New data sources and tools to monitor SDGs: The Geospatial opportunity

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Abstract

As National Statistical Offices (NSOs) assess their capacities to produce data and indicators in order to follow up the advancement for the Sustainable Development Goals (SDGs), an opportunity arises for official statistics to move beyond traditional data sources and methods. The 2030 Agenda and the SDGs provide an unparalleled opportunity for statistical innovation and modernization. There are several technological tools, as well as new data sources, from which NSOs might apply expertise and knowledge already accumulated from the MDGs. However, these innovations also require thinking beyond the traditional way of generating official statistics. The role of the statistical leadership is essential in bringing innovations and new capabilities, like employing data scientists, as well as useful experiences, and starting to produce new complementary data while taking care of not compromising the NSOs' credibility. One of such new data sources is geospatial information, which can help to locate in space different social, economic and environmental indicators. Moreover, it can also be a valuable source of information for topics such as terrain shape, soil use and other geographic characteristics supporting the understanding of different phenomena. This paper addresses issues related to the integration of new data domains, sources and how we expect to use them to supplement the traditional production of statistics to follow up the SDGs.

Keywords: geospatial information, geographic information systems, earth observations, subjective measurements.

1. Introduction.

The 2030 Agenda is integral. It offers insight into the economic, social and environmental challenges of the sustainable development, and seeks to build action plans that focus on the people, the planet, the partnerships, the prosperity and the peace.

By the same token, this integral approach opens up a new set of hurdles for official statistics. The Agenda's Sustainable Development Indicators (SDGs) address issues that have not generally been subject to "official" measurement and therefore require the development of innovative statistical methods as well as additional capacity building efforts in new fields.

After a careful review of the 230 SDGs indicators agreed by the Statistical Commission of the United Nations in March 2016, a number of countries face important challenges from the new demands for relevant information. For example, several of those indicators are considered outside the remit not only of the National Statistical Offices (NSOs) but from the National Statistical Systems (NSSs) as well; namely, beyond the boundary of what has traditionally been considered the role and the field of official statistics.

2. New fields and methods for statistical (and geographic) national systems.

Among the tests put forward to official statistics the following can be mentioned:

a) The set of indicators related to *perceptions of the population* on issues to which few countries have reliable measurements. An example is the crime and corruption statistics. In this case, the indicator on the dark figure of crime has met with resistance and skepticism by some official statistical authorities of several countries. This type of statistics is typically not considered hard data and therefore is deemed outside official statistics. Additional examples relate to the goals of the target 16:

> 16.1.4 Proportion of population that feel safe walking alone around the area they live.
>
> 16.3.1 Proportion of victims of violence in the previous 12 months who reported their victimization to competent authorities or other officially recognized conflict resolution mechanisms.
>
> 16.5.2 Proportion of businesses that had at least one contact with a public official and that paid a bribe to a public official, or were asked for a bribe by those public officials during the previous 12 months.

b) The so-called *scientific measurements*, i.e., indicators related to the quality of the waters of the sea, or the quality of the air; these types of indicators refer to scientific metrics which are normally not part of the regular work program of the NSOs or NSSs. Some countries are reluctant to consider these data as official statistics, such as:

> 14.1.1 Index of coastal eutrophication and floating plastic debris density.
>
> 14.3.1 Average marine acidity (pH) measured at agreed suite of representative sampling stations.

c) Also, the use of information produced by private sector companies, mainly *big data*, to mention some of the more relevant.

However, another very important aspect is concerned with the link between statistical and geographic information that may be exploited to maximize its potential. This paper focuses on the opportunities offered by the SDGs to use geographic information, not only as a tool for spatial reference of data, but as an additional source for producing and complementing statistical data. It also seeks to share the vision of Mexico's INEGI on how to be a proactive NSO.

3. Geospatial information

Geospatial information

The natural world is an incredibly complex system. This complexity reflects the many interactions between people and resources, and ecosystems and climate. In the context of this complexity, geospatial information facilitates targeting of social, economic and

environmental indicators to support public policies. Moreover, given the mandate of “leave no one behind” it becomes crucial to locate in space the target groups of these policies.

