



Global Partnership for Sustainable Development Data

Applying Earth Observation Data to Monitor SDGs in Colombia

The purpose of this case study is to better understand the Global Partnership for Sustainable Development Data's contribution to and the impact to-date of the application of Earth observation data to monitor the Sustainable Development Goals (SDGs) in Colombia.

The content for this case study includes direct inputs from the National Administrative Department of Statistics' (DANE) Technical Cooperation & International Relations Team from the Director General's Office, the SDGs Group, and the Geo-statistics Department; the National Aeronautics and Space Administration (NASA); as well as secondary information gathered through a number of reports and documents noted in the annex.

Key GPSDD Contributions

- Facilitation of the multi-stakeholder workshops
- Technical assistance on Earth observation data and methods
- Fostering cross-agency dialogue and collaboration
- Connecting to and brokering support from relevant partners in the GPSDD network

Key Impacts

- Connections with relevant partners and resources
- Increased technical capacity in using Earth observation data
- Improved and increased multi-stakeholder coordination
- Ability to scale Earth observation data methods both nationally and internationally

Introduction: DANE and the SDGs in Colombia

The National Administrative Department of Statistics (DANE) – the national authority in statistics for Colombia – is responsible for most of the data production in the country and is the National Statistical System coordinator. As such, DANE coordinates everything related to standards adoption, norms and best practices for the production and dissemination of official statistics, quality assessment, and the use of administrative records for statistical purposes. One of DANE's primary functions is to ensure the production of high(er) quality information and to ensure that the progress made in this area is replicated or extended to other national entities that also have certain responsibilities in the production of data.

DANE is leading the monitoring of the Sustainable Development Goals (SDGs), which are aligned with Colombia's National Development Plan (2014-2018). DANE is addressing the 2030 Agenda for Sustainable Development at multiple levels:



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- Global: As part of the Inter-agency and Expert Group on SDG Indicators (IAEG-SDGs), Colombia represents five countries of the Andean sub-region: Ecuador, Peru, Bolivia, Guyana, and Suriname. In addition, Colombia was a reporting country as part of the UN High-Level Political Forum in 2016.
- Regional: DANE participates in the Statistical Coordination Group for the 2030 Agenda in Latin America and the Caribbean and the Statistical Conference of the Americas via the UN Economic Commission for Latin America and the Caribbean (UN ECLAC).
- National: A High-level Institutional Commission for the implementation of Agenda 2030 (created in February 2015 by [Presidential Decree 280](#)). As part of this effort, DANE created an SDG Indicators and 2030 Agenda Task Force, to consolidate its work on the SDGs.¹



Figure 1 Institutional Organization for the SDGs in Colombia

Colombia produces 469 official statistics across 109 national entities as part of its National Statistics System (NSS). Of these, 92 official statistics are produced by DANE, which is transforming itself to respond to the data revolution for sustainable development. Through this effort, DANE is working to identify alternative sources of information and improve plans for how new sources of data can be integrated as part of its broader modernization strategy, which intends to effectively monitor the SDG indicators and address key data gaps. A diagnosis was conducted in this regard at the national level, that resulted in 54% data availability, 30% in need of improvement, and 16% where there is no data or methodology.²

¹ Roadmaps Assessment Report:

http://www.data4sdgs.org/sites/default/files/services_files/RoadmapsAssessmentReport_Dec2017_FINAL.pdf

² Ibid.



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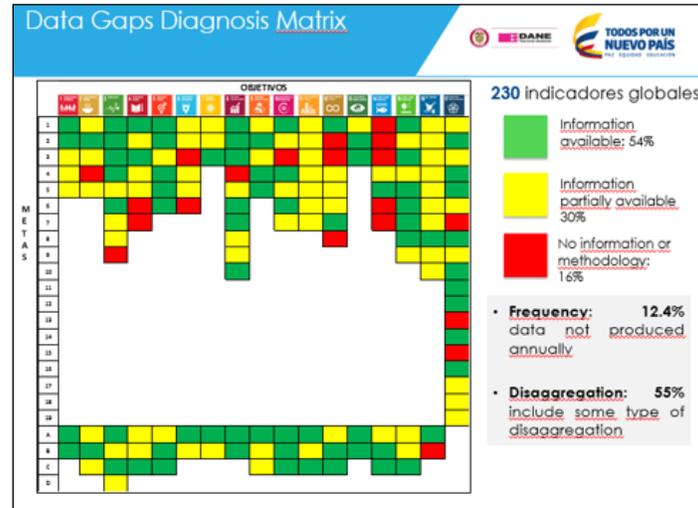


