

Linking Science to Policy to Inform Mercury Negotiations

Noelle E. Selin

Assistant Professor of Engineering Systems & Atmospheric Chemistry
Massachusetts Institute of Technology

SETAC-Boston

15 November 2011

selin@mit.edu

<http://mit.edu/selin>

<http://mit.edu/selingroup>



Massachusetts Institute of Technology
Engineering Systems Division



Massachusetts Institute of Technology
Engineering Systems Division



EAPS



Mercury, Science and Negotiations

- What is the status of global mercury policy?
- How can we understand the links between emissions and impacts?
- What strategies are available to address mercury?
- What is the role of science?

Mercury, Science and Negotiations

- **What is the status of global mercury policy?**
- How can we understand the links between emissions and impacts?
- What strategies are available to address mercury?
- What is the role of science?

Global Mercury Negotiations

- **2002: United Nations Environment Programme Global Mercury Assessment**
 - “sufficient evidence to warrant international action”
- **2002-2009: Global Mercury Programme**
 - Several countries were against a global treaty (e.g. USA, China)
- **2009: Mandate to begin treaty negotiations**
 - US changes its position
- **2010: First negotiating session (Stockholm)**
- **2011 (January): Second negotiating session (Japan)**
- **2011 (November): Third negotiating session (Nairobi)**
- **2012 (June): Fourth negotiating session (Uruguay)**
- **Early 2013: Fifth negotiating session (Switzerland or Brazil)**
- **Mid-2013: Diplomatic conference and signature (Japan)**

Major Global Mercury Issues for the Hg Treaty

- ***Measures to reduce emissions to air, water, land:***
 - Mostly from coal-fired power plants
 - 50% of emissions in Asia (mostly China)
 - Largest 3 contributors: China, India, United States
 - Targets and timetables?
- ***Measures to reduce mercury supply:***
 - Continuing mining
- ***Measures to reduce intentional use:***
 - Bans or restrictions on mercury in products
- ***Artisanal and Small-scale Gold Mining***

Issues common to environmental negotiations

□ ***Technical and Financial Assistance***

- How will developing countries pay for implementation?
- Will there be technology transfer? A specific fund?

□ ***Compliance and enforcement***

- How to get countries to meet their obligations

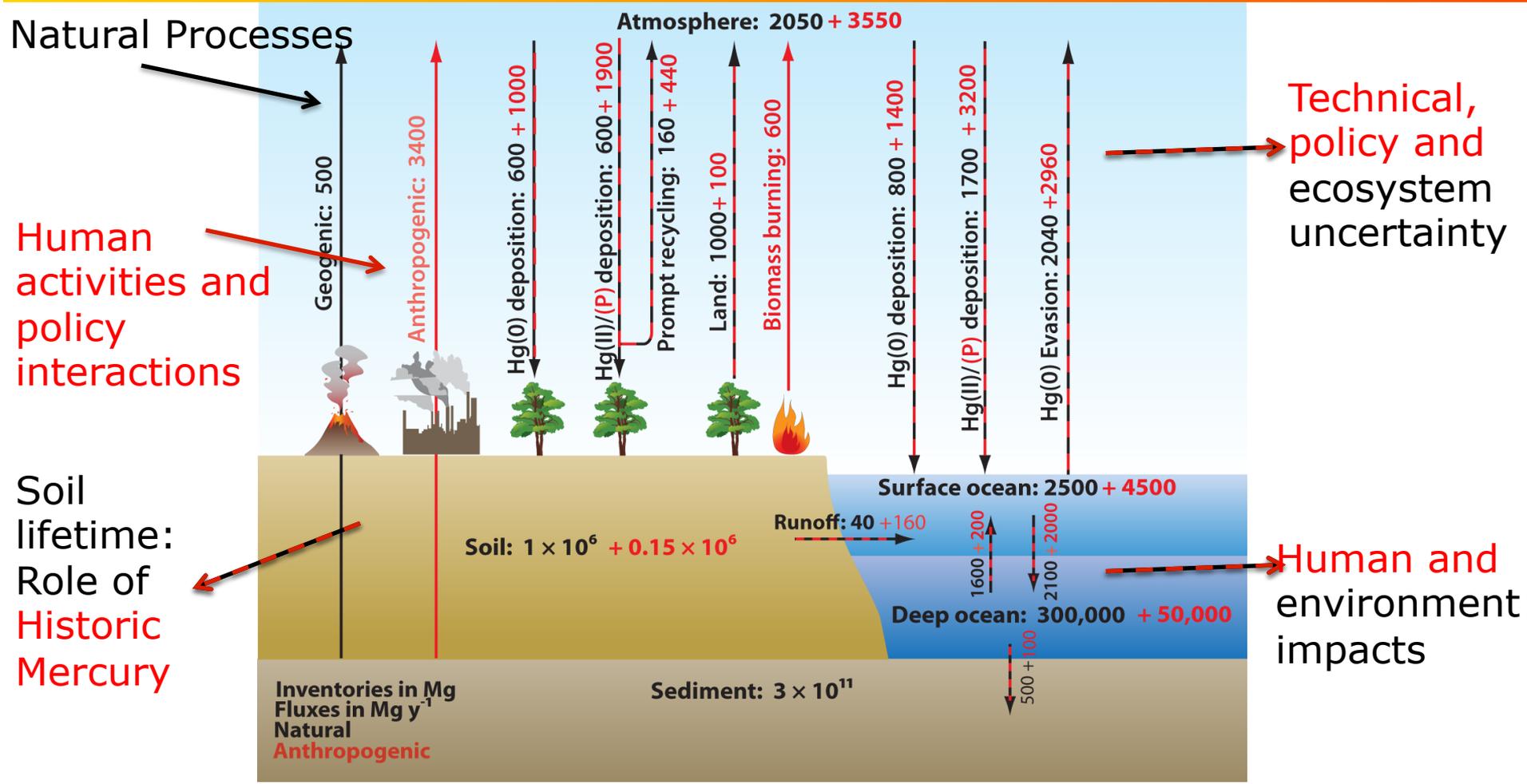
□ ***Relationship with other agreements, including trade***