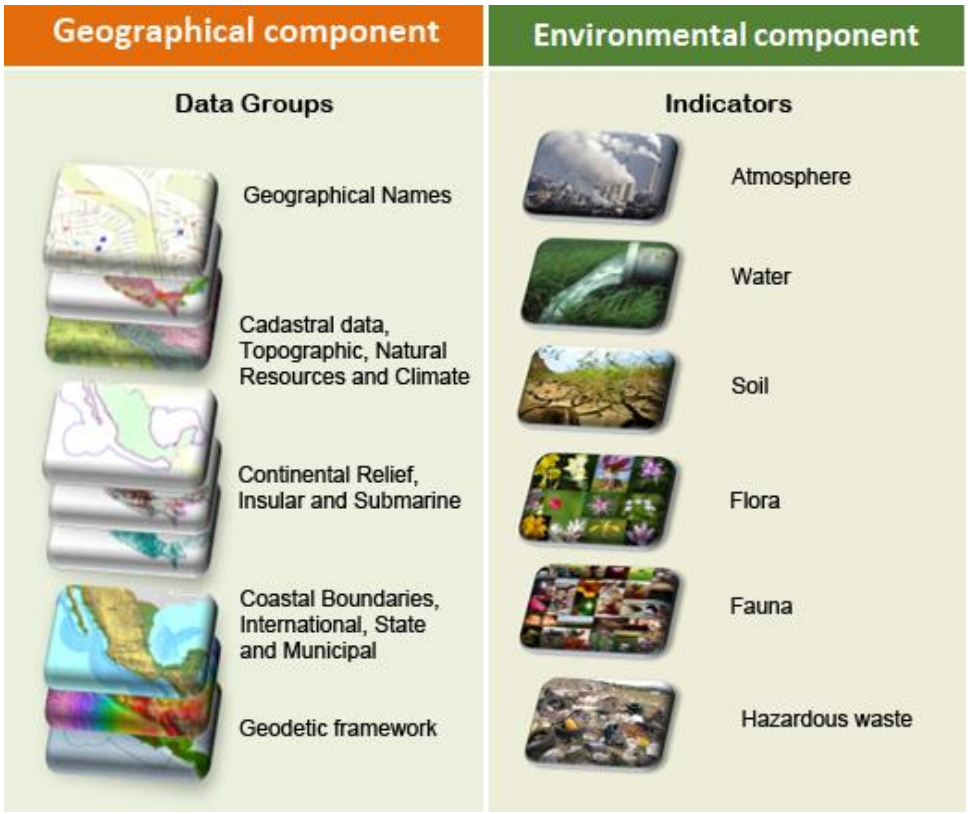
With the purpose of exploring the potential use of geospatial information as a complement to monitor SDG indicators, INEGI conducted an exercise that consisted in analyzing the global SDG framework according to the following criteria:

- Possibility for each indicator of being georeferenced
- Level of geographic disaggregation
- Identification of the data producer
- Possibility of derivation of information from the processing of remote sensing imagery

As a result from this exercise, we found that many indicators can be included in a platform for spatial reference: in all we have identified 65 SDG indicators that meet the criteria. Among them, two examples are:

14.3.1 Average marine acidity (pH) measured at agreed suite of representative sampling stations

15.3.1 Percentage of land that is degraded over total land area.

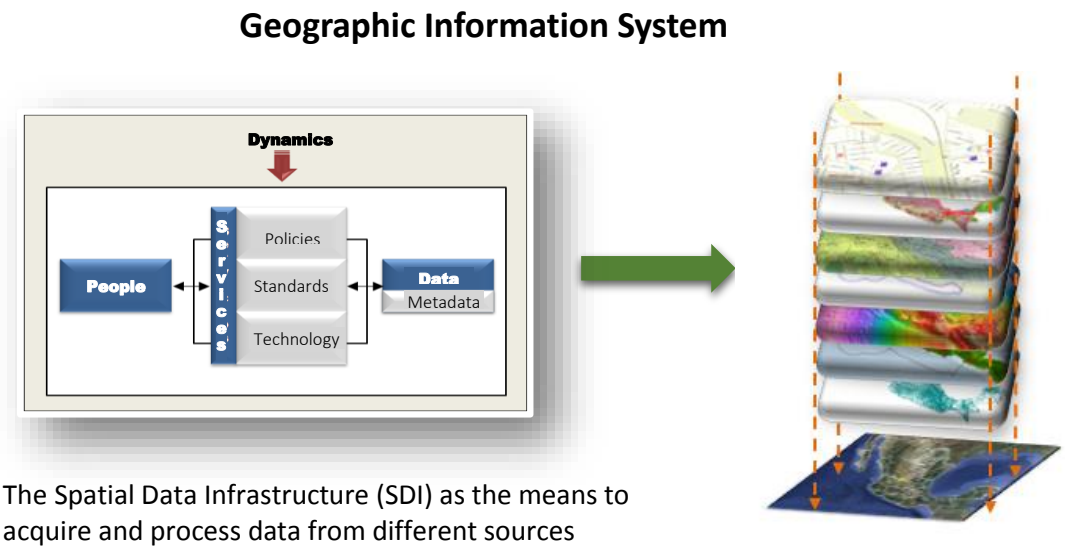


Geographic Information Systems for monitoring SDG Indicators

On the other hand, Geographic Information Systems (GIS) allow the visualization and analysis of geospatial data and promote synergies between the production and use of geographical information and statistics. In our view GIS will be a fundamental tool to track and assess SDGs progress.

In the case of Mexico, INEGI´s platform Digital Map of Mexico offers more than 200 vector data layers, with more than 71 million geographic objects and 4 raster layers covering the whole country (almost 2 million square kilometers).

