



외교부
Ministry of
Foreign Affairs



Empowered lives.
Resilient nations.

Data ecosystems for sustainable development

An assessment of six pilot countries



© United Nations Development Programme

This report is an independent publication commissioned by UNDP. The analysis and recommendations expressed in this report do not necessarily reflect the official views and positions of the United Nations, its agencies or its Member States. Textual material may be freely reproduced with proper citation and/or attribution to the authoring agency.

All rights reserved for photographic material, which cannot be reproduced in any digital or traditional format without permission except as part of this publication (such as when reposting a PDF file with attribution).

Designed by LS - lsgraphicdesign.it

Acknowledgements

This report was commissioned by UNDP and authored by UNDP consultant, Roshni Menon based on substantial inputs from the six participating pilot countries of the initiative, namely Bangladesh, Moldova, Mongolia, Senegal, Swaziland and Trinidad and Tobago. It is the outcome of an extensive consultation process within and between participating countries. Each country commissioned national level reports, which comprised the basis for this synthesis report. Special thanks go to the authors of these reports and the focal points who supported the project in the country offices:

- Bangladesh: Debapriya Bhattacharya and Towfiqul Islam Khan (Centre for Policy Dialogue), Mahmuda Afroz and Sheela Tasneem Haq (UNDP);
- Moldova: Alexandru Oprunenco (UNDP)
- Mongolia: Doljinsuren Jambal and Daniela Gasparikova (UNDP)
- Senegal: Souadou Sakho-Jimbira, (IPAR), Souleman Boukar (UNDP)
- Swaziland: Godwin Hlatshwayo (consultant), and Fatou Leigh (UNDP)
- Trinidad and Tobago: Bhesham Ramlal (consultant), Sharla Elcock, Isele Robinson-Cooper, and Stacy Richards Kennedy (UNDP).

The policy guidance and overall oversight for execution of the project was provided by Serge Kapto, Policy Specialist for Data for Development, Strategic Policy, Bureau for Policy and Programme Support.

UNDP is grateful to the Government of the Republic of Korea for its generous support without which this project would not have been possible.

Acronyms

ADIE	Agency for State Information Technology (Senegal)
AfDB	African Development Bank
ANADS	National Archive of Senegal
ANSD	National Agency for Statistics and Demography (Senegal)
ARTP	Regulatory Authority for Telecommunications and Post (Senegal)
BBS	Bangladesh Bureau of Statistics
CEPEI	Centro de Pensamiento Estratégico Internacional (Colombia)
CSO	Central Statistical Office
CSOs	Civil society organizations
ECOSOC	United Nations Economic and Social Council
ENSAE	National School of Statistics and Economic Analysis / Ecole Nationale de la Statistique et de l'Analyse Economique (Senegal)
GIS	Geographic information systems
GPSDD	Global Partnership for Sustainable Development Data
HLP	High-Level Panel (of Eminent Persons on the Post-2015 Development Agenda)
HLPF	High-Level Political Forum
ICTs	Information and communication technologies
IEAG	Independent Expert Advisory Group on the Data Revolution for Sustainable Development

MDGs	Millennium Development Goals
NGO	Non-governmental organization
NGP	National Geomatics Plan (Senegal)
NSC	National Statistical Council (Proposed - Trinidad and Tobago)
NSDS	National Sustainable Development Strategy (Bangladesh)
NSI	National Statistical Institute (Trinidad and Tobago)
NSO	National statistics office
NSS	National statistical system
ODA	Official development assistance
ODI	Overseas Development Institute
OECD	Organisation for Economic Cooperation and Development
Paris21	Partnership for Statistics in the 21 st Century
SDGs	Sustainable Development Goals
SG	Secretary-General of the United Nations
UN	United Nations
UNDG	United Nations Development Group
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund

Table of contents

Preface	9
Summary and main messages	11
1 Introduction and background: data for sustainable development	15
2 Mapping data ecosystems at the country level	19
3 Elements of an inclusive data ecosystem: key findings	23
4 Facilitating the data revolution: emerging trends and recommendations	43
5 Conclusion	53
References	57
Annex: country overviews	59
Bangladesh	60
Mongolia	63
Moldova	67
Senegal	70
Swaziland	74
Trinidad and Tobago	76

Preface

At the historic UN Summit of September 2015, Member States of the United Nations adopted the 2030 Agenda for Sustainable Development, with the Sustainable Development Goals (SDGs) enshrined at its core. The new agenda comprises the single most ambitious plan globally to achieve a more inclusive, equitable, just and rights-based world within the span of fifteen years. It commits governments to work together with all stakeholders—public and private—to promote sustained and inclusive economic growth, social development, and environmental protection, and to ‘leave no one behind’ in the process. To achieve these aims, it will require an integrated approach to poverty reduction, sustainable development and environmental action at all levels, as well as an emphasis on redressing inequalities and discrimination.

As inspiring as the ambitious ideals encapsulated in the 2030 Agenda are, goals are often easier to adopt than to achieve. In fact, there is growing recognition that the fulfilment of the SDGs’ potential will hinge on the ability of governments, businesses, civil society, academic institutions, policy think tanks, and people themselves to harness data for development. While the increase in the quantity, quality and diversity of data in recent years has been astonishing, new tools and innovative data systems that draw on dynamic sources of data for sustainable development are crucial to turn analytics into actionable insights and effective policies. In this way, data provides a ‘reality check’ in terms of what is achievable and how.

Given the breadth and complexity of the SDGs, many different types of data will be required (e.g. demographic, economic, social, environmental, etc.) with varying levels of coverage and disaggregation. A solid framework of indicators and statistical data to monitor progress, inform policy and ensure accountability of all stakeholders is imperative. In this context, data communities within countries—from traditional to non-traditional producers and users of data—as well as the UN system, are challenged to work together and demonstrate collaboration and greater coordination of efforts. While on the surface this is a technical exercise, it is also a political one: data collection can accelerate sustainable development by improving monitoring, accountability and decision-making within countries. Frequent measurement of progress, combined with open and transparent access to this data, will be vital to keeping governments on track to meet their SDG targets. Better and disaggregated data can shed light on communities and populations that are excluded from the benefits of sustainable development.

The first step, therefore, in upgrading data and statistical systems around the world is to undertake a thorough assessment of the data and statistical ecosystems within countries. This includes assessing legal and policy frameworks and capacities for official statistics; entry points for action and obstacles for multi-stakeholder engagement on data for SDG implementation and monitoring; innovation and new technologies for plugging data

gaps; and the infrastructure requirements for improved collection, dissemination and use of data. In addition, it is important to evaluate efforts to support the creation of national and international frameworks for monitoring and accountability of development delivery. This report is a starting point: it critically assesses the progress made by six pilot countries in harnessing the data revolution for the implementation of the SDGs.

Summary and main messages

This report presents the findings and recommendations from a data ecosystem mapping initiative that was launched by UNDP in six pilot countries, including Bangladesh, Moldova, Mongolia, Senegal, Swaziland, and Trinidad and Tobago. The ecosystem approach entailed a systematic assessment of stakeholder engagement on data for implementing and monitoring the SDGs; official statistical capacity, processes and policies; the legal and policy frameworks in place for data and statistics; infrastructure requirements for improved collection, dissemination and use of data; and obstacles for multi-stakeholder engagement in data processes. Finally, entry points for future action were also identified. The project's ultimate aims are to make previously excluded voices heard and ensure that no one is left behind by the data revolution, whilst ascertaining what data is currently available to measure the SDGs, evaluating end-to-end data capacity, and determining the institutional upgrading required at the national level to track the achievement of the 2030 Agenda.

The assessment of the data ecosystem across the six pilot countries found some positive developments:

- Statistical capacities have significantly improved in some pilot countries since the adoption of the Millennium Development Goals (MDGs);
- Some progress is being made within national statistical offices and other government entities to improve technical capacities and publish data periodically;
- Tertiary-level academic programmes across countries have begun offering programmes that specialize in statistical and spatial data analysis, as well as other related specializations;
- Many of the pilot countries already have some legislation in place, which provides the legal framework for the collection, use and sharing of data;
- Several initiatives have been launched across countries to open access to data sources and facilitate free dissemination of statistical data through portals dedicated to open data;
- The ICT infrastructure has improved on the whole across most countries.

However, a range of gaps remain in critical areas across many countries, some of which include:

- Inadequate human resource and analytical capacity within statistical offices;
- Low levels of data literacy amongst the general population;
- Lack of periodic upgrading of survey and data questionnaires;
- Lack of compliance of data collection methodologies with international data standards;
- Low levels of data coordination and information sharing within national statistical systems (NSS);
- Inadequate coordination of donor assistance;
- Outdated data-related processes, particularly with respect to documentation and a lack of incorporation of available technological solutions by many government agencies and departments;
- The ‘shelving’ or lack of use of data that has already been collected;
- Little impactful statistical advocacy in sectors and across the NSS;
- Lack of incentives for different communities of data stakeholders to share information;
- Legislative gaps in emerging areas, including rules around the collection of data by non-traditional sources, sharing of data amongst data stakeholders and compliance;
- Deep-rooted bureaucratic resistance to change, hindering the adoption of new policies and operating procedures vis-à-vis data and innovation;
- Varying knowledge of and compliance with the regulatory framework by data producers;
- Unorganized and/or inadequate provision of resources to statistical systems at the national level; and

- Several unresolved issues concerning data openness and interoperability.