- Trade restrictions: will they conflict with WTO?
- Mercury in waste: synergies or conflicts with the Basel Convention

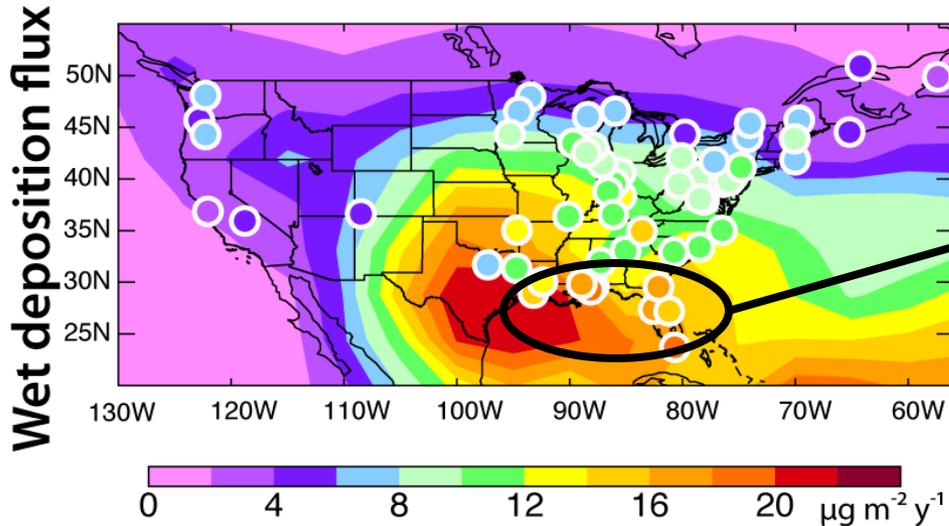
Mercury, Science and Negotiations

- What is the status of global mercury policy?
- **How can we understand the links between emissions and impacts?**
- What strategies are available to address mercury?
- What is the role of science?

Understanding the Present and Future Global Biogeochemical Cycle of Mercury

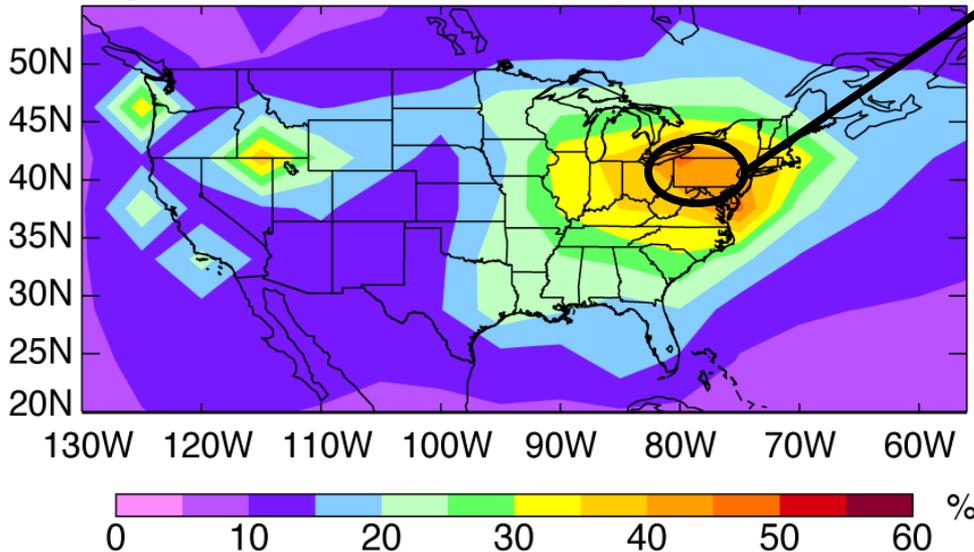


North American Contribution to Mercury Deposition



Southeast has highest wet deposition in the U.S., but mostly from non-US sources: this is due to rainout of mercury from higher altitudes in summertime

