Earth Observation and the GEF – A Primer

A STAP Advisory Document
December 2020

STAP
SCIENTIFIC AND TECHNICAL ADVISORY PANEL
An independent group of scientists that advises the Global Environment Facility

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UN environment programme

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ABOUT GEF:
The Global Environment Facility (GEF) was established on the eve of the 1992 Rio Earth Summit to help tackle our planet's most pressing environmental problems. Since then, the GEF has provided close to $20.5 billion in grants and mobilized an additional $112 billion in co-financing for more than 4,800 projects in 170 countries. Through its Small Grants Programme, the GEF has provided support to nearly 24,000 civil society and community initiatives in 133 countries. http://www.thegef.org

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Landsat 8 image of Mossoró, Rio Grande do Norte, Brazil, 25 June 2019. Source: NASA

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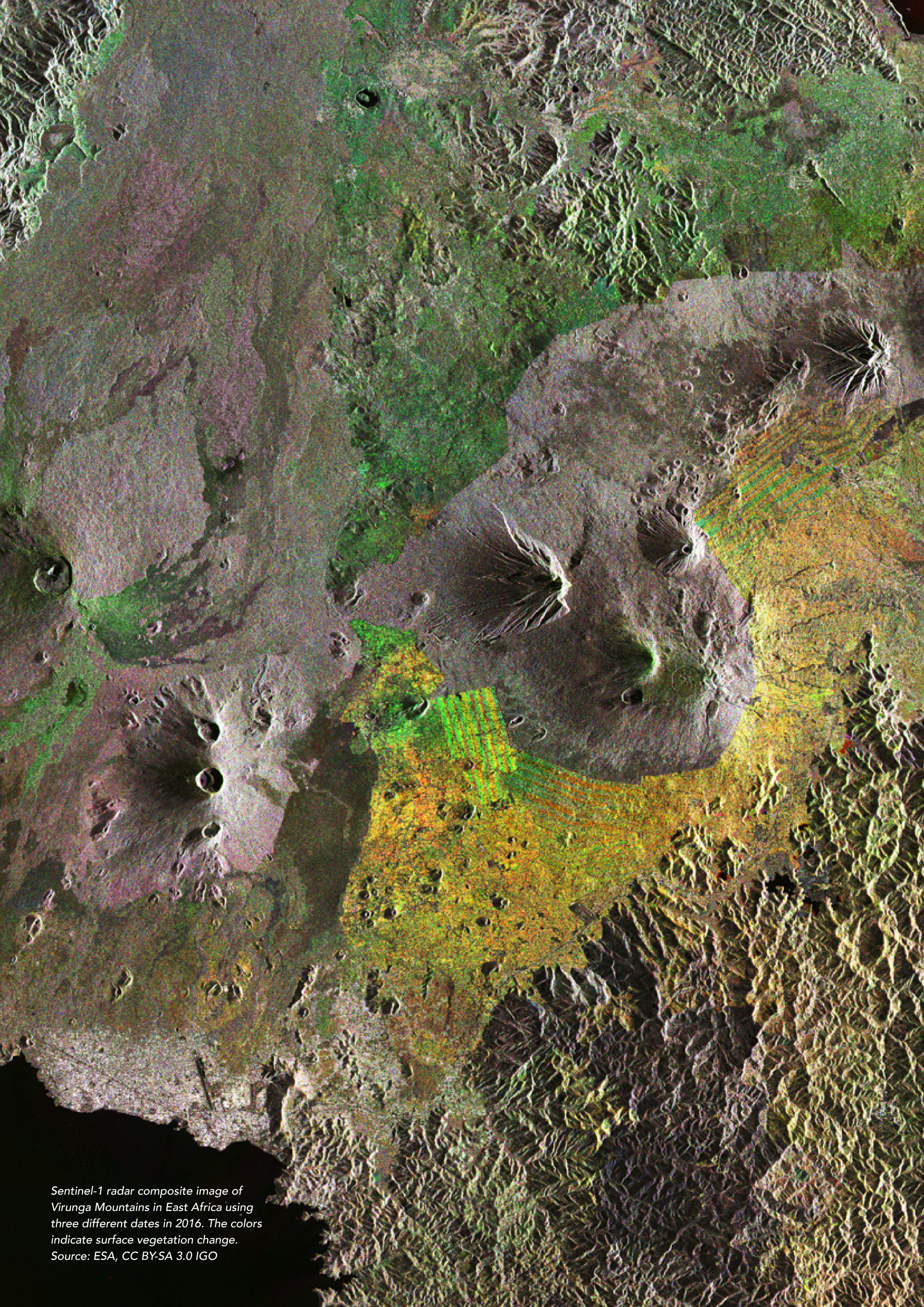
CONTENTS



Sentinel-1 radar composite image of Virunga Mountains in East Africa using three different dates in 2016. The colors indicate surface vegetation change. Source: ESA, CC BY-SA 3.0 IGO

SUMMARY

In the 28 years since the Global Environment Facility (GEF) was created, a digital revolution has taken place. Data from satellite remote sensing and other Earth observation technologies have become much more regular, widespread and accessible, and less costly. Together with scientific and technological advances such as cloud computing, machine learning and data sharing, these data offer more opportunity to observe, monitor and predict environmental and social phenomena with greater efficiency and precision.