Figure 2 SDG Data Gaps Diagnosis for Colombia

GPSDD's Contribution

The Colombia Multi-Stakeholder Workshop on Data for the SDGs Roadmap

In April 2016, the Global Partnership for Sustainable Development Data engaged with Colombia to organize the Colombia Multi-Stakeholder Workshop on Data for the SDGs Roadmap. This was the first in a series of workshops kicking off national data roadmap processes supported by the GPSDD in several countries.³ National data roadmaps support countries in developing and implementing multi-stakeholder data ecosystems to improve the production, access, and use of data to achieve national development priorities and the SDGs. DANE, with support from key partner CEPEI⁴, a civil society organization based in Bogota, led the development of the workshop program, logistics, and coordination.

The key objective of the workshop was to provide a multi-stakeholder platform to discuss how Colombia was integrating the SDGs into national planning and their related data activities, priorities, challenges, and needs. The workshop brought together a variety of domestic and international stakeholders from government, civil society, the private sector, philanthropy, and multilateral organizations including DANE, CEPEI, the National Department of Planning (DNP), Esri, ACOPI, TELEFONICA, CECODES⁵, ANDI⁶,

³ As of March 2018, Data Roadmaps National Workshops have been facilitated in six other countries: Kenya, Tanzania, Sierra Leone, Philippines, Senegal, and Ghana, with an upcoming workshop planned for Costa Rica to take place in April 2018.

⁴ Centro de Pensamiento Estrategico Internacional

⁵ Consejo Empresarial Colombia para el Desarrollo – a non-governmental organization in Bogota

⁶ National Business Association of Colombia



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AFE, the National University of Colombia, the US Department of State, the Philippine Statistics Authority, Governments of Kenya and Sierra Leone representatives, Data Act Lab, Data-Pop Alliance, OPAL (Open Algorithms), Open Data Watch, and CIVICUS, among others. GPSDD facilitated the participation of the international participants based on needs identified by Colombia and the expertise and tools these partners could offer to help Colombia address their priorities for strengthening data systems and capacity.

The workshop included discussions on the key SDG data gaps; identification of indicators for which other sectors, through GPSDD, can provide support to close data gaps; discussion of challenges DANE faces in implementation of the SDGs including lack of sub-national-level data, measurement of new topics, especially environmental issues, disaggregated information, and access to new sources of information/data; identification of opportunities for joint action around administrative data; and key takeaways to support the roadmap effort including a focus on Tier III indicators⁷ as an area that GPSDD can support.

Following the workshop, the GPSDD Secretariat continued to consult with DANE and CEPEI, including a visit in November 2016 for a direct follow up on the data roadmaps process. Through the workshop and subsequent discussions, several institutional and technical challenges were identified. The key institutional challenges included the need to strengthen cross-government cooperation; the need for multi-stakeholder partnerships including the private sector, philanthropy, and civil society; and the need to strengthen DANE's leadership role. Key technical challenges included measuring new thematic areas for goals 6, 12, 13, 14, and 16; data disaggregation; the need to strengthen and use administrative records for statistical purposes; and the need for improved access to new data sources.

To address these challenges, DANE put into place several strategies on: 1. Producing and improving existing sub-national statistics; 2. Developing a smart data strategy; and 3. Developing strategic partnerships.⁸ Through the ongoing dialogue with DANE, the GPSDD has responded to DANE's needs where possible by brokering support from partners in the GPSDD network.