% Deposition from North American Sources

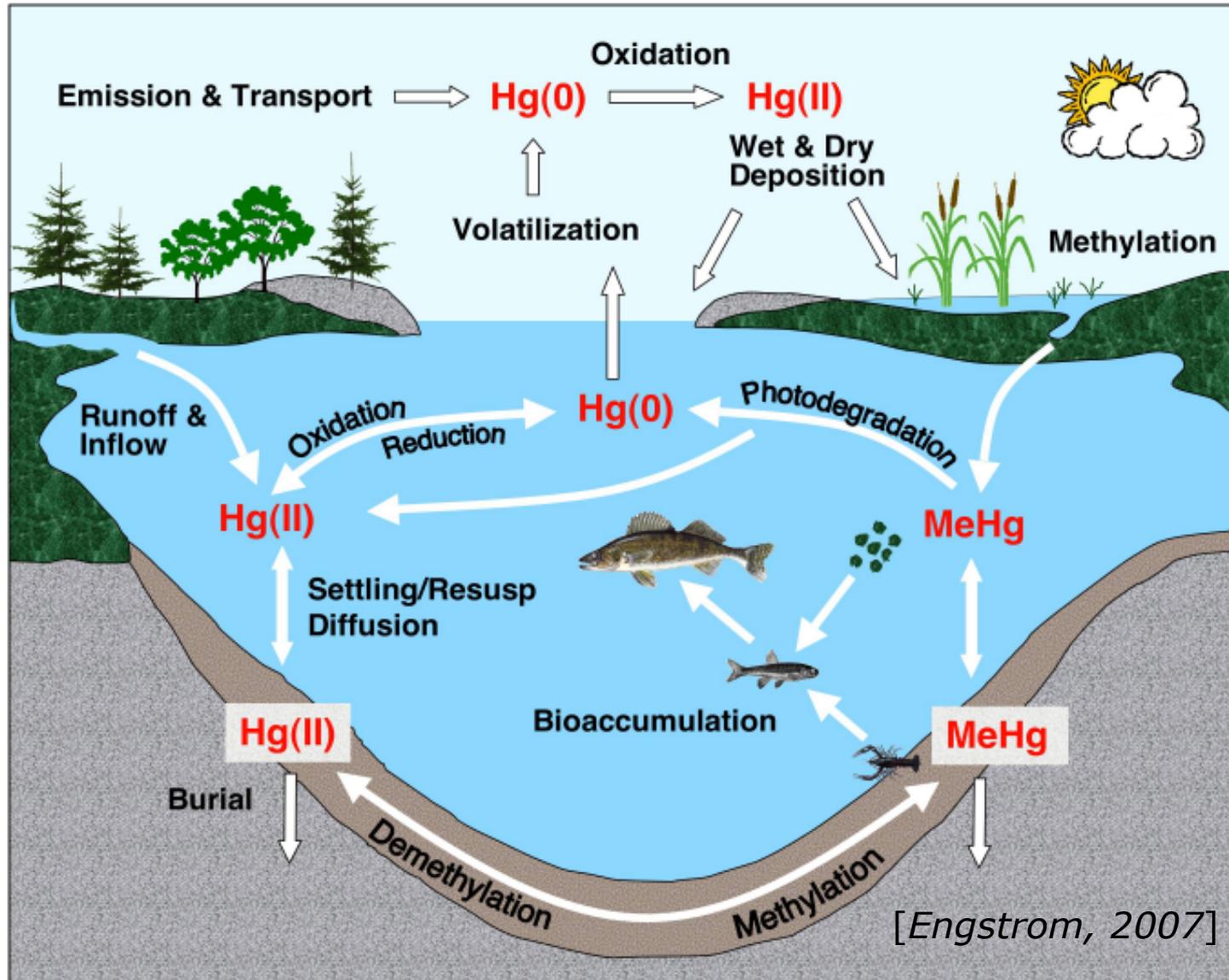


Up to 60% of deposition in Midwest/Northeast U.S. is from domestic sources

Policy implications:
Reducing deposition in both Midwest and Southeast will require policy actions on multiple political scales (national and global)