To redress these gaps, a series of recommendations were made by pilot countries for different communities of data stakeholders. For instance, it was suggested that national statistical offices (NSOs) need to:

- Evolve from a role of data producer to coordinator, managing various inputs from the broader data ecosystem, ensuring data quality, comparability and harmonization;
- Implement statistical advocacy programmes aimed at the general public to ensure data users and other stakeholders are made more aware of the value of data and how to access and use it;
- Ensure the availability of and access to data and statistics disaggregated by income, gender, age, race and other relevant factors in national contexts;
- Develop or adopt data standards including metadata, sharing, interoperability and other standards needed to support national statistical systems;
- Improve both physical and ICT infrastructure for statistics, whilst incorporating data innovations and big data technologies into SDG monitoring frameworks;
- Engage further with national universities and other relevant tertiary level institutions to work in partnership to provide appropriate training and assist in data collection and analysis efforts;
- Identify and address appropriate training needs of staff of agencies dealing with data and statistics and ensure resources and opportunities are in place to have these needs met.

Governments, meanwhile, should consider:

- Establishing, where they do not already exist, national structures and mechanisms for coordination, particularly between data-producing government agencies and between official and non-official data stakeholders for better tracking of the targets and indicators of the SDGs;
- Designing and implementing an incentive structure to motivate government departments to share existing administrative and other data;

- Motivating the private sector to share their data with government institutions through tax incentives, information exchange, and involvement in different donor-sponsored or government-sponsored sector programs and initiatives;
- Enacting more comprehensive legislation related to data and statistics for sustainable development;
- Better coordinating donor assistance and engaging in collaborative partnerships with donors to ensure that their support achieves its intended purpose, namely the exchange and development of know-how and technical expertise to build national capacities to produce and use statistics;
- Developing a comprehensive estimate of finance needs and mobilizing resources for statistics.

Meanwhile, non-official data stakeholders such as civil society, philanthropic institutions and private businesses, could consider participating in more dialogue platforms to identify social, environmental and governance risks, and to collaborate with governments to find solutions. Academic and tertiary institutions could undertake innovative research in new technologies, platforms, data and knowledge generation, and sharing to provide long-term perspectives and resources at all levels. Finally, more coordinated support and resources for statistics were requested from donors and development partners.

Achieving the SDGs will require integrated action on social, environmental and economic challenges within all countries. It also presents a strategic opportunity to build on the momentum of the data revolution to bring about a shift in the way governments, as well as the public and private sectors, use data and statistics. To this end, the data ecosystem mapping exercise provided a preliminary step towards moving to a fully developed culture of statistical literacy within countries, and to supporting a more sophisticated approach by official and non-official data producers alike to data production, use, coordination, analytics, visualization, and communication.

The background of the page is a repeating pattern of various data visualization icons. These icons include pie charts, bar charts, and line graphs, rendered in a light green and orange color palette. The icons are arranged in a grid-like pattern, with some icons partially overlapping. The overall aesthetic is clean and modern, emphasizing data and analytics.

Introduction and background: data for sustainable development

The world is increasingly awash with information, with the trend only growing exponentially. According to one estimate in 2013, 90 percent of the data in the world was created in the previous two years alone, at an astronomical rate of 2.5 quintillion bytes per day (SINTEF, 2013; IBM, undated)¹. The proliferation of a dense ecosystem of technologies and a radical shift in the volume, variety, quality and speed of data generated on people, governments, economies and the environment has led to a salvo of new information (and techniques for its storage, access and analysis) without precedent in history. The resulting explosion of data is rapidly transforming every part of society, as it brings with it enormous opportunities—as well as challenges—to improve the livelihoods of individuals around the world.

Access to data has the potential to radically improve service delivery, public administration, and accountability by governments and businesses (Sachs, 2015). It can similarly be argued that releasing freely-accessible, standardized, and machine-readable government data can increase transparency and efficiency of governments, whilst fostering civic participation and promoting new opportunities. Members of the public can use this information to fight corruption and demand smarter, more efficient local public services through tracking progress made by governments, businesses and other agencies.

In fact, it is estimated that governments worldwide have already posted an estimated one million datasets on the Internet (IDRC, 2013). However, only a small fraction of these datasets are from developing countries. This hints at a dearth of knowledge in some parts of the world, despite a data deluge in others. In short, the data revolution is not evenly distributed. There are still people about whom very little is known and they tend to be the most marginalized, poorest and excluded (UN-IEAG, 2014). While some qualitative evidence shows that open data can stem corruption and increase accountability, much less is known about its impact in developing countries (IDRC, 2013). Evidence on the use, outcomes, and impact of data remains scarce, with little systematic record of emerging best practices in varying social, economic and cultural contexts. In this context, the key question is how to transform the data revolution into a sustainable development revolution, with accelerating progress towards ending poverty, ameliorating inequality, catalyzing social inclusion and combating climate change.

1. Harnessing the data revolution to monitor the Sustainable Development Goals (SDGs)

The potential of the ‘data revolution’ to contribute to development-related aims was highlighted by the High Level Panel (HLP) of Eminent Persons on the Post-2015 Development Agenda appointed by UN Secretary-General to advise on the global development agenda to follow the Millennium Development Goals (MDGs). The HLP report stated:

¹ According to IBM, this amount of 2.5 quintillion bytes of data produced daily comes from everywhere: “sensors used to gather climate information, posts to social media sites, digital pictures and videos, purchase transaction records, and cell phone GPS signals to name a few” (IBM, website, undated).

Better data and statistics will help governments track progress and make sure their decisions are evidence-based; they can also strengthen accountability. This is not just about governments. International agencies, CSOs and the private sector should be involved. A true data revolution would draw on existing and new sources of data to fully integrate statistics into decision making, promote open access to, and use of, data and ensure increased support for statistical systems” (UN 2013: 24).

With the subsequent adoption of the historic 2030 Agenda for Sustainable Development and the 17 goals and 169 targets of the Sustainable Development Goals (SDGs) in September 2015, a strategic opportunity was presented to realize the data revolution and demonstrate the centrality of data for development. Later in December of the same year, the Inter-agency and Expert Group on Sustainable Development Goal Indicators (IAEG-SDGs) submitted its report to the UN Statistical Commission (UNSC), which included a proposal of 230² global indicators to track progress on all the targets of the SDGs. This is expected to add significant burden to national statistical systems in all countries.³

The ambitious goals, targets and indicators of the SDGs require effective implementation, monitoring and accountability of development delivery at every level—from sub-national to global levels. This necessitates more evidence-based development policy-making and implementation supported by greater capacities for statistical production, better availability of robust data and strengthened accountability of development stakeholders. It also requires developing common norms, standards and methodologies in many new areas of measurement, as well as focused attention on the needs of developing countries, particularly those in special situations such as conflict and fragility. Taken together, strengthening data and statistical systems around the world is intrinsic to the successful achievement of the 2030 Agenda.

2. Launching a data revolution for the SDGs

In the aftermath of the call for strengthened statistical systems to track progress on a new, transformative development agenda in the HLP report, various events were convened to support and nurture the nascent data revolution for the SDGs. For instance, building on the outcomes of the first phase of United Nations Development Group (UNDG) consultations on Post-2015 development priorities, UNDP, in collaboration with several partners, convened a workshop in January 2014 focused on data and accountability for the post-2015 development framework. The meeting aimed to build bridges between various stakeholder groups active in the data constituencies and the

2 In March 2016, the United Nations Statistical Commission adopted a revised framework of 232 SDG global indicators. That number is expected to increase through a process of yearly refinement and periodical review adopted by the Commission.

3 This is in contrast to the 60 indicators comprising the MDGs, 44 of them monitored at the national level.

development world, from the local to the global levels, to foster a common understanding of the data revolution and explore its opportunities.

