TASK AND PROGRESS OF IAEG-SDGS: WGGI IN MONITORING SDGS THROUGH A 'GEOGRAPHIC LOCATION' LENS

W. Geng[1,*], J. Chen[2], H. P. Zhang[2], K. Xu[3]

[1] Administrative Information Center, NASG, China - gengwen@sbsm.gov.cn
[2] National Geomatics Center of China - (chenjun, zhanghongping)@ngcc.cn
[3] Surveying and Mapping Development Research Center, NASG, China - f4workkun@hotmail.com

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ABSTRACT:

In September 2015, the 193 Member States of the United Nations (UN) unanimously adopted the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs), aiming to transform the world over the next 15 years (ESDN, 2016). To meet the ambitions and demands of the 2030 Agenda, it is necessary for the global indicator framework to adequately and systematically address the issue of alternative data sources and methodologies, including geospatial information and Earth observations in the context of geographic location (UN-GGIM, 2016). For this purpose, the Inter-Agency and Expert Group on Sustainable Development Goals Indicator (IAEG-SDGs) created the Working Group on Geospatial Information (IAEG-SDGs: WGGI) to give full play to the role of geospatial data in SDGs measurement and monitoring. The Working Group reviewed global indicators through a 'geographic location' lens to pick out those which geospatial information can significantly support the production, and analyzed the methodological and measurements issues. This paper has discussed the progress in monitoring SDGs ever since the establishment of IAEG-SDGs: WGGI, as well as the existing problems, appropriate solutions and plans for the next stage of work.

1. INTRODUCTION

Since the Industrial Revolution, the production and lifestyles of human had changed dramatically with the progress of civilization. Meanwhile, the resulting population expansion, resource shortage, environmental degradation and other issues had gradually exposed (Ray et al., 2011). In recent decades, there had been enormous disparities of wealth and opportunity, as well as more frequent and intense natural disasters, which led to the spiraling conflict and forced displacement of people. It was urgent for people to embark on new paths to achieve sustainable development.

Aims to increase the living standards of millions of people by 2015, the Millennium Development Goals (MDGs) were agreed at the United Nations Millennium Summit (Biamba, 2014). The implementation of MDGs has effectively promoted the development of poverty reduction, education, medical care, and improvement of drinking water sources in the world, especially in the less developed countries. However, some global issues still remained severe. The problems of unbalanced development of social economy and unfairness were deepening in different regions. In order to change the world in the future 15 years, the 2030 Agenda for Sustainable Development and its 17 SDGs (Pisano et al., 2016) were adopted and officially came into force. SDGs were not a simple expansion of the MDGs, but a major opportunity for change in the development of human history.

In support of achieving all the Goals and targets (Binns et al., 2017), the United Nations facilitated an intensive global engagement and mobilized all available resources so as to implement 2030 Agenda for Sustainable Development effectively. Meanwhile, a series of follow-up and monitoring measures had been proposed, including the comprehensive usage of both geospatial and statistical information for monitoring and reporting of SDGs, timely detection of problems, and suggestions for further improvement. This paper introduced the establishment of the IAEG-SDGs: WGGI and its progress in monitoring SDGs, as well as the existing problems, appropriate solutions and plans for the next stage of work.

1.1 Follow-up and Review of Implementation of SDGs

The 17 SDGs which United Nations announced demonstrated the scale and ambition of the 2030 Agenda for Sustainable Development. The governments of all countries were mainly responsible for follow-up and review of progress in the implementation (ECLAC, 2016) of the Goals and targets at the national, regional and global levels (Loewe et al., 2017) in the next 15 years. The Sustainable Development Goals Report was released every year from 2016, to provide an overview of the global implementation of the 17 SDGs, highlight areas for progress and areas that require more action to ensure that no one is left behind. At the same time, some Member States carried out regular quantitative monitoring based on indicators, voluntary annual reviewed, submitted annual reports, reflected the level of sustainable development, as well as coordinated and guided sustainable development practices. The high-level political forum under the auspices of the (Sustainable Development Knowledge Platform, 2016) United Nations

* Corresponding author

General Assembly and the Economic and Social Council would play an essential role in supervising follow-up and review.

1.2 Sustainable Development Goals and targets

The 17 general Goals were committed to achieving sustainable development in its three dimensions - economic, social and environmental - in a balanced and integrated manner (United Nations, 2015). Amongst the 17 Goals, there were 4 economic Goals, 8 social Goals, 4 environmental Goals, and 1 mean of implementation. The classification was shown in Figure 1.

