International Collaborative Science Opportunities with the U.S. EPA

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U.S. Environmental Protection Agency

- 17,000 employees
- $7 billion budget
- Broad science and technology activities
  - Providing environmental solutions
  - Supporting innovation
  - Making effective decisions for regulations and policy
- Dozens of laboratories and research centers country-wide
  - Office of Research and Development
  - Program offices for air, water, waste, pesticides, & toxics
  - Ten regional offices
Office of the Science Advisor (OSA)

• Provides cross-Agency leadership in science & science policy.
• Ensures the best possible use of science at the Agency.
• Promotes science integration through several functions:
  • Science Policy Council (SPC) – integrates policies that guide the use of science by decision makers.
  • Risk Assessment Forum (RAF) – promotes consensus on risk assessment issues
  • Program in Human Research Ethics (PHRE) – provides review according to scientific merit and ethical standards
  • Environmental Technology Initiative (ETI) – encourages sustainable technologies that help solve environmental problems.
    • Global Earth Observation System of Systems (GEOSS)
    • Forum on Environmental Measurement (FEM)
    • Council for Regulatory Environmental Modeling (CREM)
    • Environmental Technology Council (ETC)
EPA International Science Activities: Air

- Poor air quality remains a major worldwide concern, especially for cities and developing countries.
- EPA has a long history of working with international partners to improve air quality.
- Reducing international sources of air pollutants is a top EPA priority.
- Increasingly, for the EPA to achieve domestic environmental objectives, international environmental collaboration is required.
Example of EPA International Collaboration: Air

- Two decades of collaboration with China's Environmental Protection Administration (SEPA), now Ministry of Environmental Protection (MEP).

  - Memorandum of Understanding (MOU) – In December 2003 EPA and SEPA signed an MOU to provide a strategic approach for our extensive cooperation.

  - Clean Air and Energy Strategy – By strengthening regional coordination of clean air and energy management in key regions of China, EPA and SEPA are working together to reduce air pollution and greenhouse gases (GHG). The Strategy focuses on priority sectors (power and transportation) affecting air and public health.

  - U.S.-Sino Joint Committee on Environmental Cooperation – At this meeting in Beijing on December 14, 2007, EPA and SEPA identified priorities for cooperation for 2008-09.
Example of EPA International Collaboration: Air

- Partnership for Clean Fuels and Vehicles
  - A public-private partnership launched at the 2002 World Summit on Sustainable Development (WSSD).
  - Promotes clean fuels and vehicles to reduce vehicular air pollution (primarily sulfur and lead) in developing countries.
  - Eliminated lead in gasoline by 2005 for all sub-Saharan African countries, reducing lead exposure for nearly 1 billion people.
EPA International Science Activities: Water

- EPA works with other countries, the World Health Organization, and others to protect the world's oceans, ensure the health of transboundary waterways, and improve access to potable water.
  
  - Protecting the Marine Environment - The world’s coastal waters and oceans are deteriorating due to increasing coastal development, pollution from ships, and habitat destruction. Both developed and developing countries contribute to the problem.
  
  - Improving Water Quality – More than one billion people worldwide lack access to potable water and more than two billion do not have adequate sanitation. Hence, billions of people (mostly children under age 5) suffer from potentially-fatal waterborne diseases.
  
  - Transboundary Water Programs - EPA is participating in a global alliance to resolve water quality and management problems among countries who share rivers, lakes, and aquifers.
Example of EPA International Collaboration: Water

- Health effects of arsenic exposure via drinking water in the Ba Men region of Inner Mongolia, China (Inner Mongolia Center for Endemic Disease Control and Research)

- Conducted epidemiological and toxicological studies to investigate the health effects of chronic arsenic exposure via drinking water from groundwater with natural arsenic contamination.

- Produced relevant public health information with an improved understanding of arsenic exposure and the associated health effects in this population.

- Provided this information to the Chinese public health official for remediation of water systems to reduce arsenic exposure.
Example of EPA International Collaboration: Water

• In 2002, U.S. watershed practitioners (Chesapeake Bay) visited the Netherlands to learn about innovative programs:
  • Advantages of a government-wide integration of environmental policies across environmental, transportation, energy, agricultural, and recreational issues.
  • Broad-scale planning process with intensive public involvement.
  • Consensus approach to dredging that brings environmentalists, shipping companies, and the public together to ensure port viability.
  • Accounting of point source pollution to manage manure by tracking mass balances of nutrients on more than 80,000 farms.
• Together, the U.S. and the Netherlands established a profitable cooperation on land-use planning, low-impact development, and smart growth.
Example of EPA International Collaboration: Water/Microbiology

  • Helping to prepare chemical and microbiological features for safe provisioning of drinking water in developing countries.

• Sponsoring and participating as a steering committee member for WHO’s Microbial Risk Assessment (MRA) Harmonization efforts.
  • Determining universal features essential for MRA protocols and guidelines.
  • Establishing common set of MRA terms and definitions for conducting risk assessments.
Global Earth Observing System of Systems (GEOSS) - Background


- **Vision**: Decisions and actions for human benefit are informed by coordinated, comprehensive, and sustained Earth observations.