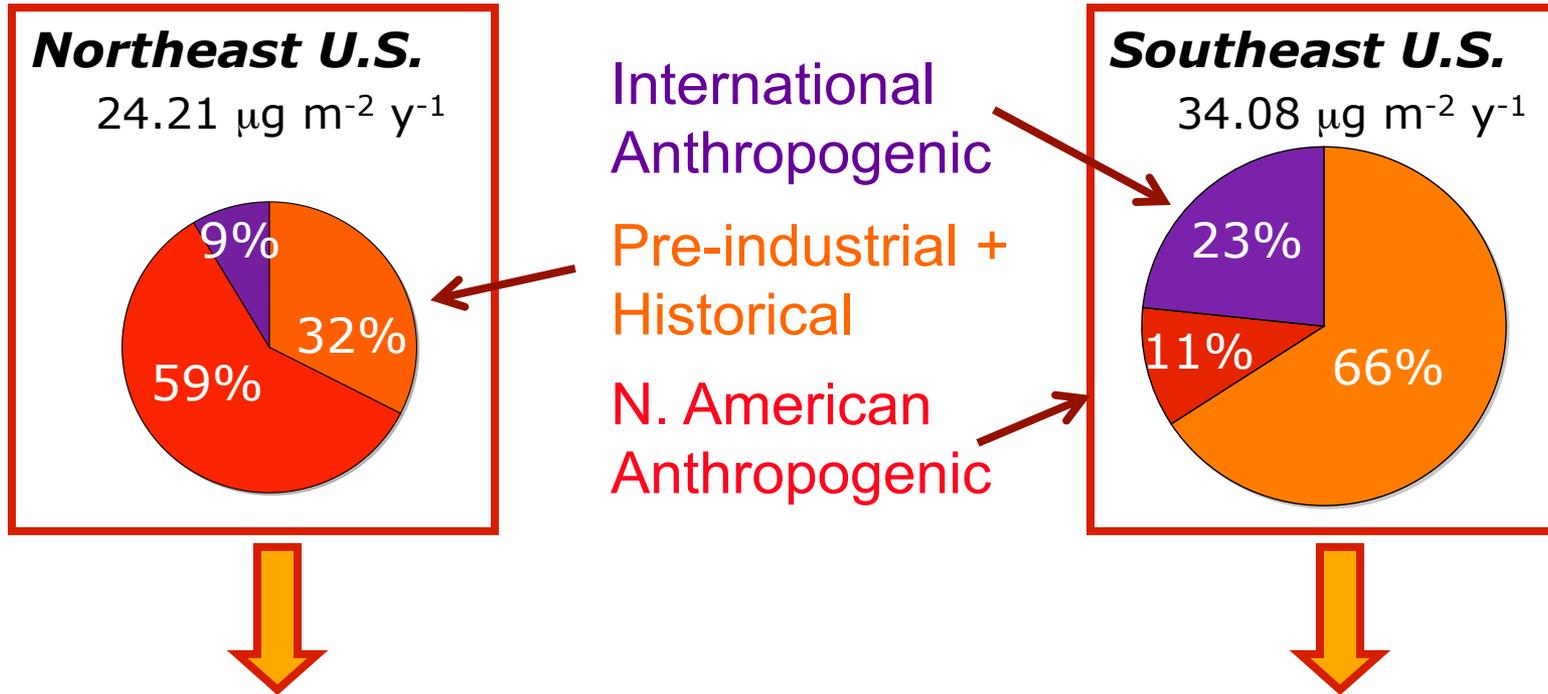
[Selin & Jacob, Atmos. Env. 2008]

From Deposition to Fish Methylmercury



Freshwater Deposition and Source Attribution

How do sources affect fish methylmercury, and on what timescales?