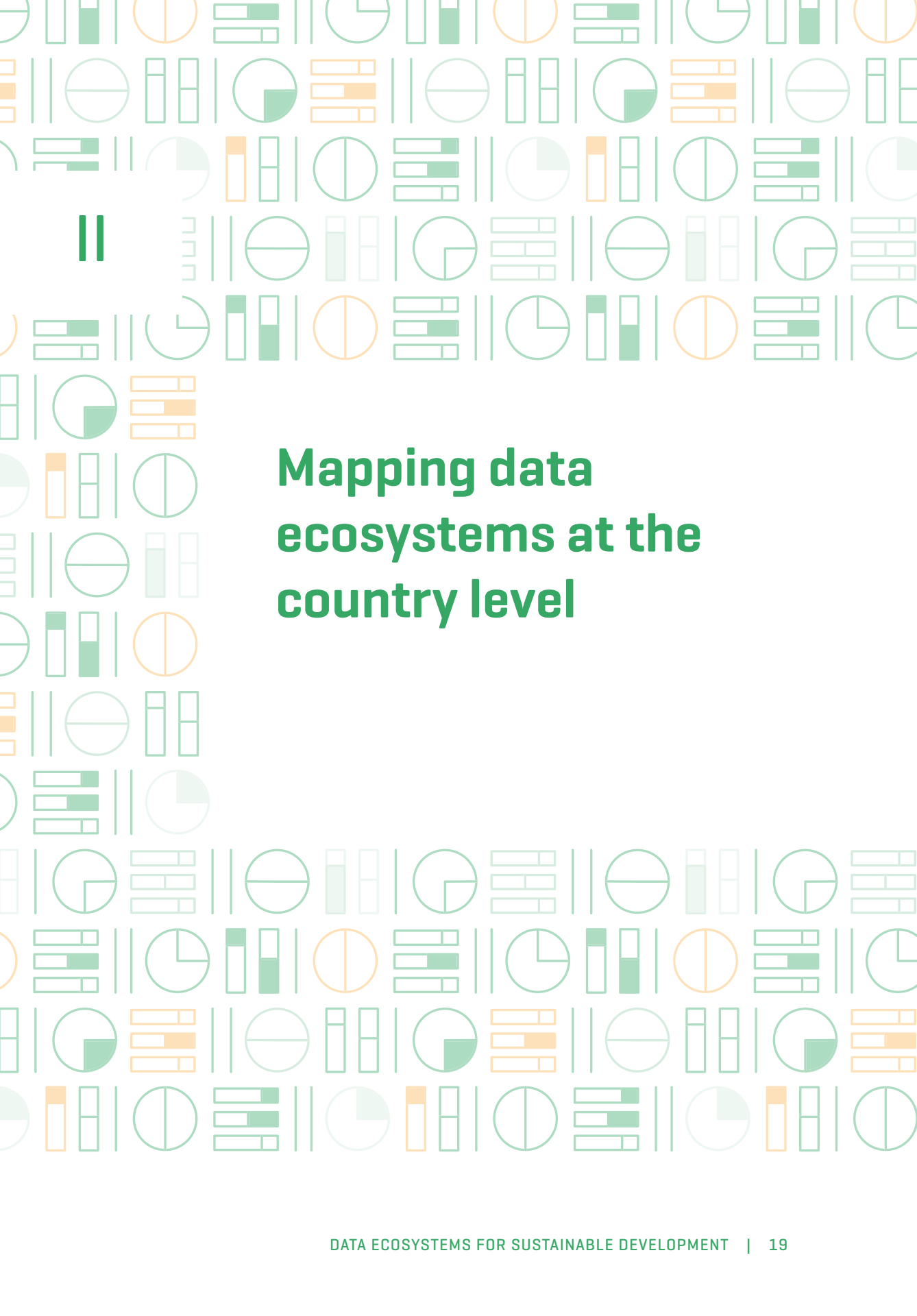
Later that same year in December 2014, the UN Secretary General's Independent Expert Advisory Group (IEAG) on the Data Revolution for Sustainable Development issued its report, *A World That Counts*, which called for the measurement of important aspects of people's lives and the environment to ensure nobody is denied the benefits of sustainable development. The IEAG suggested measures to close data gaps and strengthen national statistical capacities. It also assessed new opportunities linked to innovation, technological progress, and the surge of new public and private data providers.

At its 46th session in March 2015, the UN Statistical Commission acknowledged the importance of a systemic approach going beyond official statistics in measuring development progress. At a continental level, the African Union Commission Conference of Ministers of Finance and Economic Planning adopted at the same time an "Africa Data Consensus" which introduced the concept of "data communities" interacting with one another in a "data ecosystem" to achieve the data revolution.

In April 2015, UNDP, jointly with co-organizing partners the Overseas Development Institute (ODI), Centro de Pensamiento Estratégico Internacional (CEPEI), Africa Gathering, Partnership for Statistics in the 21st Century (Paris21), Data-Pop Alliance, and the United Nations Population Fund (UNFPA), convened the Cartagena Data Festival in Colombia. The main objective of the event was to contribute to global efforts on strengthening the use of data for the implementation of the post-2015 development agenda, by bringing relevant stakeholders—for example, thought leaders, innovators, experts and donors—together to drive the needed changes, identify concrete solutions and tools for progress and promote innovations and partnerships to monitor the SDGs. Nearly 500 people from all sectors converged in Cartagena to discuss topics such as accountability and citizen engagement, data disaggregation, big data, official statistics, and data journalism.

Finally, July 2016 was another watershed moment in the calendar for data and statistics for sustainable development. During this month, the first national voluntary reviews by 22 countries took place at the High-level Political Forum (HLPF) under the United Nations Economic and Social Council (ECOSOC), coinciding with the release of the first SDG progress report based on the initial global indicator framework.⁴

4 The Sustainable Development Goals Report 2016, <https://unstats.un.org/sdgs/report/2016/>



||

Mapping data ecosystems at the country level

UNDP has engaged in several new initiatives to scale up the data revolution, in line with its belief that the revolution goes far beyond statistics. At its core, it is about people—as users, producers, beneficiaries, and owners of data—who must be at the centre of accountability and participatory mechanisms for the 2030 Agenda and in turn be closely involved in the delivery of the new development agenda. To this end, UNDP has sought to facilitate solutions that ensure interaction, synergies and partnerships among different stakeholders, governments, civil society, international development organizations and the private sector that are grounded in perspectives of, and meaningful participation from, people of the global South. UNDP particularly helps in ensuring that development experience from the grassroots informs global discussions, and that the data revolution is actionable at the national level. As part of this drive, UNDP has most recently been supporting a mapping of the data ecosystems in six countries around the world — Bangladesh, Moldova, Mongolia, Senegal, Swaziland, and Trinidad and Tobago.

1. Purpose and objectives

The ecosystem approach entails a systematic assessment of official statistical capacity: the legal and policy frameworks in place for open data; obstacles for multi-stakeholder engagement across the data value chain, for implementing and monitoring of the SDGs; and entry points for future action. It further requires critically evaluating infrastructure requirements for improved collection, dissemination and use of data, including opportunities for taking advantage of new technologies for participation. The project's ultimate aim is to ascertain what data is currently available to measure the SDGs, whilst assessing the capacity and institutional upgrading required at the national level to track the 2030 Agenda. It is expected that this will provide clues as to what types of inputs are necessary from various stakeholders at the national and international levels to ensure the continued scaling up and improvement of data and statistical capacities around the world. This in turn is expected to inform UNDP's own data-related priority areas for future programming and implementation of the SDGs.

2. Methodology

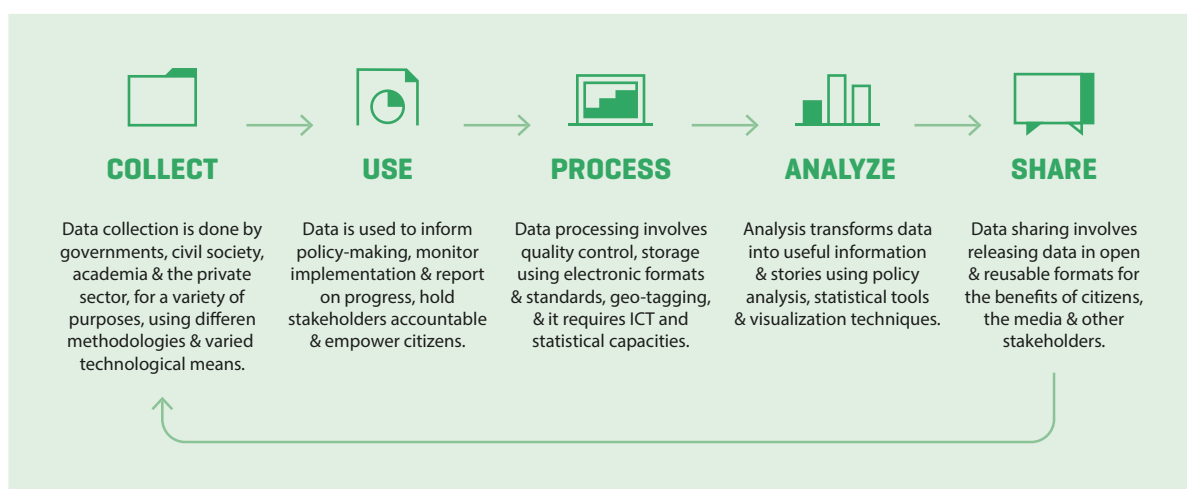
Each participating country of the data ecosystem mapping initiative—Bangladesh, Moldova, Mongolia, Senegal, Swaziland, and Trinidad and Tobago—reflects the variety of country perspectives across regions, income levels, and typologies.

Many already have active potential partners and existing data communities that can be further supported, and have demonstrated demand for strengthening engagement on data for sustainable development.⁵ With some exceptions, pilot countries undertook several key activities at the national level to assess the scope for, and obstacles against, multi-stakeholder engagement on data for the implementation and monitoring of the

⁵ This demand has been apparent from their participation in the follow-up to the UNDG Dialogues on post-2015 implementation, particularly on capacities and institutions and participatory monitoring for accountability; the leadership commitment shown in several inter-governmental processes; demand from UNDP country offices; and synergies and complementarity shown with other data revolution efforts such as the World Bank's Open Data Readiness Assessment, Paris21's Roadmap for a Country-led Data Revolution, Southern Voice's Data Test and Civicus's Data Shift.

SDGs; official statistical, analytical and technical capacity building at the level of institutions; policy formulation and human resources (including the regulatory framework for the production, use and dissemination of data); the role of innovation and new technologies; and infrastructure requirements for improved collection, dissemination and use of data. Whilst most countries broadly reviewed their data framework, some honed in on particular areas: in Bangladesh, the assessment focused on SDG 16 on peaceful societies and the statistical capacities in place to measure progress towards this goal. In Mongolia, a major case study of the health sector was featured. Thus, while some conclusions are generally applicable across the data ecosystem, some will apply only to particular sectors.