Sometimes known as "Big Earth Data", information is being used to highlight and analyze the extensive and complex ways in which human beings are altering the planet's terrestrial and marine ecosystems, and the atmosphere. Big data analysis produces robust, science-based information that enables a better understanding of what is happening and is indispensable in developing mitigation and coping strategies – "you can't manage what you can't measure[1]." Earth observation data greatly enhance the ability to mine, organize, analyze, simulate and represent information about the Earth system to allow informed decisions to be made about how to prepare for and adapt to environmental change and how to sustainably manage and conserve natural resources.

Many GEF projects and programs use Earth observation data to design, implement, monitor and evaluate interventions. However, the uptake and use of Earth observation technology by GEF agencies is uneven. Since 2017, the Project Information Form has required project proponents to provide a map and geo-coordinates of the project's location, but there remains limited guidance on how this information should be provided and how best to incorporate Earth observation data across the project cycle. This primer addresses that gap, with an accompanying technical guide providing a more detailed explanation of Earth observation principles, data sources and platforms; GEF and non-GEF case studies to illustrate how these data and tools can be used; and guidance on how to meet the Project Information Form requirements.

To advance Earth observation use within GEF programming, the Scientific and Technical Advisory Panel recommends that the GEF should:

- Provide accurate and precise project location information, beginning with the project information form, which supports the Independent Evaluation Office methodological approach for consistent post-completion verification.
- Update the GEF portal to include simple tools to capture and validate geographic data on the location of projects.
- Continue to develop the internal capacity of GEF agencies to use Earth observation data and technologies throughout the project cycle; ensure that technology solutions are embedded within the partner countries; and build local capacity within teams that develop and use the solutions operationally.
- Coordinate with agencies to develop a self-learning package to accompany the technical guide, which could include reference to existing courses and tutorials relevant to GEF programming. This could be done in collaboration with other organizations with similar objectives.
- Enable agencies to share experiences for improving the use of Earth observation technology and geospatial data across the project cycle through workshops and other relevant events.

1 This famous quote is attributed to both quality and process control guru W. Edwards Deming and management consultant and thought leader Peter Drucker.

- Participate in global conversations on best practice applications of Earth observation to support large-scale environmental projects, and engage with the emerging digital ecosystem for the planet, Group on Earth Observations, European Space Agency and NASA initiatives, Radiant Earth Foundation, and Eye on Earth Summit.

1. INTRODUCTION

Tackling complex, interrelated global environmental challenges requires wide-ranging social, economic and environmental data and information, including on *what* pressures are occurring, *where* they are occurring and *how* they are changing over time. Earth observation technology provides up-to-date knowledge about the Earth's physical and biological systems for multidisciplinary applications. The technology enables data collection through imaging and non-imaging sensors on board satellites, airplanes or drones, as well as deployed *in situ*. Earth observation data can enhance the visualization, analysis and communication of environmental issues; aid decision-making; monitor change over time; and assist in evaluating results. For example, Earth observation data are routinely used to assess changes in land cover and land use, forest extent, land degradation, and urbanization, as well as the factors that may be driving these changes, such as wildfire, road expansion and natural disasters. The same is true for seascapes, where information gathered by satellites can provide information about ocean bathymetry[2], sea level rise, coral reefs and coastal erosion.

Earth observation technologies have existed for decades but are now much more accessible owing to lower costs, investment in new systems, and policy changes (e.g. open data), as well as improvements in computing power and the Internet, and innovation in data integration and analytical methods. These advances are very useful for GEF projects, and improved knowledge and understanding of Earth observation technology can help agencies enhance the design, implementation, monitoring and evaluation of projects.

This is particularly relevant for the GEF Impact Programs and Integrated Approach Pilots, which take a "landscape approach". Combined with other spatially explicit information, Earth observation data can support greater integration and highlight potential synergies and trade-offs. For example, these data can help bring together stakeholders to share and evaluate information for decision-making using a common geographic information system. Systematic use and visualization of project data can also help in communicating results, achieving greater transparency and evaluating the long-term impact of projects.

2 Bathymetry refers to the depths and shapes of underwater terrain. Bathymetric data are used to define the habitat for benthic (bottom-dwelling) organisms and to determine where fish and other sea-life will feed, live and breed.