- **Plan**: Scientists and policy makers in many countries will design, implement, and operate integrated Earth observing systems (satellites, buoys, weather stations, and other instruments) in a compatible, value-enhanced way.

- **Benefits**: This collection of data and models can advance our environmental understanding to support 9 **societal benefit areas**: weather forecasting, loss from disasters, oceans, mitigate and adapt to climate change, sustainable agriculture, human health and well-being, ecology, water resources, and energy resources.
Global Earth Observing System of Systems (GEOSS) – User Interface Committee

- **Membership**: 29 countries & 25 participating organizations
- **Objectives**: Engage users from the 9 societal benefit areas (weather forecasting, loss from disasters, oceans, mitigate and adapt to climate change, sustainable agriculture, human health and well-being, ecology, water resources, and energy resources) in the development, implementation, and use of a sustainable GEOSS to provide outputs that are required by user groups at national, regional and global scales. Address cross-cutting issues. Promote and facilitate the communities of practice while ensuring added value to existing activities.
- **Approach**: Recommend how GEOSS can improve the delivery of needs from a “user-centric” perspective. Identify existing inventories of major user requirements, status, and gaps to be filled.
Global Earth Observing System of Systems (GEOSS) – AIRNow International

- **Vision**: Provide real-time AQ info worldwide.
- **Mission**: Promote protection of AQ by leading a worldwide community of air quality data sharing
- **Approach**:
  - Produce AIRNow 2.0 with improved software
    - Focus on standardization & interoperability
    - Low overhead and portable
    - Open-source (to the extent practical)
  - Pilot implementation: **Shanghai by Fall 2009**
  - Implement AIRNow with other partners after successful installation in Shanghai
**Inputs from Partners**
- Real-time, hourly concentrations for $O_3$, PM from **Ambient** Monitors
- Forecasts for 300 cities
- Daily National Outlooks

**AIRNow**
- Collects AQ data, forecasts (from 120+ partners)
- Checks data
- Converts data to AQI
- Maps data
- Distributes data

**AIRNow Outputs**
- Real-time Maps, Website
- Email, SMS alerts
- Target info / formats for media, health
World Health Organization (WHO)

- Climate change and human health research needs:
  - The scale and nature health vulnerability to climate change.
  - Effectiveness (including cost-effectiveness) of health protection strategies and interventions.
  - Health impacts of potential adaptation and mitigation measures in other sectors such as marine life, water resources, land use, and transport. In particular where could these have co-benefits for human health.
  - Decision-support and other tools, such as surveillance and monitoring, for assessing vulnerability and health impacts.
  - Assessment of the likely financial costs and other resources necessary for health protection related to climate change.
World Health Organization (WHO)

• Risk assessment publications from the Harmonyization Project at the International Programme on Chemical Safety (IPCS)
  • IPCS Framework for Analyzing the Relevance of a Noncancer Mode of Action for Humans (2008)
  • IPCS Framework for Analyzing the Relevance of a Cancer Mode of Action for Humans (2006)
  • Principles of Characterizing and Applying Human Exposure Models (2005)
**Global Risk Assessment Dialogue**

- International conference in Brussels, Belgium (13-14 November 2008) – topics included:
  - Regulatory risk assessment processes in the EU, US, Canada, Japan, China, and Australia.
  - Integration of natural and socio-economic sciences into the risk analysis process.
  - Communicating risks and uncertainties.
  - Ongoing activities and the current need for international collaboration to ensure identification, assessment and governance of emerging environmental risks.
  - Risk assessment challenges related to lack of hazard and exposure data, uncertainty, weight of evidence, non threshold chemicals, separation of risk assessment and risk management, training of risk assessors, transparency, and alternatives to animal testing.
Opportunities in Environmental Technologies (1 of 2)

• Through its Environmental Technology Council, the EPA is considering advancing technology commercialization projects, such as:
  • Verify experiments for a cost-effective real-time tool to measure volatile organic compounds in the subsurface that could be used in any location.
  • Accelerate adoption and use of an optical remote sensor for fugitive emission quantification. This can reduce emissions by improving leak detection.
Opportunities in Environmental Technologies (2 of 2)

• Evaluate monitoring technologies for CO$_2$ sequestration. This can reduce greenhouse gases (GHG).

• Develop and validate a microarray as a molecular toxicity evaluation tool to measure toxicity of freshwater sediments.

• Promote “green chemistry” by developing innovative technologies that reduce or eliminate the use or generation of hazardous substances in the design, manufacture, and use of products.
Benefits of Collaboration

- Leverage resources and talent:
  - Budgetary constraints (fiscal resources)
  - Different statutory mandates (legal resources)
  - Range of expertise (personnel resources)
  - Specialized laboratories/computers (scientific resources)
Science Priorities – Principal Themes

• Climate change and energy
• Environmental contaminants
• Homeland security
• Modernization of infrastructure
• Decision sciences
Future Opportunities for Collaboration

- Thank you!
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