Figure 1 The Data Value Chain



The assessment consisted of completing all or a combination of a) a literature review of existing reports, laws and regulatory frameworks to capture the data landscape in the country, including key stakeholders, relationships, frameworks and data processes; b) stakeholder surveys; c) interviews with key counterparts; and d) workshops with stakeholder groups to capture their experiences and perspectives in using or producing data to identify opportunities for collaboration across constituencies.

These activities culminated in the drafting of a national report for each country. Overall, the country reports⁶ attempted to present a mapping of the existing components of national data ecosystems, whilst addressing systemic challenges that hamper the full realization of the data revolution and recommending actions for follow-up. These reports also form the basis for the analysis in the following sections.

⁶ National reports for each country are available at: <https://www.worldwewant2030.org/Data-Accountability2015>

3. Global workshop on data ecosystems for sustainable development

UNDP convened a global workshop on 20-21 June 2016 in New York, which brought together UN and government representatives from each of the data ecosystem pilot countries, as well as data revolution advocates and champions from academic institutions, civil society groups, think tanks, philanthropic organizations, the private sector, and national planning and statistical departments of several countries around the world. Representatives of the pilot countries, along with data advocates and representatives from additional countries, with accrued knowledge in decentralized and disaggregated data collection and analysis, were brought together to:

- Present and discuss findings of data ecosystem mapping project;
- Showcase initial country-led efforts to design integrated national SDG monitoring frameworks;
- Exchange knowledge and learn from the experience and perspectives of other countries and stakeholders spearheading the data revolution; and
- Reflect on potential next steps for designing and implementing inclusive and participatory national statistical systems for implementing and monitoring the SDGs.

Discussions at the workshop covered a range of issues related to data ecosystems. Several themes were common across countries, notably, the need to improve and promote a) **coordination** between line ministries and national statistical offices (NSOs) as well as between official producers of data and non-official sources; b) **collaboration** and partnerships across and between all stakeholders; c) **funding** for statistical and data systems, including data management processes; d) national **legislative frameworks**, particularly around open data and how it is utilized; e) **incentives** to unlock access to data and other information that are already being collected by various ministries; f) technology and knowledge **exchange** through greater South-South cooperation; and g) **open access** to data, whilst also protecting data privacy. These points, amongst others, were raised in the context of how to improve the capacities of national statistical systems around the world, whilst also increasing participation in these systems by non-official data producers, such as the private sector and civil society groups. The workshop concluded with a set of recommendations for governments and external stakeholders such as UN agencies, for strengthening data ecosystems at the national level⁷.

⁷ For a more comprehensive account of the key messages and outcomes of the global workshop on data ecosystems, please refer to the workshop report, available at: <https://www.worldwewant2030.org/node/539228>



III

Elements of an inclusive data ecosystem: key findings

The data ecosystem mapping exercise across the six pilot countries of Bangladesh, Moldova, Mongolia, Senegal, Swaziland, and Trinidad and Tobago, found that each country had different capacities, processes, policies, and even national priorities related to the collection, use and analysis of data and statistics. However, several commonalities were also found, in amongst the variance. Each is described in detail below.

1. Data availability for SDG indicators

As a first step, many of the pilot countries of the data ecosystems mapping project undertook a review of the data currently available to track progress on the SDGs. They also attempted to prioritize the goals and indicators that have the most relevance within their country context. Thus it was found that:

- In **Bangladesh**, of the 241 SDG indicators, 32 were deemed to not be relevant for the Bangladeshi context, as they are either not applicable at the country level or have not yet been finalised. Of the remaining 209 indicators, data for 128 indicators (61.2 per cent) is available (either readily or not readily). Of these 128 indicators, data is not in a readily available format for 51 indicators and will therefore need to be produced from existing information. Of these 51 indicators, 30 require estimations to be made using various administrative records. Moreover, data needs to be made available at disaggregated levels for many of the proposed SDG indicators. In addition to this, Bangladesh carried out an in-depth study of data available for SDG 16. It found that out of the 23 indicators of SDG 16, data is readily available for only five of these. For nine indicators, data is not readily available but can be computed from existing sources. Data is not available for seven indicators.
- In **Moldova**, a review found that 211 out of 230 global SDG indicators⁸ are relevant for the country. Data is unavailable for 50 percent of these indicators and only partially available for a further 17 percent. However, data for 33 percent of all SDG indicators is fully available.
- In **Mongolia**, previous assessments concluded that 228 SDG indicators out of 241 are applicable in the country. Of these 228 indicators, data for only 71 indicators exist at the national level, while it is inadequate for the remaining 157 (69 percent). In fact, there is a lack of data for approximately 50 percent of the indicators of 17 SDGs. It was recommended data collection efforts should be focused on the areas of governance, economy and environment which offer “quick win” opportunities to build on existing data collection mechanisms.

⁸ Note that of the 241 indicators of the SDGs, nine were repeated separately under twenty targets. As such the number of unique indicators is 230. As of March 2017, the official list of SDG Indicators has been revised to a total of 244 indicators, 232 of them unique.

- In **Senegal**, seven SDGs are considered high priority, namely SDG 6 on water and sanitation, SDG 15 on terrestrial ecosystems, SDG 1 on poverty, SDG 2 on hunger, food security and nutrition, SDG 13 on climate change, SDG 7 on energy, and SDG 4 on quality of education.
- In **Swaziland**, 16 SDGs were prioritized (all but SDG 14 on life below water). While an assessment of available data for related indicators do not seem to have been performed, particular targets for goals were prioritized.
- In **Trinidad and Tobago**, it was reported that data is available for the ‘majority’ of indicators that comprise the SDGs. However, it was not possible to determine the quality and currency of the data that may be available given time and resource constraints.

The quick snapshot of national priorities and existing data availability indicates that most of the pilot countries already have some capacity in their current statistical frameworks to track at least several indicators of the SDGs. However, every pilot country requires more and better data to measure the remaining indicators of the SDGs that have not yet been incorporated into its national statistical framework. This necessitates further research and assessment of national statistical systems, as well as a review of the potential of non-traditional sources of data. The following analysis attempts to summarize the main areas of strength and weakness across countries using the key categories of stakeholders, capacities and institutions, processes, policies, and regulations and infrastructure.

2. Mapping data stakeholders

Data stakeholders are constituencies that hold a special interest in data, such as data producers (those involved in generating or collecting data), data users (those who process and analyse data for various purposes), intermediaries (those who digest raw data into usable information and disseminate it), and data objects (those whom the data is about). It might also include “data buyers” (those who commission and pay for data collection, and those who bankroll data for development efforts). They may be further classified by special interest (i.e. open data), thematic area (i.e. water and sanitation, gender, youth) and/or professional group (i.e. statisticians, journalists). Accordingly, each of the pilot countries undertook an assessment of the active data stakeholders within the country.

In Bangladesh, it was found that government entities, policy-makers, academics, the research community, CSOs, development partners, the private sector, journalists and students were major users and producers of data. Whilst government entities and policy-makers use statistical information for shaping strategies and regular reporting, the research community and CSOs in Bangladesh make use of official data for research and advocacy purposes. Notably, the use of statistics by journalists has been expanding within the country.

Mongolia also carried out an extensive review of traditional and non-traditional stakeholders as part of its data ecosystem mapping. It identified and assessed four different categories of non-traditional data sources, including: a) sensors and devices, b) social media platforms, c) Voice Over Internet Protocol (VOIP) and d) enterprise data. It was argued that the government and the private sector could leverage each of these to help monitor the SDGs. The country assessment concluded that for the short and medium terms, enterprise data (sourced from the government of Mongolia, banks and telecom operators) has the most potential to contribute towards the monitoring of the SDGs. The importance of data derived from social media platforms was also flagged as a locus for future innovation. In the longer term, that sensor and machine data would become more important. Finally, VOIP data was not considered relevant in the context of the SDGs.

Figure 2 Identified data producers in Mongolia

IDENTIFIED KEY DATA PRODUCERS

ADMINISTRATION DB	ENTERPRISE DB	OTHER SOURCES
Mongolian Government/ Public sector <hr/> National Registration and Statistics Office <hr/> National Data Center <hr/> Bank of Mongolia <hr/> Ministries (Ministry of Population Development and Social Protection, Ministry of Finance, etc) <hr/> Local governments including Ulaanbaatar city council, provincial & rural centers <hr/> Agencies (Customs & Tax Authority) <hr/> Universities/Schools/Institutes <hr/> State companies & Regulation Committees <hr/> Hospitals <hr/> ... <hr/>	Private Sector <hr/> Mobile operators <hr/> Banks <hr/> Enterprises & SME <hr/> Media agents <hr/> IPTV providers <hr/> Private hospitals & pharmacies <hr/> NGOs, industrial associations and Research institutes <hr/> Mongolian National Chamber of Commerce <hr/>	Social Platforms <hr/> E-commerce platforms <hr/> Satellite images <hr/> Sensor & Machine data <hr/> ... <hr/>

In Moldova, the national report delineates between three categories: data producers, data holders and data users⁹. It further notes that “data collection can be an activity

⁹ Data producers in Moldova are defined as organizations / institutions that carry out the collection of data from respondents and undertake the processing, validation and dissemination of this information. This category includes the National Bureau of Statistics and the National Bank, amongst others. In contrast, data holders, by this definition, do not “collect data from the perspective of producing indicators, but proceeding from the duties of their activity, which amount to tracking the beneficiaries of services provided” (Moldova report). Finally, data users vary widely, but include everything from public administration using data for developing their strategic framework to the private sector, academia, mass media and the general public. In addition, the analysis from Moldova includes infomediaries in this category, who are considered data users who take or use statistical data for developing different analytical reports and case studies at the request of the beneficiaries.

carried out by any actor involved in the decision-making process... by the government and public agencies, civil society, academia and the private sector for various purposes of private and public interest and by using diverse methods and technologies.” In fact, their analysis of data availability by areas and stakeholders found that a large number of SDG indicators (150) are “in the possession of data holders or those institutions which are responsible for monitoring and evaluat[ing]... the SDGs (148), as compared to indicators in the possession of data producers (90).” Therefore, it is necessary to further delineate the role of each institution responsible for producing and reporting SDG indicators. Moreover, a survey of data stakeholders found that only 25 percent (29) of respondents identify themselves as data producers and 31 percent (36) as data holders, which in turn indicates that not all data producers are part of the official statistical system. The predominance of data holders indicates that there is a great deal of data in the possession of institutions or organizations that is not being fully utilized and made available to the public, the media, and decision makers.