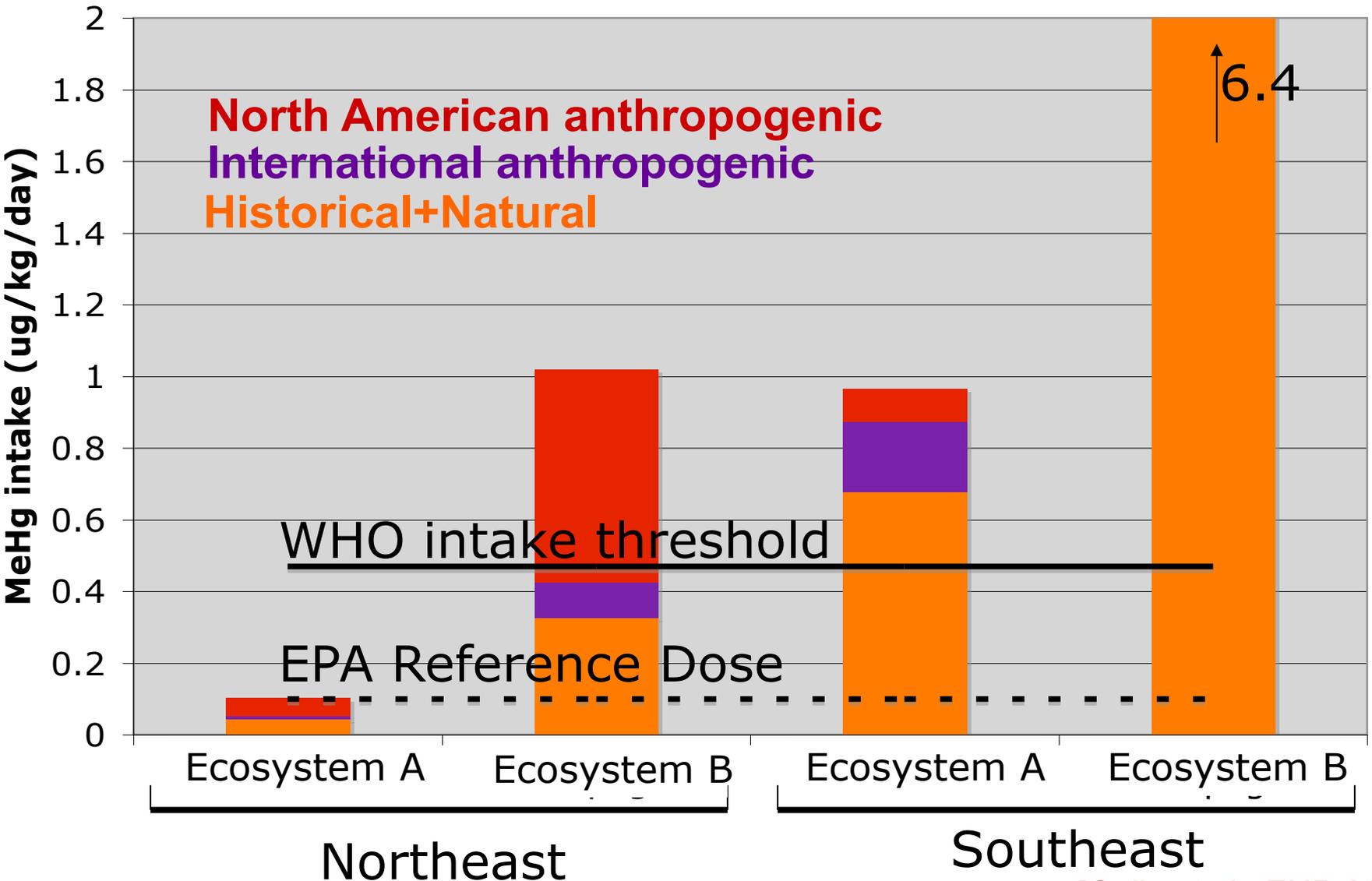
Lake, River, Watershed, and Aquatic food web models
[Knights et al., 2009]

Policy and Timescale Analysis

[Selin et al., *Environ. Health Persp.*, 2010]

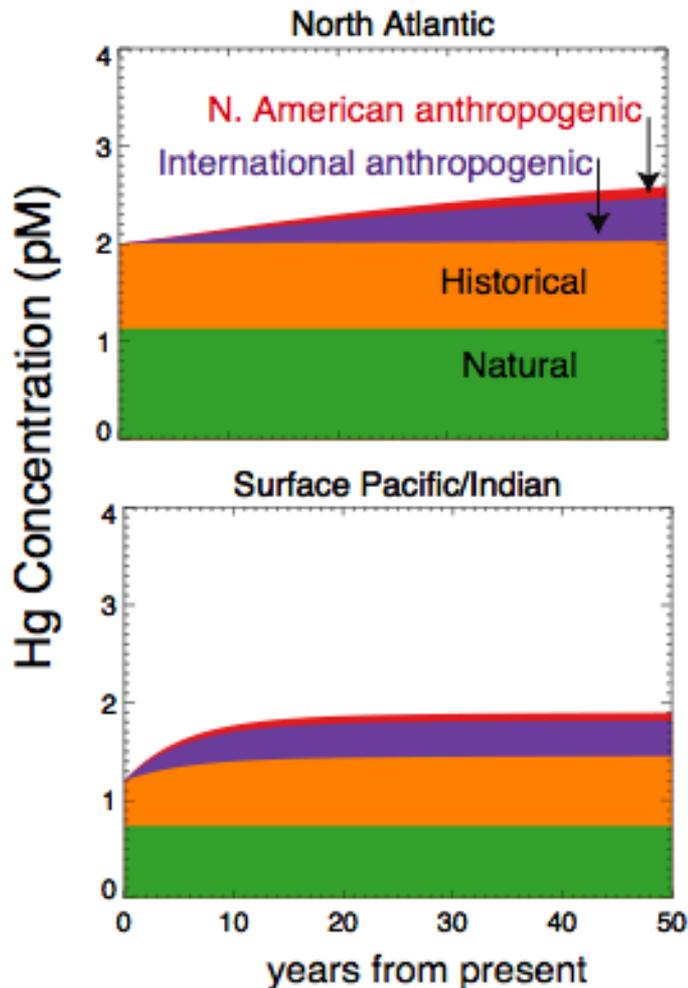
Local Exposure from Freshwater Fish

2 x 100 g fish meals/week (60 kg person) @ t=40 y



[Selin et al., EHP, 2010]

Population-Wide Exposure from Marine Fish



“current emissions” scenario
14-box ocean model: Sunderland
and Mason, 2007

No mechanistic link (yet) from oceanic Hg concentration to fish methylmercury

Historical exposure could continue to increase, complicating policy decision-making

