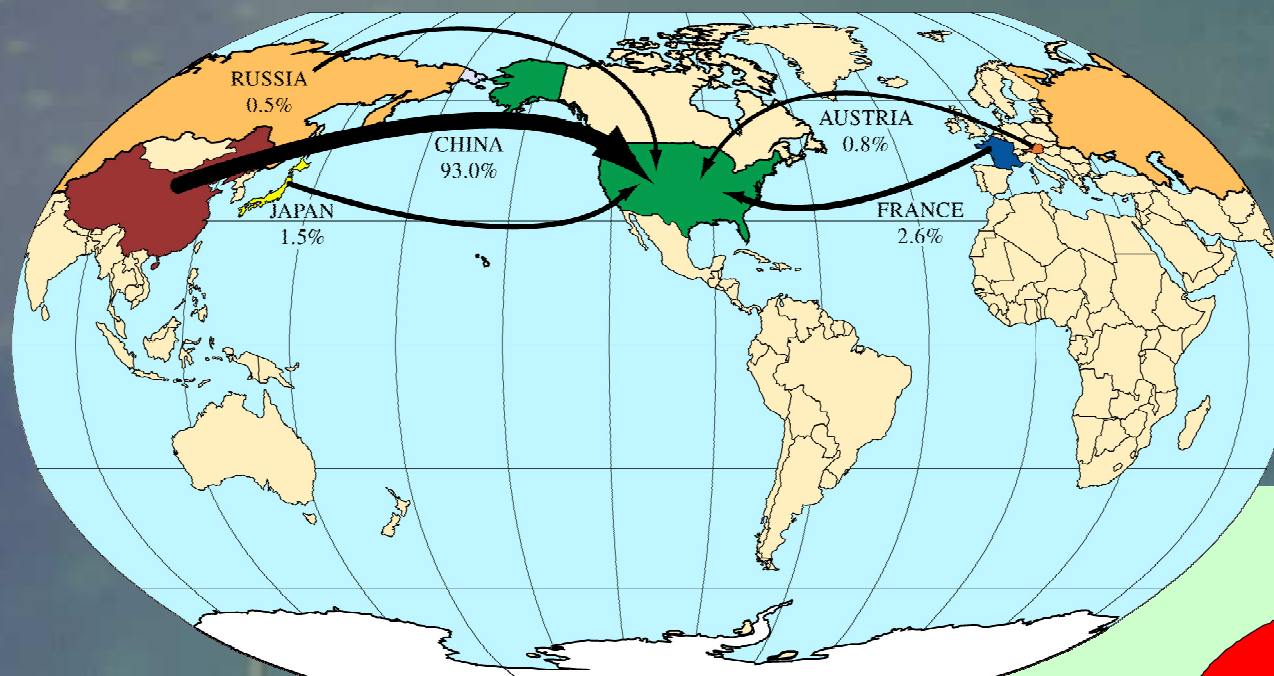
Globalize and diversify supply



Global and Domestic
Rare Earth Reserves 2009



US Import Sources and Global Production of Rare Earths



China
97.3%

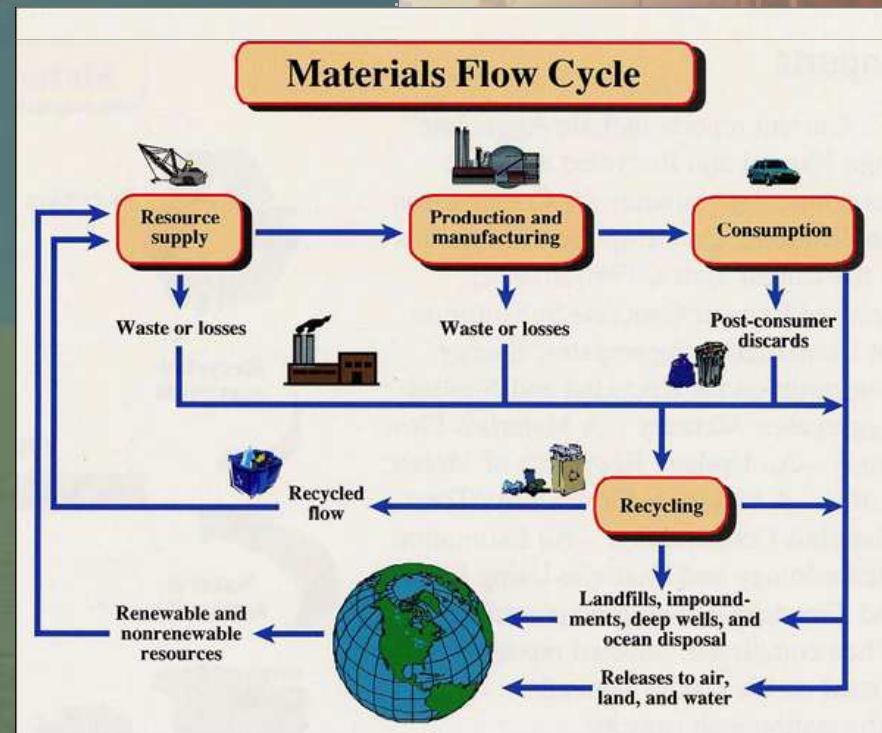
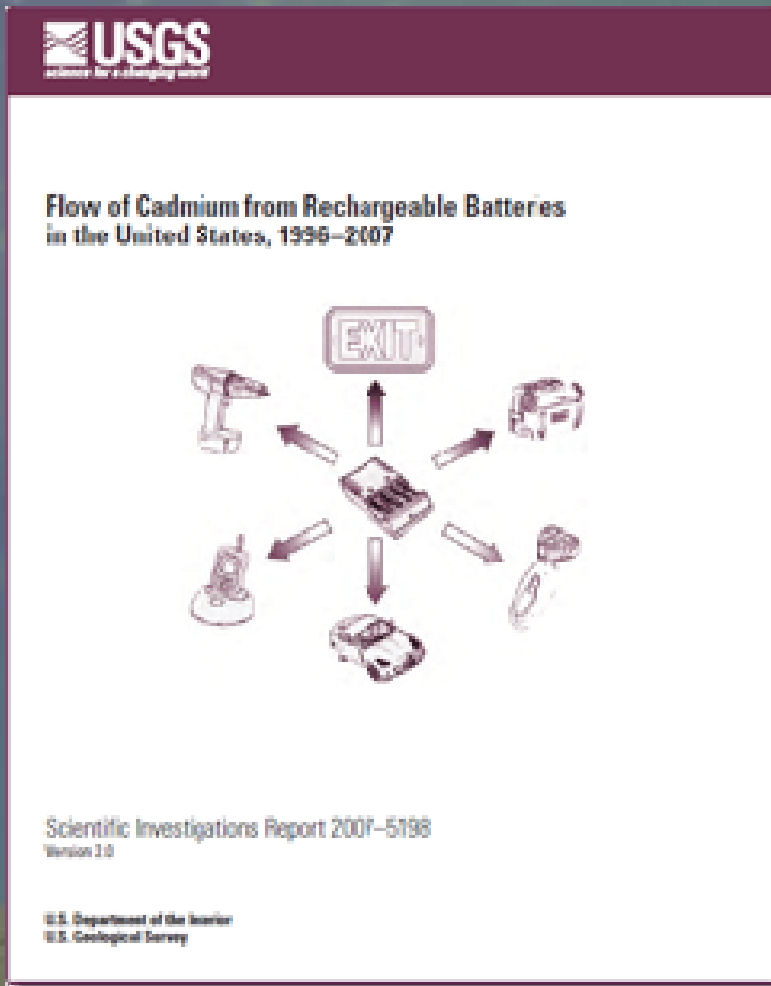
India
2.0%

Malaysia
0.3%

Brazil
0.4%

USGS Materials Flow

What happens to materials we use from the time a material is extracted, through its processing and manufacturing, to its ultimate disposition



Geoenvironmental Models of Mineral Deposit Types and Lithology Types
(non-site specific, scale independent)

Site-Specific Parameters
(influence of size, mining method, local geology/structure, topography, position in watershed, climate, etc.)

Watershed-Specific Parameters
(size, lithology, topography, climate, distribution of precipitation, hydrological properties, other acid/metal sources, vegetation, land cover, land use, etc.)

Watershed Hydrology Models
+
Reactive Transport Models
(including speciation models)



from Smith et al., 2006

Toxicology Models

Mineral Deposit

metals and acidity

Lithology

hardness and alkalinity

Mine Site Characteristics

Watershed Characteristics

DOC, constituents

Pathways

Dissolved Metals

Free Metals

Particulate Metals

Bioreceptors

Source

Transport

Fate

Pre-mining