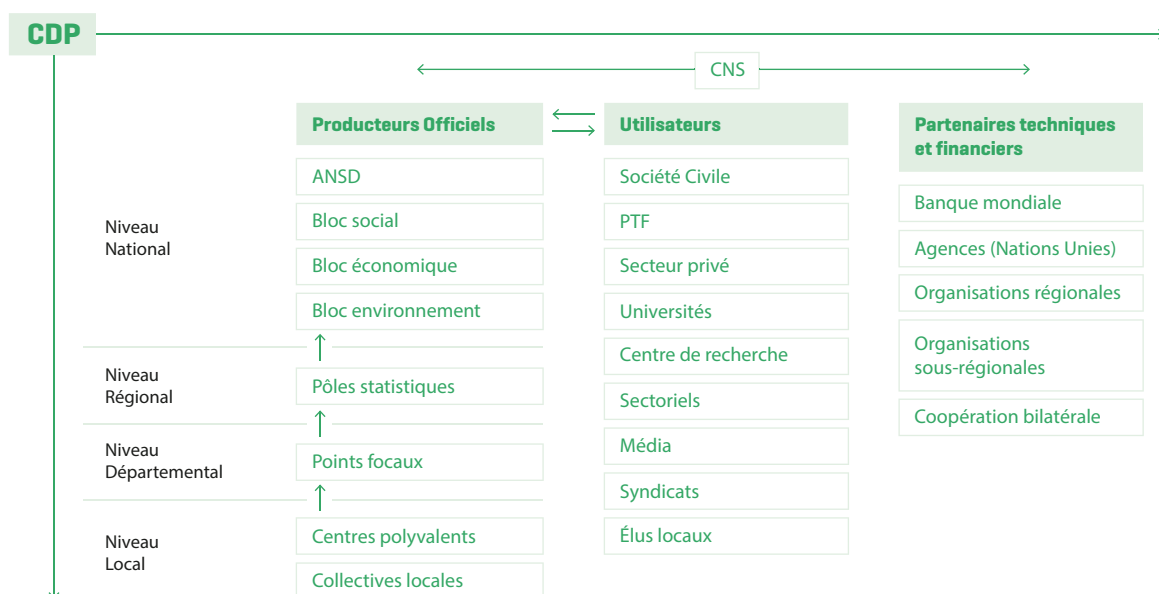
Figure 3 SDG indicators assessment from non-traditional data sources in Mongolia



Source: Mongolia country report

In Senegal, the 2008-2013 Master Plan for Statistics (NSDS, 2007) considered the production structure of data within the national statistical system. While the NSO is considered the main producer of data, other data providers in the country include consulting firms, companies, research institutes and NGOs. Meanwhile, data “users” as defined in Article 16 of the Statistics Act are: governments (i.e. policy-makers), regional and international organizations, non-governmental and business organizations, the media, researchers, and the public. It was found that the degree of collaboration between (official) data producers is “satisfactory.” However, real-time capacity needs to be strengthened, as there are often delays in the transmission and publication of data. Meanwhile, there is often no genuine collaboration among non-official data producers, in particular, civil society organizations. Finally, collaboration between producers and users was deemed to be low. In some regions within the country, users find it difficult to access the data they need.

Figure 4 Proposed national data ecosystem for the SDGs in Senegal



In Swaziland, stakeholder participation in statistical strategy design has historically been rather weak, with an over-reliance on consultants. However, a vibrant NGO sector exists in the country, which produces reports that would have “greatly enhanced the work of the NSS had these data been captured in a national repository”. An example of this is the data produced by World Vision Swaziland, which has been undertaking internationally respected studies and statistics on child survival, protection and development in the country. Finally, large private sector companies and the Standard Bank produce statistics, which tend not to be shared publicly.

In Trinidad and Tobago, a thorough assessment was performed of traditional data producers in the national statistical system (for example, the Central Statistics Office, the Surveys and Mapping Division, the Office of Disaster Preparedness and Management), as well as newer data producers.

Box 1 Philanthropy's role in strengthening data ecosystems

Many philanthropic organizations work in collaborative partnerships with governments, local foundations and the UN system to build existing data capacities, whilst addressing country-specific data issues and opportunities. Through the SDG Philanthropy platform, the Foundation Center works with local foundations, governments and national statistical offices to establish baseline principles for collaboration on data for development. This might include taking specific actions, from setting minimum acceptable data quality standards to addressing issues around security and accountability. From this basis, local data challenges and needs are assessed, which might include building capacities, upgrading data collection tools and ways to present data, as well as creating and nurturing a culture of data use across organizations. The initiative also facilitates discussions on how to best leverage existing technologies or build new technologies for data collection, use and sharing. These discussions often result in the joint development of a local data strategy involving philanthropic organizations and their partners, followed by a capacity-development workshop. In this way, philanthropic organizations can be instrumental in providing ongoing technical support and expertise to national governments to support the data revolution.

These include particular government departments and agencies (for example, the Central Bank of Trinidad and Tobago, the Customs and Excise Division and various ministries) that collect data for their own use as a result of an identified need or due to a perceived lack of timely provision of data from other organizations. In addition, non-governmental data producers were identified and evaluated, such as the Seismic Research Centre at the University of the West Indies, St. Augustine. Because the National Statistical System in Trinidad and Tobago faces several challenges in the provision of up-to-date and reliable data, the government has recently committed to establishing an independent National Statistical Institute (NSI), which will have the legal mandate to ensure cooperation from all data-producing stakeholders.

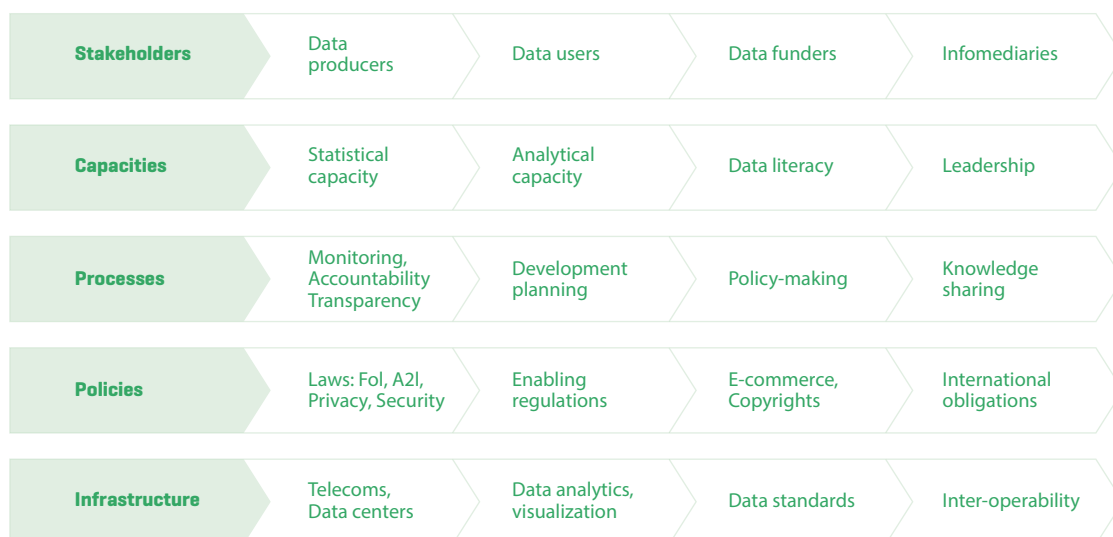
Overall, each of the reviews on stakeholders focused on slightly different categories of data communities: for instance, while Bangladesh was primarily concerned with traditional, government sources of data, the study from Mongolia was more strongly focused on the possibilities of deriving data from non-traditional sources such as the private sector, social media platforms and enterprise data. One of the major concerns flagged in Trinidad and Tobago was the importance of sustaining the capacity of local experts in key agencies responsible for supporting the data ecosystem.

The categories of data funders and infomediaries were relatively less explored across countries. However, the potential for greater collaboration between traditional and non-traditional data sources was discussed in some detail. In most countries including Bangladesh, Senegal, Swaziland, and Trinidad and Tobago, the national reports claimed little evidence of strong collaboration¹⁰ and support amongst data stakeholders, particularly between official and non-official sources. However in Bangladesh, collaboration between different official sources appeared to be strong: while the Bangladesh Bureau of Statistics (BBS) remains the best equipped and most capable data producer in the country, it collaborates regularly with several official data producers including the Bangladesh Institute of Development Studies, Bangladesh Bank, the National Board of Revenue, the Department of Agricultural Extension and several key ministries, such as the Ministries of Health and Family Welfare, Education, Agriculture, and Finance. However, the relationships are less regular and strong with other key government entities, particularly in the areas of environment, forestry, disaster relief and management, and primary education, which need to be more regular and further strengthened.