2. KEY BENEFITS OF EARTH OBSERVATION TECHNOLOGY AND DATA

GEF projects require a range of data and information across broad landscapes and time periods that cannot be collected using field-based methods alone. The use of Earth observation technologies can enable, for example, the identification and detailing of biophysical characteristics of habitats and the detection of natural and human-caused environmental change from local to global scales. This type of information can be used to understand past trends, support management decisions and monitor the impact of GEF projects.

Satellite remote sensing is probably the most important type of Earth observation. The key benefits are summarized in Figure 1. While these benefits are generally well known, the greatest value of remote sensing information is typically derived when it is integrated with complementary data obtained using other methods, including qualitative research.

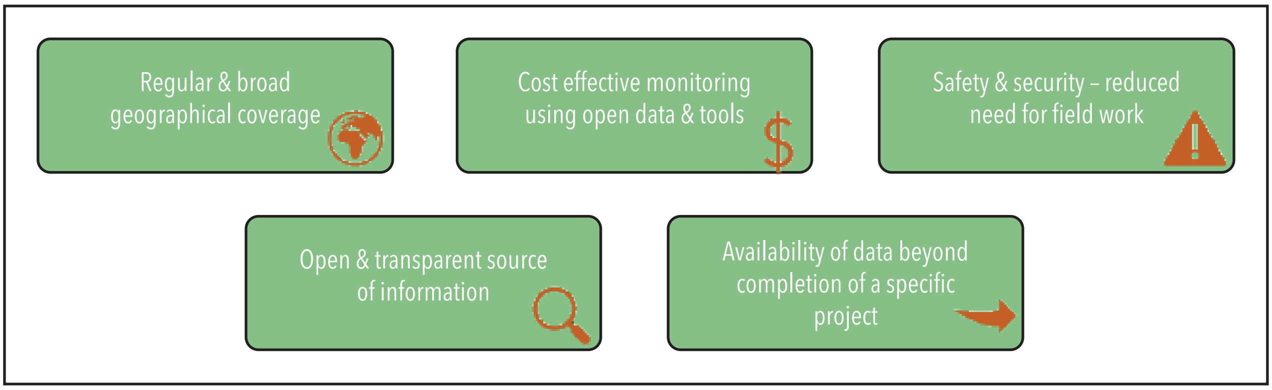


Figure 1. Benefits of satellite remote sensing

3. EARTH OBSERVATION AND THE GEF PROJECT CYCLE

Earth observation technology is useful at several points in the GEF project cycle, but the appropriate data sources and methods differ depending on the stage of the cycle (Figure 2). Information derived from Earth observation data and technology can complement that obtained using qualitative methods. Integrated, mixed method approaches (i.e. data triangulation) can be used to better understand not only the past and current state of a landscape but also the underlying drivers of change and how interventions can change the current trajectory.

Concept Development	Program/Project Preparation	Implementation and Monitoring	Evaluation
Map project location and interventions	Improve project location specificity following discussion with stakeholders	Monitor progress against indicators	Review results against indicators
Assess baseline and trends	Finalize core indicators	Visualize status and trends for adaptive management	Finalize project locations and interventions
Quantify core indicators	**CEO Endorsement / ProDoc**	Refine project location and interventions	Analyze project impact (including long-term, intended & unintended consequences)
Review environmental and social safeguards		**Midterm Review (MTR) or Midterm Evaluation (MTE)**	**Terminal Evaluation (TR)**
Project Information Form (PIF)			

Figure 2. Earth observation, geospatial technologies and the GEF project cycle

CONCEPT DEVELOPMENT

Developing a GEF project concept requires compiling and analyzing a range of data to ensure an up-to-date understanding of the environmental conditions in the project's location. At this stage, published information and tools can be easily accessed to explore key issues, trends, and degradation processes and drivers to inform the proposed intervention. The GEF project information form (PIF) requires georeferenced data and a map showing the project's location. Earth observation technology is particularly useful for concept development, and there are four typical approaches to using Earth observation data:

- **Do it yourself** – the Copernicus and NASA–U.S. Geological Survey programmes have unlocked a large amount of free, high-quality and high-resolution Earth observation data. These data can be used through in-house expertise, hardware, or software or cloud platforms such as Google Earth Engine, SentinelHub or NASA Worldview.

- **Use free, existing higher-level products** – requiring less expertise to use, thematic products provide quantitative data to develop a baseline, assess trends and address GEF indicators. Examples include Copernicus Land Cover, Global Surface Water Explorer, or above ground biomass from the Food and Agriculture Organization's WaPOR portal.

- **Use dedicated portals with more advanced visualization tools** – including Global Forest Watch or Trends.Earth, or the Vital Signs Atlas used by the GEF Food Security Integrated Approach Pilot.