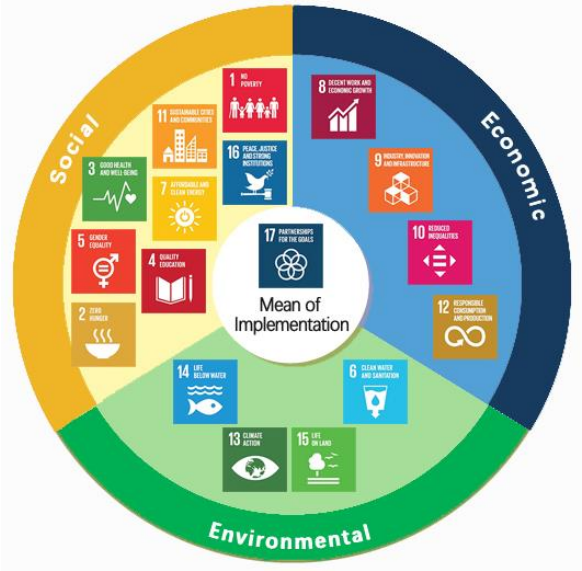

Figure 1. SGDs Structures Diagram

Furthermore, the 17 SDGs were refined to 169 targets for the specific follow-up and review the execution of the 2030 Agenda for Sustainable Development. The 169 targets could be divided into 2 categories. Some were outcome targets, which were desirable change between outputs and impact. The others were means of implementation targets to facilitate outcomes, including all the targets under Goal 17, and these were separately identified with the usage of small letters after the Goal number under SDGs 1-16, and other targets that related to policy measures or other "process" actions must be added (OECD, 2016).

1.3 Mandate of Inter-Agency Expert Group on SDG Indicators (IAEG-SDGs)

On March 6, 2015, The Inter-agency and Expert Group on SDG Indicators (IAEG-SDGs) was founded at the 46th session of the United Nations Statistical Commission, composing of Member States and involving international organizations as observers. The mandate of the IAEG-SDGs was developing a global indicator framework (IAEG-SDGs, 2017a) to support and track the Goals and targets, and ensuring the implementation of the global indicators in a variety of ways, such as regular review, experience sharing and technical support. The members of the IAEG-SDGs met twice a year, and worked electronically at other times.

1.4 Global Indicator Framework for the Sustainable Development Goals (SDG Indicators)

After many negotiations and amendments, the United Nations General Assembly adopted the global indicator framework on 6 July 2017 and contained it in the Resolution. (A/RES/71/313) (IAEG-SDGs, 2017a). There were 244 indicators listed in the global indicator framework for SDGs. However, since 9 indicators repeated under different targets, the actual total number of individual indicators was 232. The IAEG-SDGs classified all the indicators into 3 Tiers in accordance with the degree of data availability and methodological development at the global level. As of 15 December 2017, there were 93 indicators in Tier 1, for which an established methodology existed and data were already widely available. There were 66 indicators in Tier 2, for which a methodology had been established but for which data are not easily available. There were 68 indicators in Tier 3, for which an internationally agreed methodology had not yet been developed (Deb, 2017). In addition to these, there were 5 indicators which different components were classified into different Tiers, also referred to as multiple Tiers. The IAEG-SDGs had developed a mechanism for updating the tier system, in response to the inquiries regarding the material needed and criteria for indicator re-classification. It was an important task for the IAEG-SDGs and the international community to study and propose the to propose and study the methodology and standards for the indicators of Tier 3.

2. ESTABLISHMENT AND TASK OF IAEG-SDGS: WGGI

2.1 Establishment of IAEG-SDGS: WGGI

Compared with the traditional statistical data, geographic information had an advantage in visual expression and in monitoring the progress across spatial scales. Furthermore, most of the SDG indicators required geographic information data, playing an essential role in setting goals, making plans, tracking progress, assisting stakeholders and countries to make informed decisions.

Realizing the innovations in geospatial information data collection and the related technology application could make SDGs more targeted and successful than MDGs (Fischer, 2015). The IAEG-SDGs submitted a report to the Statistical Commission, creating the Working Group on Geospatial Information (IAEG-SDGs: WGGI) at its third meeting in March 2016 (UN-GGIM, 2016).

2.2 Task of IAEG-SDGS: WGGI

The primary objective of the IAEG-SDGs: WGGI was to ensure that one of the key principles of the 2030 Agenda - "leave no one behind", from a statistical and geographic location perspective. The tasks would include providing expertise and advice to the IAEG-SDGs, assessing and advising on the role of NSOs in considering geospatial information and earth observations, reviewing the agreed indicators and metadata through a 'geographic location' lens, identifying existing geospatial data gaps, methodological and measurements issues, considering how geospatial information can contribute to the indicators and metadata, providing national and regional level experiences, and proposing strategies for undertaking methodological work (IAEG-SDGs: WGGI, 2016).