3. Assessing existing capacities and institutions

In addition to mapping the range of data stakeholders and how well they work together, all data stakeholders must be equipped with the right capacities to meaningfully engage along the data value chain, in order to fully realize the potential benefits of data for development.

Figure 5 Components of a data ecosystem



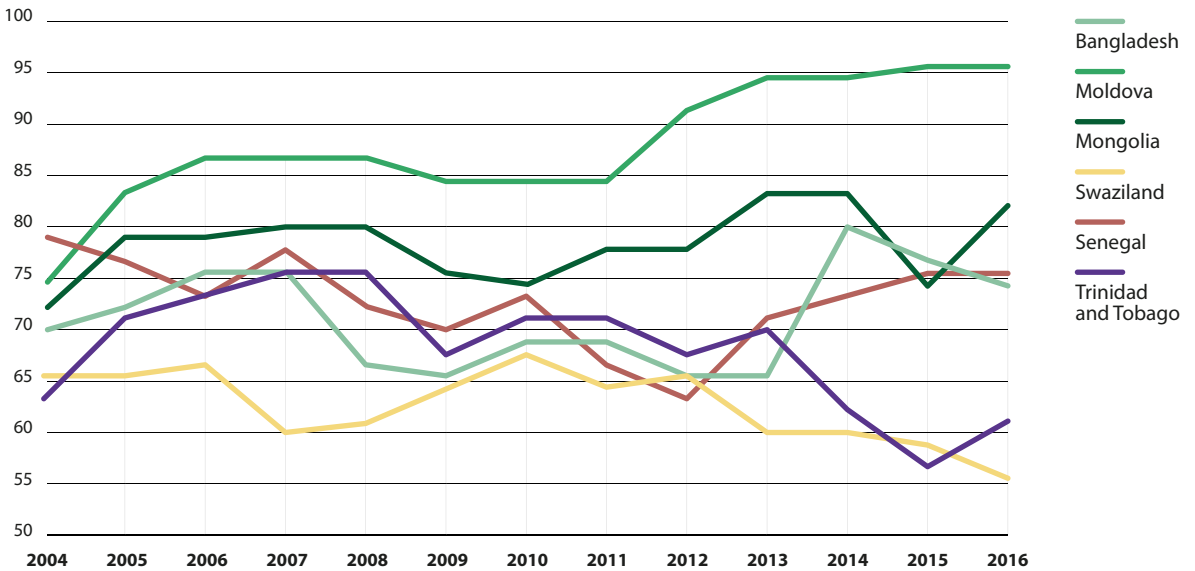
¹⁰ Collaboration in the case of Bangladesh refers to: methodological design, sample design, the design of questionnaires, data collection, data processing, report writing and data dissemination activities.

In addition to official statistical and analytical capacities in central government, this includes the capacities of parliament, the judiciary and local authorities, the private sector (including the ICT community), civil society and the media, as well as data literacy for the general public. Leadership is also an important capacity requirement for driving change inside and outside government. A key factor to assess in developing countries in particular is the sustainable availability of local capacity and expertise that would enable home-grown innovations and solutions.

The data ecosystem mapping initiative delineated several trends across countries in terms of improving capacities and institutions. Positive developments include the following:

Statistical capacities have significantly improved in some pilot countries since the adoption of the MDGs. Several of the pilot countries expressed a marked improvement in capacities since the MDGs were adopted in 2000. In Bangladesh, for example, new surveys and initiatives on data production were established and existing surveys were conducted with more regularity in order to track progress on the MDGs. A number of programmes to improve data-related capacity were also introduced. This was complemented by improvements in data availability, quality assurance and the timeliness and accessibility of data. Efforts have also been made to improve dissemination of data through the use of ICTs.

Figure 6 Progression of statistical capacity in pilot countries



Source: World Bank Statistical Capacity Indicator Dashboard

Some progress is being made within national statistical offices and other government entities to improve technical capacities and publish data periodically. In Bangladesh, for example, the BBS prepared a National Strategy for the Development of Statistics (NSDS) covering the period between 2013 and 2023. The strategy identifies a

number of time-bound actions, though is contingent on proper implementation. Aside from the BBS, a number of other government entities also undertake various activities to upgrade their respective statistical systems and to publish available data. For example, the Bangladesh Bank recently released time series data on several macroeconomic indicators and the Ministry of Finance provides long-term annual data on several other macroeconomic indicators through its regular publications. In Trinidad and Tobago, ongoing data initiatives have resulted in the digitization of the land registry of the Registrar General's Division, the upgrading of the Cadastral Management System at the Surveys and Mapping Division and the digitization of charts and records at the Meteorological Services of Trinidad and Tobago.

Tertiary level academic programmes in some countries have begun offering programmes that specialize in statistical and spatial data analysis, as well as other related specializations. In Trinidad and Tobago, for instance, the human capacity to support a functional data ecosystem is present as several academic programmes are locally offered by various tertiary level institutions. They provide needed training and personnel in statistics, spatial analysis, information and communications technologies, geographic information systems and other related specializations. Meanwhile, in Senegal the reform of the NSS gave birth to ENSAE (National School of Statistics and Economic Analysis) which was created within the National Agency for Statistics and Demography (ANSD) in 2008. ENSAE issued certificates in data collection technology, operations management collection and survey mapping, amongst others. These certificates will be required in the near future for the recruitment of field staff for the ANSD. It should be noted that training in statistics also occurs in other schools and universities in Senegal and other African countries.

However, in spite of the progress made across countries, there is still an urgent need to strengthen institutions and improve the quality of data in order to meet the demands of the 2030 Agenda. Some key areas of concern include the following:

Most pilot countries reported inadequate human resource and analytical capacity within statistical offices. While basic human resources for statistics is available, most staff engaged in the production of official data were found to lack essential training to carry out data processing and analysis in the context of changing technology and greater data flow. In Senegal, for example, more than half of the official producers (54.5 percent) considered the current level of capacity building of staff insufficient. Official statistics producers tend to not have high capacity computers and over a third (36.4 percent) do not have access to a data processing office or 'data center.' In Trinidad and Tobago the Central Statistical Office (CSO) has the capacity to support statistical analysis but lacks the capacity to undertake more in-depth analytical and visualization activities. In addition, there is a lack of specialized personnel for processing specific types of data or addressing particular problems with statistical data. For example, a survey in Trinidad and Tobago found that more than 70 percent of the organizations surveyed had three or fewer statisticians and data management professionals. In addition, many government organizations, including the CSO, reported a lack of adequately trained and experienced staff. An additional concern was that many of the government organizations which produce data have been operating on outdated organizational structures estab-

lished decades ago. This has led to underemployment, unfilled positions, incorrect designations and to the hiring of high numbers of external contract workers, which have in turn contributed to limited capacity at the Central Statistical Office to conduct in-depth data analysis. The country study from Mongolia, meanwhile, found that there was insufficient training on new software and IT programmes; insufficient education levels of statisticians and data workers, particularly in rural areas; high personnel turnover rates; inadequate incentive structures, including low wages, for some staff such as IT professionals or statisticians who work across ministries. The country study from Swaziland also cited limited human resources in the NSS as one of the causes of low and stagnate statistical capacity within the country.

There tends to be low levels of data literacy amongst the general population across countries. The lack of readily available data has led to reduced requests for data in some countries, which has in turn resulted in the absence of a culture of—and use of—data. Thus, for example, research from previous studies found that many people in Trinidad and Tobago might not be able to analyse the data even if it is provided to them.

Survey and data questionnaires have not been upgraded periodically. In Bangladesh for example, it was found that the BBS conducts few regular surveys and the data generated by other government entities is inadequate in terms of procedures, methodology, timeliness, coverage and quality. Often the data is not reliable, representative or comparable.

Data collection does not always comply with international data standards: For example, while international standards are used to collect statistical data in Trinidad and Tobago, agencies that are part of the national statistical system do not always adhere to these standards and in some cases have devised their own standards. The Trinidad and Tobago Bureau of Standards, the agency authorized to develop and implement such standards, has not adopted or developed national standards with respect to statistical and geospatial data. Additionally, there are no metadata standards or even metadata for most data sets in Trinidad and Tobago. This has led to challenges in the sharing and use of data for most stakeholders.