- **Work with specialized partners or consultants** – use external services for processing, image interpretation and product development.

At the concept stage, Earth observation can contribute to the assessment of environmental and social risks and potential impacts associated with the proposed project or program, as well as the identification of measures to address such risks and impacts.

PROJECT PREPARATION

Once the project concept is approved, additional information is likely to be needed for CEO endorsement. For example, supplementary data analysis and quantitative information may be required to further delineate the project's boundaries and to refine estimates of expected global environmental benefits. At **CEO endorsement/approval**, agencies provide additional information regarding the relevant environmental and social risks and impacts associated with the proposed project. The same data portals and tools used in concept development may provide the required information.

For example, the Integrated Landscape Management to Secure Nepal's Protected Areas and Critical Corridors project from the World Wildlife Fund used forest cover data derived from remote sensing images and spatial analysis to determine baseline information and to identify target areas for project interventions.

The project document can specify the Earth observation data and analysis that should be completed to support project implementation, for example what type of detailed mapping may be required or how Earth observation will be used to generate data for indicator reporting.

IMPLEMENTATION AND MONITORING

Earth observation data and analysis can be used to support project implementation and monitor progress, including on performance indicators, building on data sources and information gathered for concept development and project preparation. The synoptic, consistent and regular information that can be obtained from Earth observation can be used to review up-to-date environmental conditions and trends to support adaptive management. Earth observation data can inform proposals to modify the project design during, for example, the **midterm review**, at which time the implementing and executing agencies assess whether the project is on track to meet the indicators set out in the project document and propose appropriate modifications, if necessary.

EVALUATION

Earth observation is useful for evaluation of the project intervention and final reporting against project indicators for the **terminal evaluation**. When combined with other spatial information, Earth observation data can reveal new insights, and geospatial analysis can help overcome some of the limitations that are encountered in evaluations on a regular basis, such as missing baseline information and missing information on the evolution of environmental conditions as a project progresses.

The GEF Independent Evaluation Office (IEO) is increasingly using Earth observation data and analysis to verify project outcomes in areas such as forest management and protected area management [3] and to assess impact and estimate value for money [4].

APPLICATION EXAMPLES

Several GEF and non-GEF projects provide good examples of using Earth observation technology to support decision-making and to detect and monitor environmental conditions and change over time. Figure 3 summarizes several case studies that are included in the *Earth Observation and the Global Environment Facility* technical guide [1].

Case studies	GEF Implementing Agency / Lead Organization	Region	Project Phase: Concept	Project Phase: Preparation	Project Phase: Implementation	Project Phase: Evaluation	Focal Area: Biodiversity	Focal Area: Int. Waters	Focal Area: Climate Change	Focal Area: Land Degradation	IPs: SFM	IPs: FOLUR	IPs: Sustainable Cities	Technologies: Spaceborne EO	Technologies: Airborne/drone	Technologies: Cloud Platform	Technologies: Citizen science
Land assessment through mobile and online tools (Open Foris)	FAO	Global			■	■				■	■	■	■	■		■	■
SkyLight Platform to combat illegal fishing	Vulcan	Africa			■			■							■	■	
Mapping land cover for protected area planning in Nepal	WWF	Asia		■	■		■				■			■			
Trends.Earth to map and visualize land degradation trends	CI	Global	■	■	■	■				■		■		■			
Jaguar habitat connectivity characterization	UNDP	LAC		■	■						■			■			
Monitoring of indicators for Food Security	IFAD	Africa		■	■				■	■		■		■			
UN Biodiversity Lab to build capacity of policymakers to use spatial data for conservation action	UNEP, UNDP, CBD	Global		■	■	■	■	■	■	■	■	■	■	■		■	
NASA's Fire Information for Resource Management System (FIRMS) for mapping fire	NASA	Global	■	■	■	■				■	■	■		■		■	
Global Ecosystem Dynamics Investigation (GEDI) mission for forest canopy and structure mapping	NASA	Global	■	■						■	■	■		■			
Global Biodiversity Information Facility (GBIF) and citizen science	GBIF	Global			■		■				■	■	■				■
Global Forest Watch for global forest cover monitoring	WRI	Global	■	■	■	■	■				■			■		■	
Seychelles Marine Spatial Planning	TNC, UNDP	Africa			■		■	■						■			
Satellite-based Sargassum monitoring	CLS, ESA	LAC	■					■						■			
Water resources and wetland monitoring inititatives using Earth observation	NASA, USAID, ESA	Global		■	■			■				■		■		■	■
Global Platform for Sustainable Cities use of Earth observation for Urban mapping	WBG, ADB, IDB, UNEP, UNDP	Global		■	■	■	■			■			■	■			
Forest Monitoring in the Amazon Biome	INPE	LAC		■	■						■			■		■	
Open Data Cube for environmental change analysis	CSIRO	Global	■	■	■	■	■	■	■	■	■	■		■		■	
Forest Monitoring and the Central Africa Regional Program for the Environment (CARPE)	NASA, UMD	Africa		■	■						■			■			