2.3 Membership of IAEG-SDGS: WGGI

Currently, the Co-Chairs of the Working Group were Ms. Marie Haldorson from Sweden and Ms. Paloma Merodio Gomez from Mexico, who were the members of the IAEG-SDGs. The Working Group consisted of 25 members from Member States, United Nations agencies and international organizations (Table 1). In addition, the experts who had technical expertise and practical experience in applying geospatial methodologies and tools within a monitoring context should be drawn into the group, to ensure broad expertise and effectiveness. The secretariat of the Working Group was based at the United Nations Statistics Division (IAEG-SDGs: WGGI, 2018a).

Sweden (Co-Chair)	**Mexico (Co-Chair)**	
Botswana	Brazil	Canada
Chile (UN-GGIM: Americas)	China (UN-GGIM: Asia Pacific)	Colombia
Denmark (UN-GGIM Task Team on SDGs)	Ethiopia (UN-GGIM: Africa)	France
Germany	Germany (UN-GGIM: Europe)	Italy (UN-GGIM: Europe)
Netherlands	Qatar (UN-GGIM: Arab States)	United Kingdom (UN-GGIM EG-ISGI)
TBA (GWG-Big Data)	UN-Habitat	WHO
EuroStat (European Commission)	GEO Secretariat	GEO – EO4SDG
OECD	UN-GGIM: Private Sector Network	

Table 1. Membership of IAEG-SDGS: WGGI (IAEG-SDGs: WGGI, 2018a)

3. THE PROGRESS OF IAEG-SDGS: WGGI IN MONITORING SDGS

Since its establishment two years ago, the IAEG-SDGs: WGGI had held four meetings, actively promoting the contribution of geographic information in monitoring SDGs. Please refer to Table 2. The progress of IAEG-SDGs: WGGI.

Time	**Location**	**Events**
30 Mar - 1 Apr2016	Mexico City	First established by IAEG-SDGs
May - Jun2016	Global	Terms of Reference finalized
Jul 2016	Global	Composed membership of WG
4 Aug 2016	UNHQ, New York	1st Meeting of WG
Sep 2016	Global	Work Program 2016/2017
12 - 14 Dec2016	Mexico City	2nd Meeting of WG (Expert Group Meeting)
8 - 10 May 2017	Kunming	3rd Meeting of WG
5 Oct 2017	Global	1st Online Meeting of WG
6 - 8 Dec2017	UNHQ, New York	4th Meeting of WG
28 Mar 2018	Global	2nd Online Meeting of WG
Mar 2018	Global	Work Program 2018/2019

Table 2. The progress of IAEG-SDGs: WGGI

Reviewing the agreed global indicators through a ‘geographic location’ lens, the working group discussed and identified the geospatial data types that might be used in monitoring 17 SDGs, including population distribution, cities and infrastructure mapping, elevation and topography, land cover and use mapping, oceanographic observations, hydrological and water quality observations, atmospheric and air quality monitoring, biodiversity and ecosystem observations, agricultural monitoring, hazards, disasters and environmental impact monitoring, and so forth.

3.1 Indicators where Geospatial Information had Contribution

At its Expert Group Meeting in Mexico City, the working group reached consensus on 2 short lists of indicators. One of them included 15 identified indicators whose production required the contribution of both geospatial information and statistical data. And the other included 9 identified indicators whose production was supported significantly by geospatial information (Haldorson et al., 2017). Please refer to Table 3. List of Indicators where geospatial information had contribution.

Production Methods	**Indicator**	**Tier Classification**
Geospatial information together with statistical data could contribute directly to the production	2.4.1	Tier III
	6.3.2	Tier III
	6.5.2	Tier II
	6.6.1	Tier III
	9.1.1	Tier III
	9.c.1	Tier I
	11.2.1	Tier II
	11.3.1	Tier II
	11.7.1	Tier III
	14.2.1	Tier III
	14.5.1	Tier I
	15.1.1	Tier I
	15.1.2	Tier I
	15.3.1	Tier III
	15.4.1	Tier II
Geospatial information could significantly support the production	1.1.1	Tier I
	1.4.2	Tier III
	4.5.1	Multiple Tiers
	5.2.2	Tier II
	5.4.1	Tier II
	5.a.1	Tier II
	5.a.2	Tier III
	11.7.2	Tier III
	15.4.2	Tier II

Table 3. List of Indicators where geospatial information had contribution (IAEG-SDGs, 2017b)

