Attaining Sustainable Development

Earth Observations in Support of SDGs and Disaster Risk Reduction

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(From the Sendai Strategic Framework Preamble*)

- Geospatial information has been widely recognized as an important aspect of DRM...
- Furthermore, DRM is central to sustainable development. As such, the framework contributes to the achievement of the 2030 Agenda for Sustainable Development.

*Strategic Framework on Geospatial Information and Services for Disasters (UN GGIM, 2017)
Examples from an evolving national geospatial agency:
1. Maintaining core datasets while generating new ones as technology enables and society demands
2. Growing emphasis on Public Private Partnerships
3. Advancing from data acquisition and distribution to analytics, integration, and decision support
4. Crowd sourcing and citizen science
“A vision to observe Earth for the benefit of all.”

Interior Secretary
Stewart Udall, 1966

Fifty years ago, on September 21, 1966, Secretary of the Interior Stewart Udall announced his vision to create “a program aimed at gathering facts about the natural resources of the earth from earth-orbiting satellites.” It was an idealistic goal at the time, but came with encouragement and support from U.S. Geological Survey Director Bill Pecora. The announcement created “Project EROS”.

Over the past five decades, the Landsat Program and other international earth observation programs have matured. Udall’s vision gave the world the confidence to create satellite systems to help people understand the intricate nature of our planet with a new perspective.
Landsat series of Earth-observing satellites has created the longest, most comprehensive record of the Earth’s condition ever assembled – the gold standard for tracking elements of land surface change.

With Landsats 7 and 8 currently operational, data collection anywhere on Earth every 8 days.
More than 2 million images in the archive.
Free and available to all users since 2008.

Landsat is a Public/Private Endeavor.
Every Landsat mission has components built by the private sector. USGS ground system and flight ops teams rely heavily on the private sector.
After 47 years of Landsat data collection, USGS is enabling user access to “Analysis Ready Data” and a new generation of time series algorithms for land cover and land change datasets. Derived from L4-L8 Tier 1 data processed to surface reflectance and brightness temperature measurements, (Level-2 products). Makes the archive more accessible, easier to analyze and reduces amount of time users spend on analysis of landscape change.

Landsat Mid-infrared Band

Time series - row: 1161 col: 5419

Reflectance (scale factor 0.0001)

Date


500 1000 1500 2000 2500 3000 3500

Allows pixel tracking in geospatially calibrated tiles and dense temporal stacks, “datacubes”.
Goals: complete acquisition of national lidar coverage with IfSAR in Alaska in 8 years, apply lidar technology to map bare earth and 3D data of natural and constructed features.

3DEP is a public private partnership:
- ROI 5:1, conservative benefits of $690 million/year, potential to generate $13 billion/year
- Leverage the capability and capacity of private industry mapping firms; achieves a 25% cost efficiency gain by collecting data in larger projects
- Vendors provide technology and methodologies that result in accurate and consistent data across unique and varied data collection projects
- 3DEP is working through the private sector mapping firms to investigate new technologies that have the potential to further reduce costs and increase data quality
Global Ecosystem Mapping

Public Private Partnership integrating bioclimate, lithology, land cover, and landform type to map 3,923 ELUs globally. Esri web application; 250 m resolution. Mapping of global MarineEcological Units recently completed.
Advancing from data acquisition and distribution to analytics, integration, and decision support:

EO Example: SDG 2 – Zero Hunger

| 2.c | Adopt measures to ensure the proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility. |
Famine Early Warning Systems Network
An activity of the USAID Office of Food for Peace involving USGS, NOAA, NASA and USDA

• In 1986, after disastrous famines in Africa, USAID called on USGS for assistance with satellite remote sensing of drought impacts
• First monitoring of the African Sahel with vegetation index images began in 1987
• FEWS NET has matured over the past 3 decades and EO is just part of the current program
FEWS NET
Dimensions of Food Security Analysis

Availability
- Weather, climate and crop monitoring and assessment
- Sub-national livelihood zones and profiles

Access
- Food markets and trade monitoring and assessment
- Food security decision support

Households

Utilization
- Health and nutrition
Ethiopia experienced severe drought, associated with El Nino, during the main growing season of 2015. Extensive areas in the north central region saw less than 65% of normal rainfall.
Satellite remote sensing, climate forecasting, and land surface modeling capabilities provided the agro-climatic evidence needed by FEWS NET food security analysts to project livelihood impacts many months in advance.

December 11, 2015, Government of Ethiopia issued a worldwide appeal for over $1.4 billion in emergency needs to reach over 10 million people. Though the 2015 Ethiopian drought was more severe than in 1984, a hunger crisis was averted.
Geospatial data plays an essential role in reducing the risk of disasters associated with hazards such as earthquakes, volcanic eruptions, landslides, wildfires, floods, coastal storms, and tsunamis.

Situational awareness in disaster response

Fire perimeter map used by the National Interagency Fire Center for incident command, daily planning, and dispatch.
Science Applications for Risk Reduction (SAFRR)

Tsunami hazard assessments and evacuation maps for 73 US Pacific Coast communities; integrating land use, population and elevation data in a geospatial format.

Evacuation model of a portion of Washington State’s coast.

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USGS Pedestrian Evacuation Analysis Tool Training

Monday July 27, 2015 10am – 4pm
San Francisco State University
Main Campus, HSS Building, Room 290
1600 Holloway Avenue, San Francisco, CA 94132

Email us to reserve one of the 24 spots available!
Kevin Miller: kevin.miller@caloes.ca.gov
Jeannie Jones: mjones@usgs.gov
Jeff Peters: jipeters@usgs.gov
Mathew Schmidtlein: schmidtlein@usgs.edu

Cal OES
Governor’s Office of Emergency Services

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A subduction zone—where one plate slides under another—like Cascadia can produce an earthquake strong enough to trigger a tsunami.
Crowd Sourcing and Citizen Science: Earthquake Early Warning

TED detects two to three earthquakes a day, on average. Especially in regions with few seismometers, TED reports often come in before traditional seismic networks detect an earthquake, giving seismologists early warning. TED sometimes detects earthquakes entirely missed by USGS’s automatic processing system. In addition, the tweet text and attached images sometimes offer a rapid qualitative assessment of an earthquake’s impact.
US National Map Corps

Using an online web mapping application, volunteers update structures in all 50 states, Puerto Rico, & US Virgin Islands in support of The National Map & US Topo Maps

Participants – 725 active volunteers

Process - Verify, update, add or delete points

Required: Check location and Name

Optional: Address, City, Zip
GEO and the SDGs
Priority Engagement Area

GEO is instrumental in integrating Earth observation data into the methodology of measuring, monitoring and achieving the SDG indicators.

Brochure gives many more illustrations of EO data allowing decision-makers to help identify the status of conditions they need to report, as well as visualize solutions.

GEO Initiative: Earth Observations for the Sustainable Development Goals (EO4SDG)

EO4SDG Initiative goals:

**GOAL I: Demonstrate** how EO and geospatial information, with socio-economic and other data contribute in novel and practical ways to support achievement of the SDGs.

**GOAL II: Increase** skills and capabilities in use of EO for SDG activities and their broader benefits.

**GOAL III: Broaden interest and awareness** of EO support to the SDGs and contribution to social, environmental, and economic benefits.
Thank you!

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