Figure 3. Selected GEF and non-GEF project case studies using Earth observation data

Note: ADB = Asian Development Bank; CBD = Convention on Biological Diversity; CI = Conservation International; CSIRO = Commonwealth Scientific and Industrial Research Organisation; EO = earth observation; ESA = European Space Agency; FAO = Food and Agriculture Organization of the United Nations; FOLUR = Food Systems, Land Use and Restoration; GBIF = Global Biodiversity Information Facility; GEF = Global Environment Facility; IDB = Inter-American Development Bank; IFAD = International Fund for Agricultural Development; INPE = Brazilian National Institute of Space Research; Int. = International; IP = Impact Program; LAC = Latin America and the Caribbean; SFM = Sustainable Forest Management; TNC = The Nature Conservancy; UMD = University of Maryland; UNDP = United Nations Development Programme; UNEP = United Nations Environment Programme; USAID = U.S. Agency for International Development; WBG = World Bank Group; WRI = World Resources Institute; WWF = World Wildlife Fund.

These case studies used Earth observation and other spatial information to assist in the design, implementation and evaluation of a project. Box 1 summarizes how geographic information systems and remote sensing data were used as inputs to quantify ecosystem services and support prioritization and decision-making for jaguar conservation.

BOX 1. ECOSYSTEM SERVICES PROVIDED BY THE HABITAT OF THE JAGUAR (*PANTHERA ONCA*)

To assess the extent and value of ecosystem services within the jaguar range across Latin America, the United Nations Development Programme, King's College London and Equilibrium Research used the Co$sting Nature tool and mapped other conservation-related factors including biodiversity, current human pressure on the land, and future threats. Biophysical ecosystem service production and value was calculated at the local, national and global scales. Many geospatial data sets contributed to the assessment, including vegetation information derived from MODIS* and SPOT** satellite sensors and Landscan population data. The results identified the most important ecosystem services, which included carbon storage, natural hazard mitigation, non-timber forest products, water provisioning, culture-based tourism and nature-based tourism. The information is used to raise awareness of the importance of jaguar landscapes in achieving the Sustainable Development Goals. It is also used to generate political will for greater investment and action in conserving jaguar landscapes and corridors in the context of government programmes, including GEF-financed projects.

* Moderate Resolution Imaging Spectroradiometer (MODIS) is a sensor on the Aqua and Terra satellites that provides daily global optical and thermal data and spatial resolution from 250 m to 1,000 m.
** Satellites Pour l'Observation de la Terre (SPOT) is a series of commercial medium-resolution satellite sensors. Currently, SPOT 6 and 7 provide optical data with a spatial resolution of 6 m. Key characteristics and applications of Earth observation data and technologies

4. KEY CHARACTERISTICS AND APPLICATIONS OF EARTH OBSERVATION DATA AND TECHNOLOGIES

GEF agencies have a lot of experience with Earth observation technology, but it can be challenging for project developers to determine what information is best suited to a given project because of the many data sets and platforms available. Understanding how these data may be applicable requires that users assess their information requirements and then consider the key characteristics of available sensors and systems to determine which is the most appropriate to address their specific needs (Figure 4).

Define project information requirements

- What is the challenge to be addressed?
- What biophysical information is required?
- What is the size of the area?
- What is most important: spatial detail, large area, high frequency of observation, or long time frame?
- How will Earth observation data be integrated with other data?

→

Assess how Earth observation can address the requirements

- Determine if Earth observation information products or services exist.
- Consult with Earth observation experts from research institutions, specialist agencies or companies.
- Evaluate trade-offs, such as costs of data processing and storage, and skills and expertise.
- Recognize the benefits and limitations of Earth observation technology for particular phases of the GEF project cycle.

Figure 4. Process to determine how to use Earth observation data to meet project requirements

A summary of the key characteristics of remote sensing systems – optical, radar and lidar – can be found in Figure 5, along with the key applications relevant to the GEF.