4. Evaluating processes

Stakeholders interact with one another in processes for which data plays a key, and sometimes central, role. These processes include accountability (rights holders need information in order to hold duty bearers to account), participation and inclusion (people must have a voice on which of their data is used and how, data must be disaggregated to ensure nobody is left behind), development planning, implementation and monitoring (policy-makers need data to inform their decisions, SDG indicators must be measured), knowledge sharing and dissemination. These processes may be triggered or enabled by relevant laws and regulations. The implementation of the development agenda at the national level further entails interaction, consultations and commitments between international development agencies and national counterparts. Some key insights from the pilot country studies include the following:

There tends to be low levels of data coordination and information sharing. Nearly all the pilot country studies concluded that while many governments departments are involved in the production of data (in addition to NSOs), this is not coordinated effectively, leading to duplication of tasks and varying quality of data. For example, in Trinidad and Tobago, no single agency is presently vested with the responsibility of leading the coordination of the national effort to implement a functional data ecosystem, particularly with respect to statistical and geospatial data. Instead, 65 separate government agencies are involved in collecting data, with few inter-departmental Memorandum of Understandings (MOUs) or agreements to collaborate or work together. In Moldova, it was suggested that greater “resource channelling” should entail delegating some responsibilities specific to data processes to a single institution, so as to avoid duplication of certain activities and reduce the burden of reporting. In Swaziland, the national assessment reported low levels of coordination and information sharing in the NSS. This is reflected in the lack of mechanisms for user-producer dialogue and inadequate mechanisms for data producers to meet on a regular basis to share their programs and jointly identify gaps in data required by users. In addition, coordination between sectors and the Central Statistical Office was reported to be at best weak and not meeting sector expectations. Finally, coordination between official and non-official data stakeholders is non-existent. The resulting lack of coordination of roles and processes has meant that most government departments work in isolation from each other except in a few instances where they have collaborated due to mutual need. For example, in Trinidad and Tobago the National Spatial Data Infrastructure (NSDI) Council was established in 2014 and a National Task Force in 2016 to implement the National Statistical Institute by 2017. In Bangladesh, the BBS has signed formal data exchange protocols with several local, regional and international organisations and development partners.

Coordination of donor assistance is often lacking. In spite of a large presence of external donors in some countries, there are sometimes no formal partnerships and coordination mechanism among donors and between them and the government. For example, in Swaziland, in the past some donors funded statistical activities to collect specific data without assessing what other statistical activities were taking place in the country. This has sometimes led to the distortion of national priorities for statistical development and such assistance may not achieve the lasting impact it might otherwise have had, were it to be coordinated. There is also lack of public-private partnerships, and limited space for civil society in Swaziland. Information asymmetries on activities by development partners in the country make it difficult for government to plan and budget, and for donors to harmonize their interventions.

Many existing data-related processes, particularly with respect to documentation, are outdated and many government agencies and departments have not incorporated available technological solutions to preserve information and knowledge. Many government departments have not adequately documented systems in place for describing the processes used in data collection, processing, analysis, dissemination, storage and data backup. In Trinidad and Tobago for instance, due to the general absence of documenting what occurs, how it occurs and what standards and specifications are used when undertaking a task, it is a challenge for organizations to easily account for their activities, review lessons learned and to provide transparency for



Source: Cartagena Data Festival, April 2015

stakeholders to access data and information (for example, through providing information on websites for download) when required. This can lead to a culture of ‘gatekeeping’ wherein existing data is shelved or hoarded for lack of use (see below).

Moreover, experienced and knowledgeable personnel take valuable knowledge with them upon retirement or transfer to another organization

In some cases, data that has already been collected is ‘shelved’ or remains unused or is not shared with statistical offices. In Mongolia, consultations with stakeholders and review of existing data in the health sector indicated that a tremendous amount of data is currently “shelved” within computers at *soum* (town), *khoro* (sub-district) and district level hospitals, as well as in private health institutions. Meanwhile, government (sectoral) agencies might also resist the urge to transmit their data to a central coordinating agencies, leading to the retention of information in certain sectors (Senegal). This in turn exacerbates the problem of multiplying initiatives to collect the same data, which in turn leads to uncoordinated data processing.

There is a lack of incentives for different communities of data stakeholders to share information (Mongolia, Senegal, Trinidad and Tobago). This also contributes to a prevailing culture of hoarding information within certain government departments. At other times, agencies may share data but only for a fee (as is the case with several

government departments in Trinidad and Tobago, and Mongolia). There may also be insufficient buy-in and awareness of the necessity to share information with the public — or even between government departments — which in turn precludes open sharing of information and collaborative partnerships.

Little impactful statistical advocacy takes place in sectors and across the NSS in many countries at the high policy and political level. Nearly every pilot country pointed to the lack of leadership and data champions to highlight the role of statistics as a strategic resource in planning, decision-making and good governance. In Swaziland, statistical advocacy work was deemed particularly important for high governmental levels as the under-appreciation of data often results in a “vicious cycle” of statistical under-development. It was suggested that policy-makers need more of an understanding of how to make better use statistics, and be encouraged to provide appropriate financial allocations in national budgets. In Trinidad and Tobago, the need for data champions and public advocacy campaigns on the value of data and evidence-based decision-making was underlined.

5. Reviewing existing policies and regulations

The legislative framework constitutes a critical enabling factor for the data ecosystem, as it mandates or restricts the use of data and defines the boundaries of such use in accordance with the societal values and priorities of each country. Some strides have been made in this regard:

Many of the pilot countries already have some legislation in place regulating the collection and use of data. In Trinidad and Tobago, for instance, several pieces of legislation have been enacted to govern various aspects of the data ecosystem, including issues such as freedom of information, copyright, privacy, protection of personal and financial information, data dissemination, statistical data collection, e-commerce and computer misuse. Some examples include the Statistics Act of 1952, which established the Central Statistical Office (CSO), the Freedom of Information Act of 1999, the Data Protection Act of 2011, which established the Office of Data Commissioner, and the Electronic Transactions Act of 2011, amongst others. In addition, legislation enacted to create local government bodies also provides for the collection of statistical data. Meanwhile, Senegal passed its Law 2004/21, which stipulates the organization of the NSS and the terms of production of statistical data, as well as the coordination of the sector at the national level, in July 2004. This law defines, for the first time, the concept of national statistics and outlines the institutional framework governing the activities of public and parapublic organizations responsible for producing and disseminating official statistics. It also mandates access, free of charge, to the processed information to all users. Moldova has a strategic framework for the development of statistics. The National Bureau of Statistics, established as the core of the centralized national statistical system, operating under a Law on Official Statistics, is empowered to organize and manage all statistics activity in the country, along with other public institutions involved in the production of official statistical information.

Several initiatives have been launched across countries to open access to data sources and facilitate free dissemination of statistical data through portals dedicated to open data. In Senegal, the National Agency of Statistics and Demography (ANSD) launched several open data initiatives. It participates in a program launched by the African Development Bank (AfDB), called 'Open Data for Africa,' which is a portal that confers free access to statistical data and provides users various indicators over time that can be used as a basis for a comprehensive national analysis. A separate web-based portal called Stat-GIS or Geographic Information System Statistics has also been launched on the ANSD website, whilst the National Geomatics Plan is working to develop another interactive portal to enable access to geotagged data on the territories of Senegal. Added to this, the National Statistical System web portal publishes statistical data on various topics from government departments. The National Archive of Senegal

Box 2 Piloting an open data platform in the Ulaanbaatar City Administration in Mongolia

Ulaanbaatar City Administration's IT department carried out a project to create a big/open data platform aiming to cover all 65 agencies of the city. This platform was designed with the aim of becoming the singular place for accessing all city-related data. The project took place within a year, wherein a big data platform based on Hadoop technology, as well as an open data platform based on CKAN technology was launched. The project ended up covering only 10 entities out of the city's 65 agencies. The implementation of the project revealed valuable insights into what kinds of challenges are present for the Mongolian government if the government chooses to implement the same project at the national level. Key constraints included: a) a lack of understanding and support at the decision-making level; b) poor data quality; and c) a lack of standardization.