Towards Integration of National Statistics and Earth Observations for SDG Monitoring

Key priorities for DANE and areas where they expressed a desire for GPSDD support, were to fill data gaps related to Tier III indicators and to better integrate other data sources, particularly Earth

⁷ The SDG indicators have been [classified](#) into 3 tiers based on the level of data and methods available:

Tier 1: Indicator conceptually clear, established methodology and standards available and data regularly produced by countries.

Tier 2: Indicator conceptually clear, established methodology and standards available but data are not regularly produced by countries.

Tier 3: Indicator for which there are no established methodologies and standards or methodology/standards are being developed/tested.

⁸ Roadmaps Assessment Report:

http://www.data4sdgs.org/sites/default/files/services_files/RoadmapsAssessmentReport_Dec2017_FINAL.pdf



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observation (EO) data with national statistics. DANE was already very active in this area but there was an opportunity, through GPSDD, to work with new partners and experiment with new methods to advance this work and overcome barriers. GPSDD provided a recommendation that allowed DANE to rapidly replicate a successful pilot and better leverage EO data. GPSDD has also helped foster cross-agency dialogue and collaboration in the use of EO for the SDGs.

Colombia leads the working group for the Statistical and Geospatial Framework for the Americas (MEGA) as part of the UN Global Geospatial Information Management for the Americas (UN GGIM: Americas). This working group “will enable the linking of statistical information of various types, and its corresponding geospatial location, and will improve the accessibility and usability of these geospatially enabled statistics.”⁹

In alignment with this effort and its lead on measuring SDGs, DANE conducted a pilot project to propose a method using Earth observation (EO) data to calculate SDG indicator 11.3.1 – the ratio of land consumption rate and population growth rate, in 2015. The methodology used remote sensing processing and GIS analysis of freely available Landsat images in combination with population data in the Barranquilla Metropolitan Area (MA) in northern Colombia for the years 2005, 2010, and 2015. As a result of this project, DANE concluded that “big data from satellite images is a source of relevant information for the calculation of some SDGs” and that “results were satisfactory and showed that it is possible to overcome the challenges and replicate this project for other areas.” However, they faced barriers to replicating the pilot:

- While the “Landsat platform provides free access to satellite imagery data since 1971, in some cases improvements must be done in order to overcome the cloud shadow and gaps issues.”
- “To exchange information and knowledge in a timely way, strategic partnerships promotion among national and international bodies, big data providers and academy are desirable.”¹⁰

To help address the challenge of replication, GPSDD recommended the use of Google Earth Engine to scale the algorithms used in the pilot project to the whole country. The use of the Google Earth Engine platform automated the processing and classification of the images, since there are configurable scripts that facilitate the replication in other zones. With this enhanced methodology, indicator 11.3.1 was calculated for the six metropolitan areas of Colombia. These activities produced several results: 1) methodology and calculation of the indicator in the six metropolitan areas; 2) a methodological guide; and 3) a script for selecting, processing, and classifying images in Google Earth Engine. The results of these activities also highlighted the need to investigate methods that overcome technical limitations encountered due to the presence of clouds.¹¹

⁹ “DANE: Progress and strides in the Integration of Statistical and Geospatial information for sustainable cities” presentation from May 2017 by DANE at the Kunming Forum on UN-GGIM

¹⁰ “Use of Satellite Images to Calculate Statistics on Land Cover and Land Use” Report: http://eo4sdg.org/wp-content/uploads/2017/08/4.-Report_Pilot_Project_Colombia_v3-1.pdf

¹¹ “GEO Big Data for SDG” Presentation by DANE at the “Towards Integration of National Statistics and Earth Observations for SDG Monitoring” Workshop in 2017



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Based on these and other activities, DANE identified data gaps and capacity limits that were preventing them from effectively integrating geospatial and EO data with national statistics to address the SDGs' information demand. GPSDD saw an opportunity to broker a connection with NASA who had expressed a desire to support countries to better leverage EO data to address the SDGs. To help foster collaboration, GPSDD along with the NASA and DANE co-organized a workshop designed to bring together key Colombian and international agencies and stakeholders working on these issues specifically. The workshop was held in March 2017 and brought together DANE, the Ministry of Environment and Sustainable Development (MADS), the Institute of Hydrology, Meteorology and Environmental Studies (IDEAM), NASA, Group on Earth Observations (GEO), University of Maryland, European Space Agency (ESA), Committee on Earth Observation Satellites (CEOS), and the World Bank. In line with the priority SDGs identified in the first roadmap workshop, these discussions focused on a subset including: Goal 6 (Clean Water and Sanitation), Goal 11 (Sustainable Cities and Communities), and Goal 15 (Life on Land).