3.2 Selecting and Studying Three Typical Indicators

After extensive research and discussion, the working group selected three typical indicators, including 6.6.1, 9.1.1 and 15.3.1. Three task teams established for each of the three indicators to provide case studies that demonstrate methodological approaches, data availability, disaggregation, the perspectives of global data, and working with the custodial agencies. Taking the indicator 9.9.1 (Proportion of the rural population who live within 2 km of an all-season road) (United Nations, 2017) as an example, the task team was asked to review the status of the current metadata of Indicator 9.1.1, acquire and document national experiences from among task team members, and provide an overview of current for geospatial information and techniques availability, illustrated by one or more case studies. Indicator 9.1.1 measured the fraction of people who lived in rural areas and had access to an all-season road within a walking distance of approximately 2 kilometers. The original work relied on available household surveys to estimate road accessibility (World Bank, 2016).
However, the methodology had several weaknesses that it was difficult and costly to conduct and update, as well as respondents did not know how to estimate the distances. Therefore, it was necessary to identify a replicable and consistent approach to measure the accessibility of the transportation infrastructure (World Bank, 2015).
This was the integration of geographic information and statistics. Please refer to Figure 2. Mexico’s approach to Indicator 9.1.1. This was provided by the National Institute of Statistics and Geography (INEGI) (Merodio, 2017), using the buffer and overlay analysis of the geographic information systems (GIS), with population census data, national topographic data, transportation data, and other related data. It was proof that geospatial information could provide enabling methodologies and processes for disaggregation. Furthermore, the disaggregation of national statistical data was considerably strengthened through the lens of geospatial information. Once a recognized methodology had been established, Indicator 9.1.1 could move to Tier II with a proper amount of data.

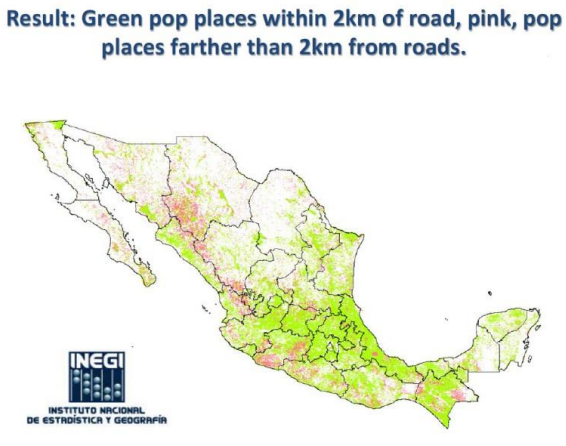

Figure 2. Mexico’s approach to Indicator 9.1.1 (Merodio, 2017)

In the meantime, the World Bank, with the support of the Department for International Development (DFID), was devising a new, GIS-based Rural Access Index (RAI) that exploited advances in digital technology to measuring rural access. As an essential outcome document, the 2016 report Measuring Rural Access: using new technologies was jointly issued. The second phase of RAI program will cover 30 countries by 2018 (Purdie, 2016).

3.3 Addressing Three Identified Crosscutting Issues

The Working Group agreed to the formation of another three task teams to address three identified crosscutting issues, namely data disaggregation by geographic location, alternative data sources and international (global) dataset. The three task teams were required to submit the results of research and evaluation in the form of a report or a statement. Taking into account the limited time, a brief report covered a large spectrum of topics, some examples and a couple of graphics.
For instance, the task team fully affirmed the significant role of both international and national geospatial data sources, as well as addressed a cross-cutting issue. In addition, they observed that the national basic geographic spatial data sets (basic maps) had different timeliness, and some satellite data could be used for free. They noted that geospatial data from international sources, as long as it was appropriate, useable and needed nationally, would play a part in the production of some indicators that required trans-boundary or cross-border considerations. In addition, an example of integrating international and national data sets was given (IAEG-SDGs: WGGI, 2017a).

3.4 Common Issues of Mechanism and Technical Capacity

1) Geospatial Data availability remained one of the primary challenges. In fact, many countries and regions had established their own basic geographic information systems which could provide appropriate basic geographic information for monitoring of SDGs. Nonetheless, some data could not fully meet the requirements due to data types, update frequency and spatial resolution which needed to be integrated, refined, or dynamically updated. For some developing countries (especially underdeveloped countries), they had not yet achieved the comprehensive coverage of basic geographic information at a basic scale, as well as lacked the technical capacity for data updating.
2) The spatialization of statistical data was a problem that needed to be addressed urgently. SDG indicators calculation utilized a lot of social and economic statistical data. Whereas most statistical data, that were collected based on administrative divisions unit, could only represent statistical objects in space conditions in the average area. In fact, it was difficult to reflect its real space distribution or uniformity coefficient. In addition, it was often difficult to implement the SDGs monitoring results and the policy measures built on those data into the corresponding geographic location which was not convenient for implementation or operation (Chen et al., 2018). To this end, the statistical data of social economy needed to be spatialized by adopting the technology of disaggregation.
3) The lack of indicators calculation method became an obstacle to work. For those indicators in Tier 3, internationally methodology and standards needed to be developed or tested. For instance, remote sensing imagery could be utilized to extract indicator 6.6.1 covering the extent and changes of wetlands involved. On the other hand, as for those indicators in Tier 2, such as indicator 11.3.1 which involved the distribution of construction land, the calculation method should be further optimized, according to the needs of large-scale computation and dynamic monitoring.