		Forest/Vegetation/ Soils	Freshwater	Coastal/Oceans
Optical				
	Key properties	• Sensitive to vegetation health • Reflectance from vegetation and soil surface • Limited sensitivity to vegetation structure	• Sensitive to chlorophyll and suspended matter • Penetration of water column up to 20-30 m* under optimal conditions	• Sensitive to chlorophyll and suspended matter • Penetration of water column up to 20-30 m* under optimal conditions
	Key applications	• Land cover and land use types and change • Forest types • Crop types	• Surface water extent and variability • Wetland classification Surface water quality (eutrophication)	• Bathymetry (clear waters) Water quality (chlorophyll and suspended soils) • Coastline change (erosion, deposition) • Coastal habitat (e.g. mangroves, marshes, coral reefs)
Radar				
	Key properties	• Some penetration of vegetation canopy and soils • Sensitive to vegetation structure	• No penetration of water • Sensitive to water surface roughness	• No penetration of water • Sensitive to water surface roughness
	Key applications	• Forest cover change (clear cuts) • Forest biomass*	• Surface water extent and variability • Wetland classification	• Coastal habitat (e.g. mangroves)
Lidar				
	Key properties	• Penetration of vegetation canopy • Limited penetration of soils • Sensitive to vegetation structure	• Penetration of water up to 20-80 m* under optimal conditions	• Penetration of water up to 20-80 m* under optimal conditions
	Key applications	• Forest biomass • Forest structure • Topography • Flood risk	• Bathymetry • Bank/shoreline change	• Bathymetry • Coastline change (erosion, deposition)

Figure 5. Key characteristics and applications of satellite Earth observation systems

* depending on wavelength and environmental factors
Source: Hatfield Consultants.

Figure 6 shows how the type of information collected at the same place can vary depending on the sensors used (e.g. lidar versus true color digital camera on board an airplane). Lidar systems generate a dense data set of highly accurate georeferenced elevation points – often called a "point cloud" – that can be used to create three-dimensional representations of the Earth's surface with features such as vegetation canopy height. Additional technical information about optical, radar and lidar systems is provided in the technical guide.

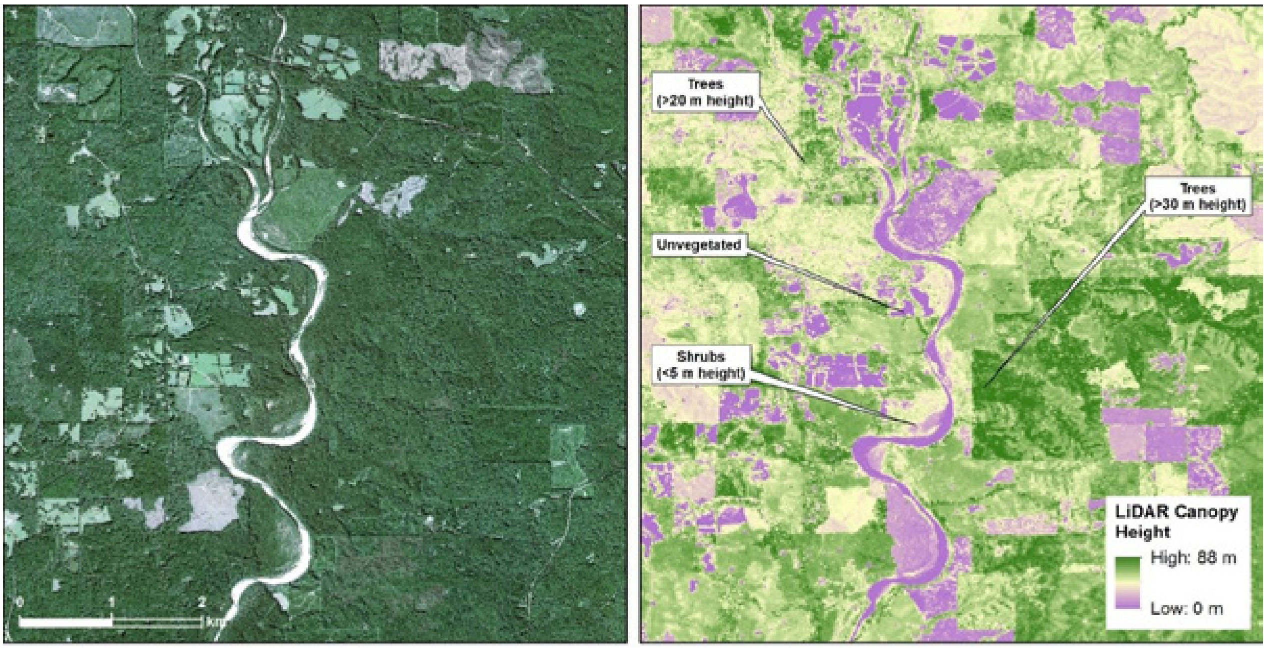


Figure 6. Lidar canopy height model (right) compared with aerial photo (left)

Source: Hatfield Consultants, using true color aerial photos (2016) and lidar data (2016) from Mississippi Automated Resource Information System.

Earth observation can address many information needs, and it is optimal when complemented with other methods, including qualitative research. One of the challenges in relating geospatial technologies to qualitative data is the difference in temporal and spatial scales of information [5,6]. For example, remote sensing images can cover broad areas on a regular basis, whereas socioeconomic information may be for specific locations and times (e.g. household surveys) or generalized regions and time periods (e.g. censuses). It may take time for indicators of socioeconomic development to appear in the landscape and for remote sensing technologies to be able to capture evidence of that development (e.g. agroforestry and revegetation strategies).