Different challenges on different scales (local to global)

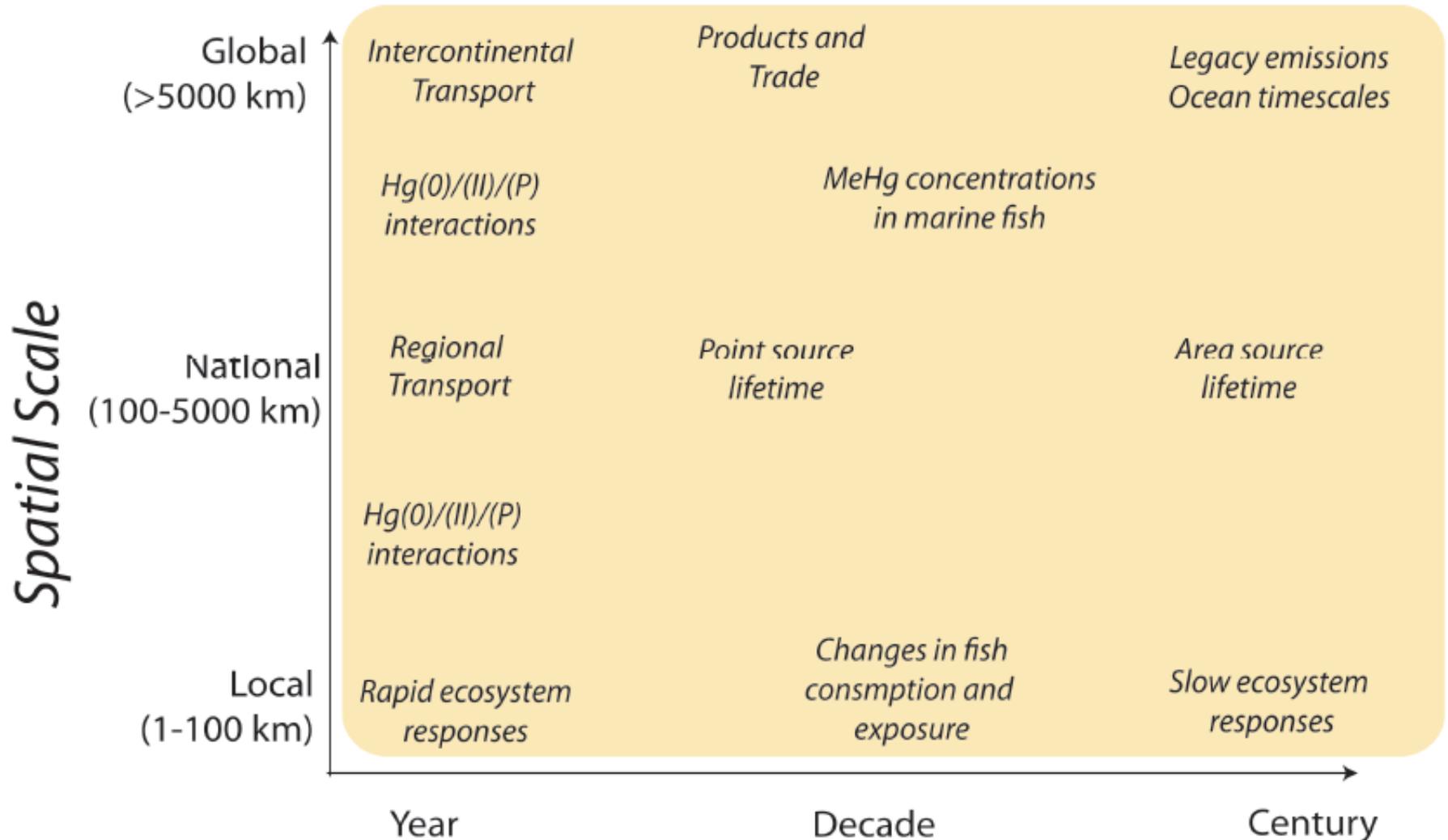
Adaptation and mitigation necessary? (Learning lessons from other issue areas)

[Selin et al., EHP, 2010]