4. PLANS FOR THE NEXT STAGE OF WORK

Over the past two years, the Working Group had addressed “where is the data” and going forward, they would be addressing “where is the expert advice and guidance? - what are the frameworks to implement, principles, standards etc. to adopt”. The Working Group would promote the work through the following measures, so as to contribute to the production of indicators.

4.1 Developing the Global Statistical Geospatial Framework

Considering that some Member States were short of specialist capacities and expertise of geospatial information and statistical integration in indicator application, the Working Group started to focus on the capacity development for national statistical systems, so as to ensure the wider application of geospatial information. In this aspect, the Working Group actively coordinated with the Expert Group on the Integration of Statistical and Geospatial Information (IAEG-SDGs: WGGI, 2017b), as the Global Statistical Geospatial Framework would promote the development and integration of unified geo-statistical information. Meanwhile, the Working Group encouraged the Member States to improve the usage of GIS and related technology, as well as develop the human resources and expertise in the field of spatial statistical information so as to support varieties of statistical sectors.

4.2 Leveraging the Combined and Coordinated Resources

The Working Group realized that they needed to leverage the combined and coordinated resources more. As a result, they became actively cooperated with custodian agencies to support and promote the methodologies and metadata for the development of indicators, as well as to handle the data sources and data availability. The Working Group identified the right partners that were relevant to the SDGs, integrated those partners in the implementation process, made efforts with partners to maximize and unify the impacts, as well as created clear, effective strategies and followed-up actions.

4.3 Establishing Two Task Streams to Promote the Work

To accomplish the objectives and task, the Working Group established two task streams at its 4th Meeting in December 2017. One task stream was focus on disaggregation by geographic location and aggregation of geocoded unit level data (IAEG-SDGs: WGGI, 2018b). This task stream sought to Develop guidance on disaggregation and aggregation, by offering national initiatives and projects, sharing the outcomes, methodologies and experiences with the Working Group. The other task stream would be addressing appropriate means to allow for NSOs to uptake appropriate analysis or production ready satellite time series data contributed by space agencies. This task stream would work on one or some of the six identified indicators (6.3.1, 6.3.2, 6.6.1, 9.1.1, 11.3.1 and 15.3.1), and offer their methodologies and outcomes. The secretariat for EO4SDGs together with ESA, NASA, JAXA and GEO would provide the needed expertise.

5 . CONCLUSION

As the intergovernmental mechanism for providing expertise and advice through a ‘geographic location’ lens in the production and application of SDG indicators, led by IEAG-SDGs, the IAEG-SDGs: WGGI would play an essential role in achieving the SDGs. The main strength of the working group was its members from both the statistical community and the geospatial community. With their specialist capacities and expertise background, the members understood the context and circumstances of the research fields. Based on this, it was possible to enable an accessible, integrative and interoperable ‘data ecosystem’ in order to keep track of progress of the SDGs. After working together for a certain period of time, the working group reached a high consensus that the disaggregation of national statistical data was considerably strengthened through the lens of geospatial information. In November 2017, the Fifth High Level Forum on United Nations Global Geospatial Information Management published Mexico City Declaration (UN-GGIM, 2017), put forward a project plan to build a global partnership mechanism, vigorously developed new technologies, new methods and new tools, made great efforts to provide a reliable, accurate, timely based geographic data, to support progress monitoring, decisions-making and action - taking of sustainable development. And furthermore, the Work Program (2018/2019) of the Working Group proposed strategies for undertaking methodological work on specific areas for improving disaggregation by geographic location (IAEG-SDGs: WGGI, 2018b). This would, to a great extent, guarantee the foundation for the integration of statistical and geospatial information, such as supporting and improving the production and application of SDG indicators.

The IAEG-SDGs: WGGI would effectively advance its work by capacity strengthening, technical assistance, strategic partnerships, and multi-lateral collaboration at the national and regional levels, in order to contribute to “leave no one behind”.

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