The cost of Earth observation data has declined dramatically with much data available free under an open data license, but users must also consider the costs of downloading, storing and processing big data, including human resources.

5. TRENDS IN EARTH OBSERVATION DATA AND TECHNOLOGY

It can be challenging to keep track of trends in Earth observation technology, especially during a period of rapid development in information and communications technology, including computing capacity, location-enabled and Internet-connected mobile devices, and the numerous services associated with them.

Figure 7 highlights the key trends in remote sensing, including the move towards open data and open software, and the increasing availability of data to more users, rather than being restricted to highly trained users. New approaches to using Earth observation data have evolved, with access to cloud data storage and processing environments. These can include commercial data provided on a subscription basis.

Two well-known Earth observation cloud computing platforms are Google Earth Engine and Sepal, which at present are available at no cost to users. For more advanced users, cloud computing systems from Amazon Web Services, Microsoft Azure, and the European Commission-supported Data and Information Access Services also provide access to a large amount of Earth observation data.

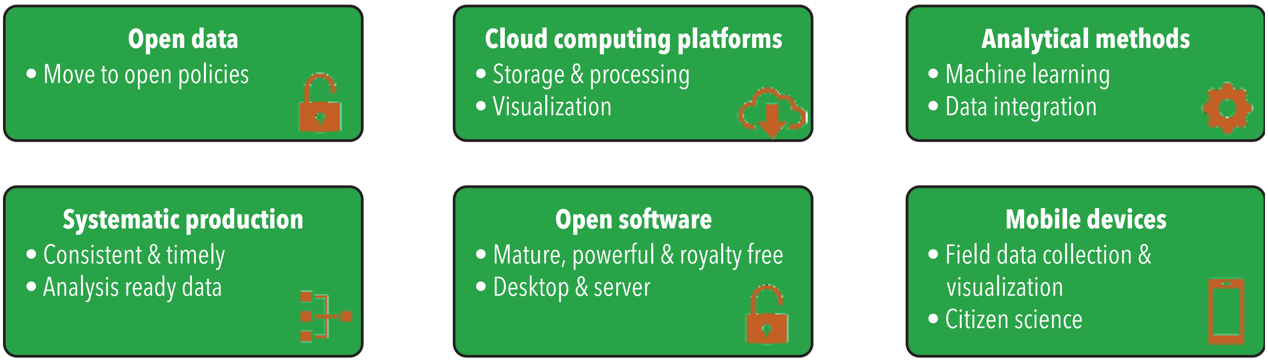


Figure 7. Trends in Earth observation technology

6. IMPROVING THE GEF'S KNOWLEDGE OF THE LOCATION AND IMPACT OF INTERVENTIONS

Systematic information on the location and impact of GEF interventions can improve decision-making, accountability and transparency. However, like all types of data, geographic data need to be managed to protect privacy and meet security requirements.

The benefits of collecting and sharing geographic information on GEF projects include:

- Better understanding of the geographic context and spatial extent of GEF projects. Currently, the GEF portal shows only the name of the country in which the project is located.

- Accessible information on past and current GEF project locations, which can help users identify synergies, avoid potential duplication of effort, and coordinate to maximize the impact of GEF investment.

- Better monitoring of projects during the implementation phase, which could help projects adapt to changing conditions.

- Robust and precise evaluation of project impacts.

The GEF's current guidance on providing georeferenced information and a map in PIFs recommends using geonames.org to provide geolocation ID numbers to standardize the format in which data are provided. Alternatively, the latitude and longitude of one point in the project area is requested. While providing project location information is mandatory, uneven implementation of the guidance can result in poor-quality maps with project locations not identified, no regional context, basic map elements not included (e.g. scale bar, north arrow, legend), and inaccurate or missing GeoNames geolocation ID or coordinates.

All GEF agencies systematically collect information on projects that can be georeferenced. Some agencies go further and collect GeoNames or the coordinates of a bounding box (a pair of longitude and latitude coordinates that define a box that covers the project area). Since agencies are collecting and using project geolocation information, it would be reasonable to expect that GEF-7 PIFs include accurate geolocation information.

To ensure that implementing agencies provide consistent and high-quality project geolocation and an acceptable project map, Annex 1 provides detailed guidance that also addresses recommendations by the IEO [7].

7. CONCLUSIONS AND RECOMMENDATIONS

Enhanced satellite Earth observation capabilities, recent policies on open and free access to data and tools, and advances in algorithms and data processing are facilitating widespread use of Earth observation data at scale, and beyond the specialized scientific community. These developments offer large landscape coverage, opportunities to improve the robustness of environmental data and indicators [8], and the ability to determine scientific baselines more accurately and to monitor change over time, including after project completion.