This large volume of information and their spatial representation can be used not only to produce geospatial indicators, but also to monitor them in space and time. For example, indicator 15.2.2 Net permanent forest loss, might be monitored by a sequence of satellite images for a given target area during a period of time.



The Spatial Data Infrastructure (SDI) as the means to acquire and process data from different sources

SDGs and Environmental Statistics

Another important case is related to statistics on the environment and climate change. In general, these are fields that have typically lagged in terms of resources and relevance in comparison to others, both within the NSOs and the NSS. The 2030 Agenda is an opportunity to advocate for environmental statistics. The available methodological resources for this subject are quite valuable: the System of Environmental-Economic Accounts (SEEA), the Framework for the Development of Environment Statistics (FDES) and UNECE´s Recommendations for Statistics related to Climate Change, offer the possibility of adapting and introducing methods and new lines of work to boost the production of these statistics with the leadership of the NSO.

The environmental dimension of sustainable development is fleshed-out in the SDGs, particularly on oceans and marine resources (within Goal 14), ecosystems and biodiversity (Goal 15), land degradation and desertification (also Goal 15). The environmental dimension is transversal and therefore it appears embedded under other goals as well, such as affordable and clean energy (Goal 7), sustainable cities and communities (Goal 11) and climate action (Goal 13).

Environmental statistics are multi-disciplinary, cross-cutting, and involve numerous stakeholders, actors and producers. To inform about sustainable development, data from the environment must be collected and statistics need to be produced regularly, as a part of official statistics of the NSS.

A recent comparison between the FDES Basic Set of Environment Statistics and the environmentally-related SDGs indicators will serve to map the growing demands of environmental statistics emanating from the needs of the SDGs and will provide a clearer picture on exactly which basic statistics would be required for the indicators. Some indicators to be part of environmental statistics are:

15.2.1 Progress towards sustainable forest management

15.3.1 Proportion of land that is degraded over total land area

15.c.1 Proportion of traded wildlife that was poached or illicitly trafficked

SDGs and Earth Observations

Remote sensing observations provide data from the different portions of the electromagnetic spectrum allowing to obtain specific information for vegetation, crops, pollution and water, just to mention some variables. This information will support policies aimed at protecting forests, planning for growth of urban areas, monitoring water resources, managing coastal zones, and increasing their resilience, among other uses.

Earth observations also contribute to the implementation of the 2030 Agenda and the SDGs, since social and economic data multiply their value and support the following up and the assessment of the extent of ecosystems, the provision of ecosystem services and diagnosing the condition of the countries' natural capital: soils, water, biodiversity, minerals, etc.

SDGs and Satellite Big Data

The sensors and models that measure, monitor and forecast our planet produce millions of data for the environment. We have more information than ever before at our fingertips. This data availability requires multidisciplinary efforts in order to achieve more frequent and diversified results across the policy spectrum.

Big data has the power to transform how environmental impacts can take action on sustainability. INEGI is currently developing and applying mathematical models to analyze climate change with data derived from satellite images.

4. Final ideas

It is useful to take a step back and observe from the distance the post-2015 development revolution that means the 2030 Agenda. The statistical community should take advantage of the opportunity offered by the SDG agenda to innovate and move beyond the traditional boundaries of official statistics.

The technologies and the data already exist and they are at our disposal if we have the ability to establish partnerships and reach sharing agreements. The Data Revolution proclaimed by the UN Secretary General, means that we must apply those technologies and the new data sources to respond more effectively to our key users, providing information with better opportunity and better coverage.

In particular, the spatial dimension of the data is becoming an increasingly important one.

NSOs have the opportunity to introduce this dimension in their measurements and analyses. It is important to take ownership of the spatial vision integrating geographic and statistical information in the work programs and in the roadmaps for the SDGs. There are however very few cases in the world in which the production of statistics and the production of geographical information are integrated into one institution. Whenever this is not the case, it is important to start and to strengthen the collaboration between the statistical office and the national geographic authority. For example, this cooperation can take the form of a formal written agreement whereby the parts agree to work for the development of products and services integrating both fields of information.

Furthermore, it is essential that NSOs establish strategic alliances with producers of geographic information belonging to other arenas such as academia and the private sector.

For Mexico´s INEGI there are many challenges. One of them is to launch a comprehensive agenda to boost the production and integration of environmental statistics. We have progressed in the field of the system of national accounts with the regular estimation of the satellite account on “green GDP”, however this is not sufficient in current times. Basic environmental statistics and further exploitation of geographic information are key to develop an integrated system. Understanding the interrelationships of the environment with the economy and the society, allows an integrated approach to the 2030 Agenda and the SDGs indicators.

The other challenge is to advance the integration of GIS as an everyday tool that provides an information base for planning and decision-making aimed at sustainable development, visualizing how this integration is an excellent support for the design of public policy and decision making both locally and nationally.

Finally, to this end we should continue to foster cooperation and collaboration among countries and international and regional organizations, such as the UN Global Geospatial Information Management (UN-GGIM) and its regional counterparts.