Environmental Intelligence

Actionable Information for Decision Makers

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Environmental Intelligence (EI)

- What is *environmental intelligence*?
- Why is EI an attractive concept?
- Who produces EI?
- EI collection, exploitation and dissemination architecture
- Looking toward the future

Environmental Intelligence (EI)

What is EI?

- **EI defined:** actionable (i.e., decision-quality) information created by collecting (measuring/observing), compiling, exploiting, analyzing data to characterize the state of the environment at a given location or spatial region and time (past, present, future).
- *Weather* or *environmental intelligence* is a core element of **business risk management** for weather sensitive industries such as energy, agriculture, construction, and retail sales.
- In the government sector *environmental intelligence* has been introduced into the community's vernacular by the current NOAA Administrator, Dr. Kathryn Sullivan

As tradecraft, EI is about getting the right information about the natural environment to the right people at the right time *for purposes ranging from national security to broad societal benefits such as conservation strategies and promoting sustainability*

Environmental Intelligence

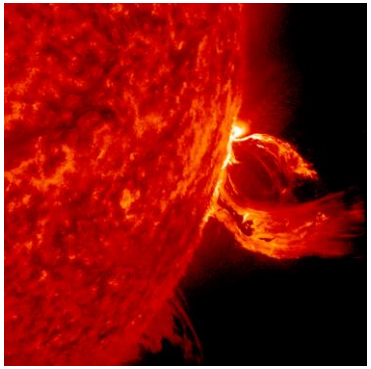
Production Funnel

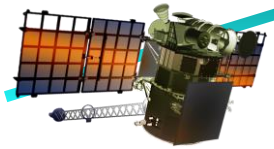
Collection

Processing

Analysis & Production

Environment → **Data** → **Information** → **Environmental Intelligence**





NCEP — National Centers for Environmental Prediction

National Weather Service — NHC — National Hurricane Center

NCEI — National Centers for Environmental Information

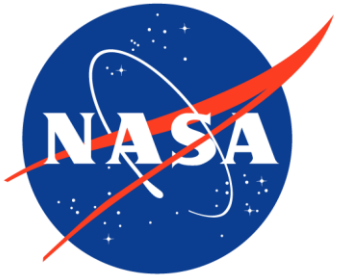
Observations and measurements of the environmental are transformed into actionable intelligence

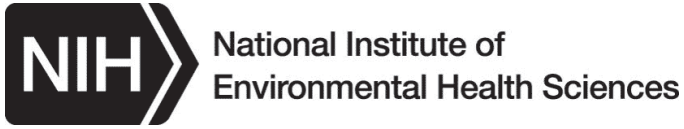
Environmental Intelligence (EI)

Why is EI an attractive concept?

- EI elegantly connects applied meteorological, oceanographic, hydrologic and other environmental sciences to decisions that impact national security, economic security, commerce, public safety and every individual's quality of life
  - *Business risk management*
  - *Critical infrastructure protection*
  - *Disaster response and recovery*
  - *Community planning for resiliency*
  - *Military operations*
- **Developing EI tradecraft** could lead to new paradigms in research, education, training and careers
- Sub-disciplines within EI could emerge to provide end-to-end solutions and actionable information expressed as impacts through a new class of decision tools

Who Produces EI across the Federal Government?





These agencies comprise a US Government ***Environmental Intelligence Community***

EI's *Current* Organic Global Architecture

No architect, no governing body, minimal protocols

- EI data collection and information production systems reside within a organically formed, global architecture with emergent properties and complexity
  - *We are developing an increasing rich understanding of the natural environment with unprecedented situational awareness*
  - *Our modeling capabilities are advancing beyond what was considered possible 20 years ago*
- There would be great benefit for the community to focus more intensely on the full set of data that we may need to answer critical questions.
  - *Where are the gaps? Innovative collaboration opportunities?*
  - *How can we focus on high value and "complete" information?*
  - *Understanding the relationship between the questions we need to answer, and the data needed to answer it is the link between collection capabilities and actionable, decision-quality information*

Architecture-driven national strategies

A key enabler of cross-agency synergy

- Government budgets are tight and will remain so--affordability is key
- Agency information needs overlap
  - *Global cloud imagery is needed by both NOAA and the Air Force*
- Effective, efficient EI is based on an national, architecture-driven investment strategy that crosses agency boundaries to make best use of data already being collected
- EI systems no longer serve limited technical constituencies
  - *How we measure scientific attributes is rapidly evolving*
  - *Maximum value will be derived from **open access to data** to users spanning from individual to operators, research scientists and policy-makers.*

*The concept of collecting, openly sharing and transforming data into actionable information for the benefit of society is a foundational principle of **GEO** and **USGEO***

Production of Decision-Quality Intelligence

New and improved tradecraft (sources and methods)

- **Commercial start-ups** are developing the business case for space-based environmental remote sensing in a variety of domains including GPS-RO, space weather and atmospheric sounding
  - *New opportunities are largely fueled by the exploding **cube-sat** industry and the advances and reduced cost of computational capability and data storage*

- **Key enablers:**
  - ***Metadata** (common and standardized) to characterize and catalog information so that it can be searched in multiple dimensions, discovered and put to proper use*
  - ***Tools** for location, analysis and fusion--to identify, filter, combine, fuse, mine and exploit data within and across environmental domains (e.g., atmosphere and ocean)*
  - ***Infrastructure** to support modeling and data services*

How Will We Know It's Working?

Observables

- Rapid, easy access to the right data
- Robust exploitation of the rich variety of data we are collecting including from non-government sources
- Enhanced information from multiple sources to support scientific and other inquiries
- Robust set of tools to transform data into usable forms
- New problems being addressed using existing data in novel ways

Trends

Looking toward the future

- Increased commercial opportunities
- Improved analytics to deal with massive increases in data volume
- Amplified need for inter-agency and inter-national cooperation
- Expanded opportunities for government agencies to focus on high-value, otherwise unobtainable data
- Shift from stovepiped, product-centric models with defined product sets and limited expensive sources *to* multi-modal, multi-use raw and processed data -- combined to produce problem-centric results

There is an opportunity for the environmental community (government, commercial and academia) to embrace and mature the developing discipline of *environmental intelligence* to vastly enhance the creation and delivery of decision-quality information to users ranging from the individual citizen to corporations and governments.