The environmental indicators highlighted some of the challenges related to cross-agency coordination regarding the use of satellite data. By focusing on a particular topic and priority, and bringing together the key organizations involved in addressing these topics, the workshop created the space to better understand who is doing what, and to surface some of the challenges.¹²

Several international partners had previous on-going collaboration with MADs and IDEAM, however, this workshop provided an opportunity to have a “deeper level of engagement across agencies to identify where further collaboration could be developed to address these data challenges and highlighted the importance of institutionalizing multi-stakeholder mechanisms for collaboration against the SDGs.”¹³

Impacts to-date in the Application of EO to Monitor SDGs

Increased Technical Capacity

While Colombia had the inputs and the self-developed methodologies to process data related to SDGs because of their routine statistical processes, the GPSDD facilitated collaboration on the integration of EO data to measure SDGs has increased access to technical resources and best practices in this area.

The incorporation of the Google Earth Engine platform for satellite image processing into the methodology for SDG indicator 11.3.1 improved technical capacity and efficiency. The enhanced methodology optimized response times and enabled the calculation of the indicator across 151 cities in Colombia. However, the indicator still could not be calculated for 13 cities due to the lack of cloud-free satellite images. In addition, the methodology has been used to support the calculation of other SDG indicators, such as 9.1.1 – “proportion of the rural population who live within 2Km of an all-season road.”

¹² Roadmaps Assessment Report:

http://www.data4sdgs.org/sites/default/files/services_files/RoadmapsAssessmentReport_Dec2017_FINAL.pdf

¹³ <http://www.data4sdgs.org/news/applying-earth-observation-data-fill-data-gaps-sdgs-colombia>



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In order to complement the progress on indicator 11.3.1 and identify additional areas of collaboration, the international partners at the March 2017 workshop presented on methods for land use and land cover change, water ecosystems, forest management, automated methods for delineating urban areas, integration of optical and radar imagery, the use of data cubes for analysis ready data, and a developing National Spatial Data Infrastructure (NSDI) program in Colombia. Through this knowledge exchange, DANE connected with NASA to access radar images, which are not affected by cloud cover, as an alternative source of information to calculate indicator 11.3.1 for the remaining 13 cities. Additionally, NASA and GEO have offered DANE technical assistance to improve processing and classification of optical and radar images via online courses. DANE is currently in the process of evaluating the use of these methods and data types to obtain more information for the relevant indicators.

These discussions also contributed to the identification of specific areas where EO, satellite-based, ground, and in situ data can contribute to address data gaps and needs, and track, monitor, and report on SDG targets and indicators. These include indicators 11.7.1 – average proportion of the built surface of the cities corresponding to open spaces for the public use of all; four Goal 15 – Life on Land – indicators (15.1.1, 15.2.1, 15.3.1, and 15.4.2); and 6.6.1 – change in the extent of water-related ecosystems over time.

To-date, the linkages made with institutions such as NASA, GEO, and some universities have allowed DANE to develop new capabilities that have been essential to develop new projects and methodologies using EO data to address data gaps and monitor SDGs. In particular, the linkages have enabled the use of several innovative or non-traditional data sources and have helped specific teams from DANE, such as the SDGs team and the Geo-statistics Directorate, to produce more efficient and quality measurements.

Multi-stakeholder Coordination

The GPSDD-facilitated convenings, through both the workshops and additional meetings, have strengthened cross-institutional communication and collaboration, particularly between the National Statistics Office and the government agencies responsible for specific SDG areas, as well as with civil society, the private sector, and international organizations. In particular, the workshops and follow up communications with the various entities helped facilitate better understanding of roles, challenges, and possibilities, highlighting that each of the entities has something to offer.