Mercury, Science and Negotiations

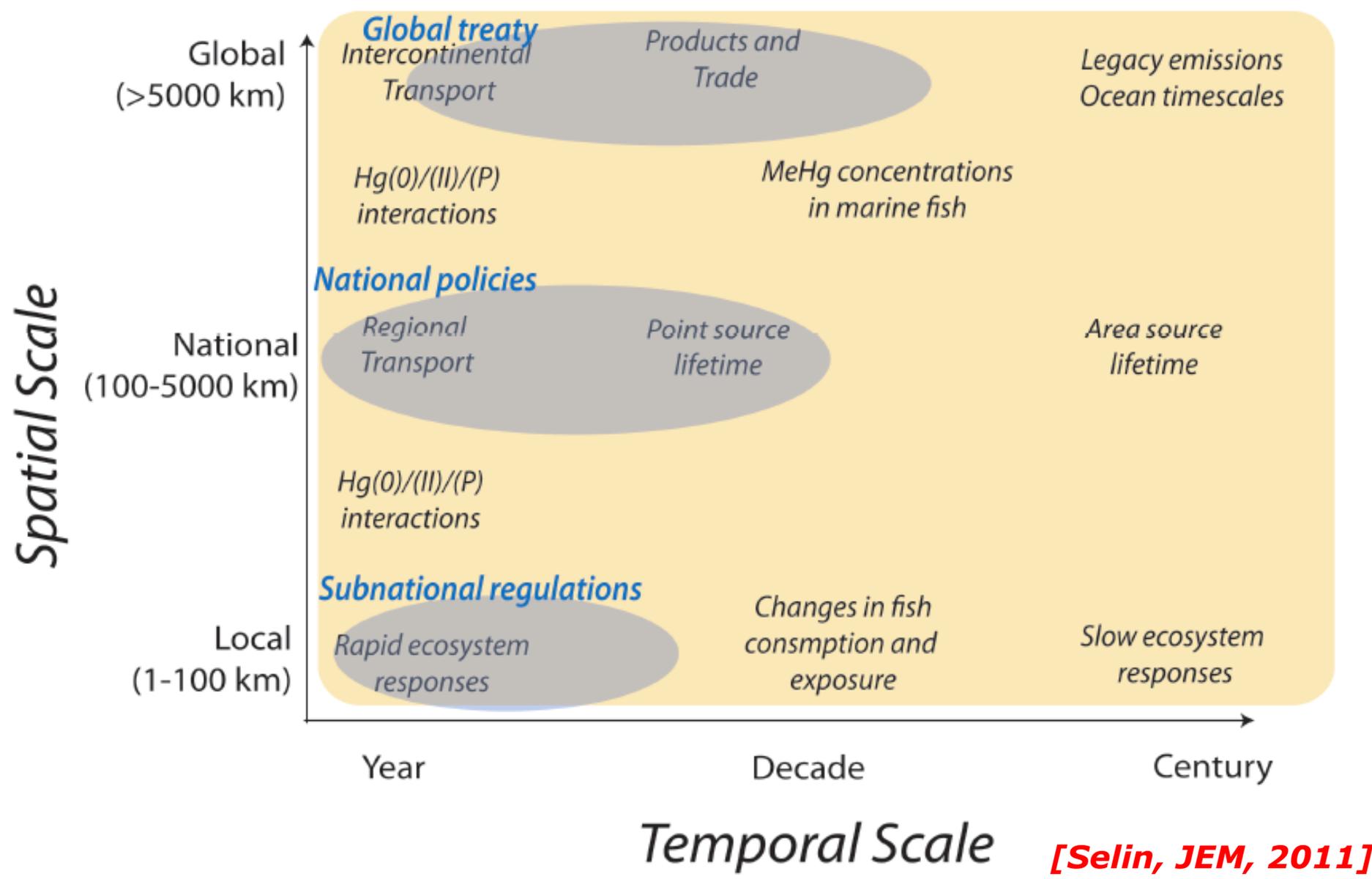
- What is the status of global mercury policy?
- How can we understand the links between emissions and impacts?
- **What strategies are available to address mercury?**
- What is the role of science?