Several GEF agencies already use geospatial information and Earth observation technology in their projects and have a designated lead person for geospatial technology to advance its use. The PIF requirement on mapping and geocoding is also encouraging agencies to provide spatial data for their projects. The IEO has recommended that the GEF make greater use of spatially explicit data for projects addressing protected areas [3], biodiversity [9] and land degradation [10]; more precision in recording and reporting project location will help in the monitoring and evaluation of progress and results [11].

The Scientific and Technical Advisory Panel supports these actions and suggestions and further recommends:

PROVIDING PROJECT LOCATION INFORMATION AND MAPPING:

1. Provide accurate and precise project location information beginning with the PIF, which enables evaluation of the project and supports the IEO's methodological approach for consistent post-completion verification [12].

2. Provide a high-quality project location map in the PIF. Where appropriate, integrate Earth observation base images and/or Earth observation-derived products into the project location map and use archive data to illustrate baseline conditions and trends and to clearly define the project intervention.

3. Define several project indicators that can be assessed remotely using Earth observation, which will enable more frequent and efficient monitoring.

4. Update the GEF portal to provide fields and simple tools to capture and validate geographic data on the location of projects, such as an interactive map to draw the bounding box for a project area. In the future, functions could be developed to upload geographic data in commonly used formats to precisely define the project intervention area. This would help agencies update information over the GEF project cycle to support project evaluation and the communication of project impacts.

BUILDING CAPACITY IN EARTH OBSERVATION:

5. Continue to develop agencies' internal capacity to use Earth observation data and technologies throughout the project cycle, and to share Earth observation science and tools to provide opportunities for others to benefit from successes.

6. Ensure that technology solutions are also embedded within the partner countries, and build local capacity within teams who develop and use the solutions operationally.

7. Consult with experts in Earth observation outside individual organizations when designing projects and programmes that will use Earth observation technology.

GENERATING AND SHARING EARTH OBSERVATION KNOWLEDGE:

8. Coordinate with agencies to develop a self-learning package to accompany this document, which could include reference to existing courses and tutorials that are relevant to the GEF programming. This could be done in collaboration with other organizations with similar objectives.

9. Enable agencies to share experiences for improving the use of Earth observation technology and geospatial data across the project cycle through workshops and other relevant events.

10. Participate in the global conversations on best practice applications of Earth observation to support large-scale environmental projects, and engage with the emerging digital ecosystem for the planet, Group on Earth Observations, European Space Agency and NASA initiatives, Radiant Earth Foundation, and Eye on Earth Summit.

ANNEX 1. GUIDANCE ON PROJECT LOCATION INFORMATION AND PROJECT MAP

PROJECT LOCATION INFORMATION

Global projects:

a. *Specify the project is global, no GeoNames required*

Multi-country projects:

a. Whole countries are the project area:

—*Specify country names and GeoNames IDs*

b. Sub-areas of countries are the project area:

—*Specify country names and GeoNames IDs*
—*Specify province/state names and GeoNames IDs*

EXAMPLE:

A multi-country project in Viet Nam and the Lao People's Democratic Republic focused on the River Ma transboundary basin and coastal areas. The country and province GeoNames IDs are provided.

- Countries: Viet Nam (1562822) and Lao People's Democratic Republic (1655842)
- Provinces: Thanh Hóa Province (1566166), for example; all provinces with activities are listed

Single country projects:

a. Whole country is the project area:

—*Specify country name and GeoNames ID*

b. Sub-area(s) within the country are the project area:

—*Specify country name and GeoNames ID*
—*Specify province/state names and GeoNames IDs*

EXAMPLE:

A single country project in Brazil addressing sustainable forest management in the states of Amazonas and Rondonia. The country and state GeoNames IDs are provided.

- Country: Brazil (3469034)
- States: Amazonas (3665361) and Rondonia (3924825)

For any project in a **sub-area** of a country or multiple countries (e.g. a protected area), provide the bounding box in decimal degrees.

EXAMPLE:

A project in Brazil addressing sustainable forest management in the states of Amazonas and Rondonia. The latitude and longitude of the bounding box are provided in decimal degrees.

Upper left: –74.03502, 2.340589

Bottom right: –56.047211, –13.72352

PROJECT MAP

A project map should be provided in the project information form with the following elements:

- Title
- Description of intervention, to correlate the expected impact and activities that will be completed
- Scale bar (using the International System of Units), coordinate system and datum
- North arrow
- Graticule (a latitude-longitude grid overlay)
- Inset map showing context of project location in the country or region
- Legend, including identification of project sites as needed

All elements must be readable, and maps are recommended to have a minimum of 150 dots per inch and at least 10-point font for text.

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