As noted above, the Colombian government has been involved in the use of Earth observation data for the SDGs and has established an inter-agency coordination mechanism on data needs for SDGs. This collaboration furthered the commitment to use non-traditional methodologies to address SDG indicators, signaling political buy-in for the multi-stakeholder approach.

Through the March 2017 workshop, a number of next steps were identified in relation to goals 11, 15, and 6. These included action items such as “schedule technical joint discussion between MADs, IDEAM, and DANE for sharing experiences and discussing how to best take advantage of techniques and algorithms already developed by international initiatives and agencies,” “connect with Water Resources



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Division within IDEAM to explore which variables could help contribute toward 6.6.1,” and “Use of existing country-level data cube.”¹⁴

These action points highlight coordination among the institutions and the possibility to leverage existing resources. Specifically, the collaboration started the process of broader use of a Landsat-based, country data cube, which is a time-series of multi-dimensionally stacked, spatially-aligned pixels ready for analysis developed by the Committee on Earth Observation Satellites (CEOS) and IDEAM. Supporting access to analysis-ready data and EO infrastructures such as the data cube for other institutions within Colombia, IDEAM, and DANE can help make SDG monitoring and reporting manageable, cost-effective, and sustainable.

Scaling Methods Nationally and Internationally

As noted earlier, DANE is positioned to play a role at national, regional, and global levels. As a manifestation of this, DANE’s Office for Technical Cooperation is a stakeholder in the collaboration because Colombia has an extensive territory and diverse regional statistical development. These conditions have increased the interest of the national government in innovation, new technologies, and collaborative work in order to replicate lessons learned not only with international partners in Latin America or Africa in a South-South Cooperation framework, but also at the national level, with members of the National Statistical System that DANE coordinates, on a sub-national level to build capacities in the different regions, cities, and towns inside the territory, and with other non-governmental private and civil society organizations.

At the regional level, there has been keen interest in learning from Colombia’s experiences of using EO to monitor SDGs. Recently, in November 2017, DANE was invited to present at the Conference of the Americas on the use of geospatial data for statistical data production. Additionally, Colombia has received requests for methodology via NASA and is looking to review and standardize successful EO methods and use of EO data products to enable documentation, standardization, and sharing with other countries.

At an international level, GPSDD, in partnership with NASA and GEO, hosted a participatory and consultative multi-stakeholder training event in July 2017, featuring representative from governments, civil society, international and research organizations, and academia as part of the High-Level Political Forum on Sustainable Development’s SDGs Learning, Training and Practice 2017 track called “Applying Earth Observation Data for SDGs.” This training provided an opportunity for international stakeholders to learn from country experiences, of challenges and unique methods being developed, and piloted on the use of EO data to address challenges. Colombia was one of two countries who presented at this workshop.

¹⁴ “Towards Integration of National Statistics and EO for SDG Monitoring in Colombia” Workshop Summary notes



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References:

“Applying Earth Observation Data to Fill Data Gaps on the SDGs in Colombia.” GPSDD blog post:
<http://www.data4sdgs.org/news/applying-earth-observation-data-fill-data-gaps-sdgs-colombia>

“DANE: Progress and stride in the Integration of Statistical and Geospatial information for sustainable cities.” Powerpoint presentation by DANE, May 2017

“GEO Big Data for SDG.” Powerpoint by DANE at the March 2017 Workshop.

“Report on the Colombia Multi-Stakeholder Workshop on Data for Sustainable Development Goals Roadmap.” Report by CEPEI.

“SDGs Learning, Training and Practice 2017: A Capacity Building and Networking Event in Finding Solution to Sustainable Development Challenges” Agenda

“Sustainable Development Goals – SDG Indicator 11.3.1: Ration of Land Consumption Rate to Population Growth Rate.” Pilot project Report.

“Towards Integration of National Statistics and Earth Observations for SDG Monitoring in Colombia – Draft Summary Report.”

“The Group on Earth Observations” Powerpoint presentation from Session 2 Plenary.

“Use of Satellite Images to Calculate Statistics on Land Cover and Land Use.” Pilot Project Report shared by DANE.