Mercury as a cross-scale science-policy problem

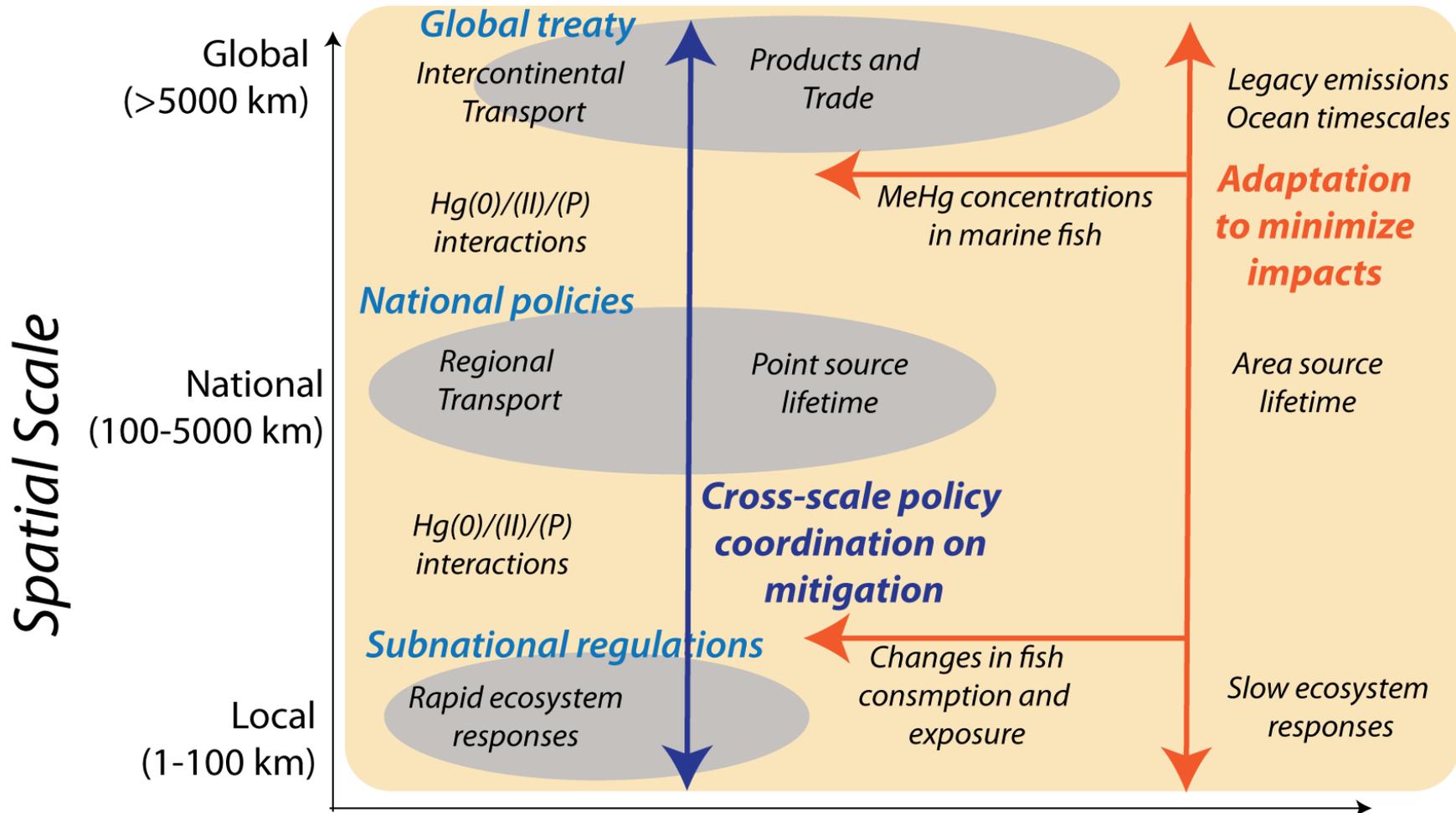


Temporal Scale [Selin, JEM, 2011]

Mercury as a cross-scale science-policy problem



Mercury as a cross-scale science-policy problem



Temporal Scale [Selin, JEM, 2011]

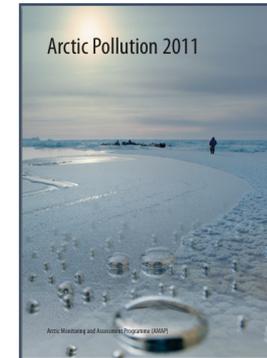
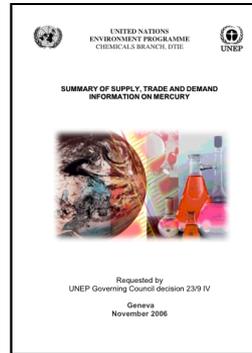
Mercury, Science and Negotiations

- What is the status of global mercury policy?
- How can we understand the links between emissions and impacts?
- What strategies are available to address mercury?
- **What is the role of science?**

Mercury assessments

- ❖ Scientific assessments informing international action

CLRTAP
assessments
(EU & North
America)



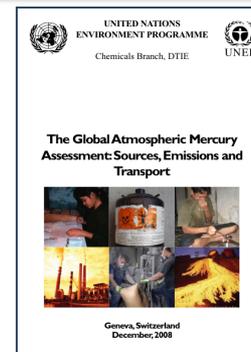
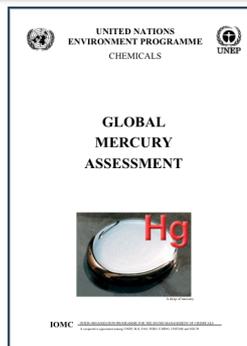
1989
1995

2002

2006

2008

2011





The Mercury Game

- Allows participants to understand the interface between science and politics
- Experiential learning
 - 1) General instructions
 - 2) Assessment
 - 3) Confidential, player specific instructions

Game is available to download at <http://mit.edu/mercurygame>

Please play the game in your courses and lab groups!

International Mercury Assessment



Table of Contents

Introduction, purpose and scope of the report

Issue 1: Institutional form for future action

Issue 2: Atmospheric emissions

Issue 3: Demand for use in products and processes

Issue 4: Artisanal and small-scale gold mining

Conclusion

Lessons from the mercury game

- International environmental negotiation dynamics
- Science communication
- Challenges of interpreting uncertainty
- Interests and stakeholders' interpretation of science
- Balance between scientific, political and economic considerations