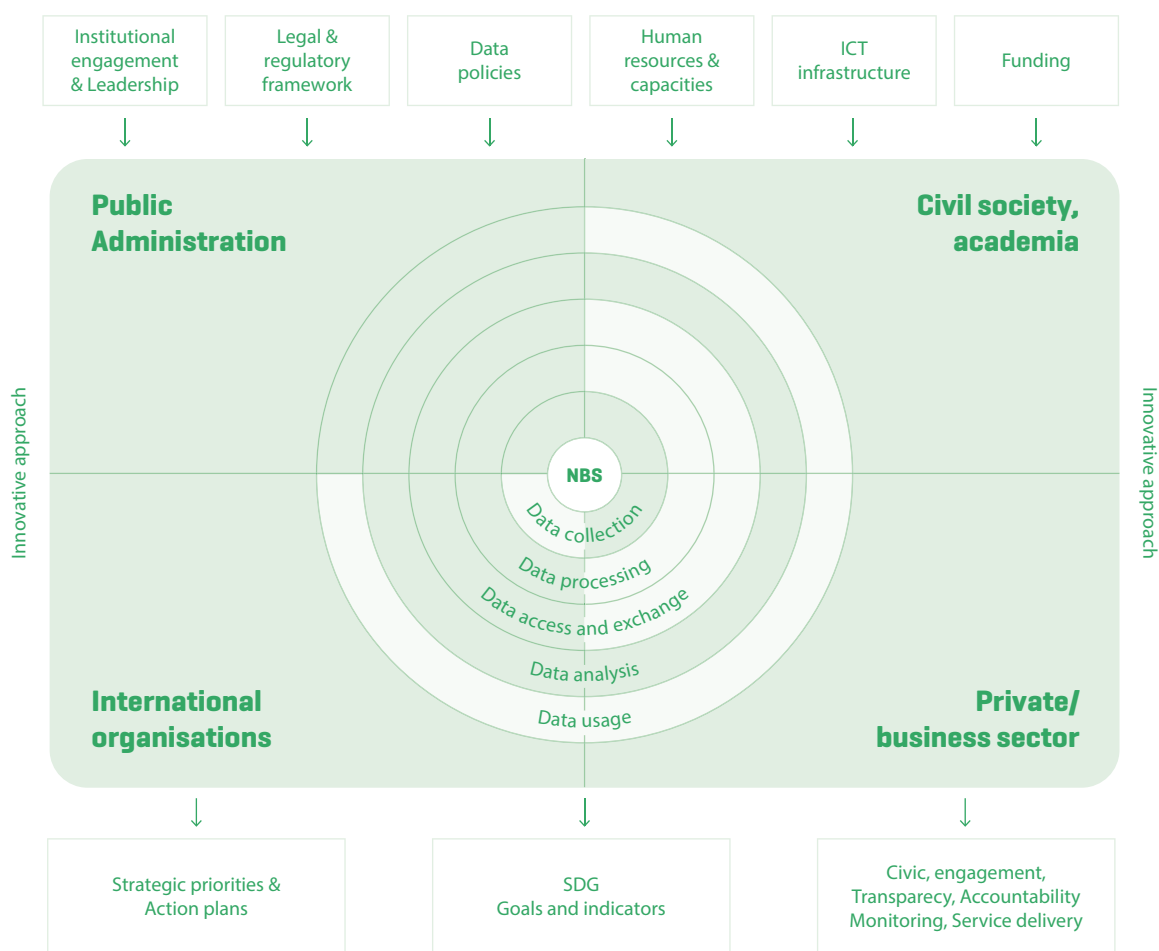
Source: Mongolia country report

(ANADS) publishes micro data and metadata from several surveys and censuses. A pilot program called D4D (Data for Development) has also been launched to promote open data. Meanwhile, Mongolia has been a member of the Open Data Partnership (OGP) since 2013 and subsequently carried out open and big data projects within venues such as the Ulaanbaatar City Council (see box 2). Trinidad and Tobago is also party to several international initiatives that support transparency in governance. These include the Open Government Partnership (OGP) and the Open Data Initiative amongst others.

These reforms have led to significant progress in facilitating the collection and dissemination of data in important sectors such as education and health. However, several challenges and gaps continue to hinder the use and availability of data across countries and within particular sectors such as governance, justice and environment in the case of Senegal. The key gap across countries relates to the need for even more comprehensive legislative frameworks and policy environments to ensure the achievement of the SDGs. Specific bottlenecks to address include the following:

There are gaps in legislation in key areas related to data collection by non-traditional sources, sharing of data amongst data stakeholders and compliance. In Moldova, for example, under the law on official statistics there is currently no clear procedure for conferring non-traditional agencies and authorities involved in data production with the status of ‘producer of official statistics.’ In Trinidad and Tobago, a lack of a clear national policy on data sharing has resulted in organizations operating without a written policy. Conversely, they have sometimes developed policies that contradict those of other government departments.

Figure 7 The Data Ecosystem Model in Moldova



Source: Moldova country report

This has frustrated users’ ability to access data in a standard and easily usable form. In addition, some major stakeholders in the data ecosystem in Trinidad and Tobago have been established by Cabinet decision. As a result, they do not have enabling legisla-

tion to support their operations, and the Central Statistical Office (CSO) cannot demand compliance from them in the provision of data or support to the organization. Finally, in Swaziland, the Swaziland Statistics legislation (which pre-dates the UN Fundamental Principles of Official Statistics) does not provide for, among other things: the establishment of the professional independence and objectivity of official statistics; authority for the head of the CSO to coordinate the NSS and promote data quality in national statistics, to determine the scope of official statistics, concepts, definitions, methods and choice of data sources and to release suitable micro data; coordination among data producers to minimize duplication of effort and avoid production of conflicting data; and equal and simultaneous access to statistical data and information.

Some government departments have deep-rooted bureaucratic resistance to change. Officials in some countries felt that they may not have the authority to adopt new policies without having to undergo a long and trying process. Compounding the problem is the perception that the heads of agencies and divisions have little discretionary authority to implement new policies. In addition, some government agencies within countries, such as Trinidad and Tobago, have expressed the belief that data should only be shared with other government organizations and not with the private sector and the general public. This makes the design of a national data sharing policy a challenge. Finally, even where relevant policies may be in place, their implementation is sometimes hampered by inadequate institutional structures, missing or inappropriate standard operating procedures, financial constraints, capacity deficits, and lack of buy-in and ownership.

There are often unclear or inadequate data dissemination strategies across countries. There are several means by which data may be distributed—through printing hard copy publications, CDs, DVDs and most accessibly, publication on interactive websites. In Bangladesh, while the BBS regularly publishes the *Statistical Yearbook*, *Statistical Pocketbook*, *Monthly Statistical Bulletin*, *Yearbook of Agricultural Statistics*, *National Accounts Statistics* and *Foreign Trade Statistics*, the BBS website is arguably neither interactive enough when compared to global standards nor user-friendly. Notably, the website provides metadata for many but not all indicators. Furthermore, information on how data is collected and compiled for most indicators is provided only in printed publications and in some cases, processes are not adequately clarified, making interpretation difficult. This is also true of data published online by other government entities: it tends to be inadequate and published infrequently and in formats that are not user-friendly. In some countries, data is only available after payment: for example, some ministries in Trinidad and Tobago have made data sets available online for a cost. In Swaziland, many national data stakeholders generate data mainly for internal use and without consideration for the needs of other data users. Therefore, few agencies disseminate data for external use. Most sectors in the country also bemoaned the lack of annual statistical reports and limited use of websites to disseminate information.

Data producers sometimes display varying knowledge and use of the regulatory framework. In some countries, despite the existence of a legislative framework, many stakeholders, including official producers, continue to be unaware of the existence and reach of these regulations. For instance, in Senegal 17.6 percent of official producers

report being unaware of the legislative framework. Moreover, almost half of all official producers (44.1 percent) are unaware of the existence of a regulatory body that oversees compliance to statistical standards and data exchange. Meanwhile, a very large 67 percent of informal producers report not being aware of the existing regulatory framework. However, this trend is not uniform across all countries: survey results from Moldova indicate a high level of knowledge among data community stakeholders with reference to the legal framework on access to data (90 percent of respondents), and of the acts governing data protection (86 percent).

At the national level, there is often unorganized and/or inadequate provision of resources to statistical systems. The report from Trinidad and Tobago pointed out that while the government is the single most important source of funds for supporting the data ecosystem, budget allocations for data management activities does not occur in a deliberate or coordinated manner. The resulting competition amongst government ministries and organizations to source funding has in turn led to a climate of “personal ownership of resources”. Consequently, collaboration and mutual support between government-based data stakeholders may be lacking. Meanwhile, the sheer lack of financial resources has been flagged as one of the reasons for low and declining statistical capacity in Swaziland. In Senegal, it was simply noted that regular conduct of statistical operations (censuses and surveys) requires substantial funding.

6. Infrastructural capacities and needs

One of the keys to the data revolution is a robust ICT infrastructure. Specifically, the question of what ICT products and services are available across countries to support and enable the data revolution for all stakeholders—from data producers to users, funders and infomediaries—is an important one. To this end, several countries have invested in a robust ICT infrastructure. Key findings from the ecosystem mapping exercise are listed in brief below:

The ICT infrastructure has improved on the whole across most countries. For example, Trinidad and Tobago has developed a relatively modern and robust ICT infrastructure, with mobile penetration at 140 percent and 63.8 percent of the population having access to the Internet (TATT, 2013; World Bank, 2013, quoted in Trinidad and Tobago national report). There are two main telecommunication carriers in the country and the infrastructure for supporting access to the network is adequate to meet the needs of most stakeholders (TATT, 2013, cited in the national report from Trinidad and Tobago). The government has also installed a communications backbone, called GovNeTT, to provide a platform for interconnectivity among all government ministries and organizations. In addition to this, a Data Centre was installed as part of GovNeTT to provide data services support to government agencies. This infrastructure is managed through a public-private sector arrangement by the National ICT Company (iGovTT). Finally, a draft National ICT Plan 2014-2018 (called smarTT) was developed by the Ministry of Science and Technology in 2012/2013 but has not yet been formally adopted as government policy. The plan provides a comprehensive strategy for ICT for Trinidad and Tobago, covering the areas of innovation and human capital development, access and digital inclusion in different geographical areas of the country, e-Business and ICT sector development, infra-

structure development, and e-Government. While these developments are progressive, the absence of an official roadmap for ICT development in the country remains a cause for concern.

In Swaziland, the ICT sector is beginning to thrive after the establishment of a fully-fledged Ministry of Information Communications and Technology in 2009. From 2006 to 2010, there was a steady increase in the number of telephone subscribers in the country. The number of Internet users also steadily increased with the introduction of internet-based services such as Wi-Fi. However, much of this is limited to urban areas, with many schools, clinics and shopping centres in rural areas still lacking access to computing and Internet services.

Mongolia and Moldova have also invested significantly in information management systems. In Mongolia, more than 40 government institutes and agencies have some form of information management system in place, providing in the process, a good base for e-governance. Furthermore, the NSO is leading an initiative to create an integrated database in the country. In Moldova, although there is no separate strategy on ICT infrastructure development, ICT infrastructure is considered a crucial crosscutting area, underpinning the technological leap required to catalyze the data revolution. In fact, most national strategic documents include components on infrastructure and the use of ICT.

Senegal has made large investments in the ICT sector and demonstrated strong results in terms of absorption capacity of new technologies. It has been connected to the Internet since 1996 and developed a national strategy for ICT development in 2001. More recently, high-speed Internet and optical fibre connections have been installed. Besides opening up the ICT sector to private investment, the country has promoted e-governance and the strengthening of the national ICT industry. It regulates the sector through the Regulatory Agency for Telecommunications and Post (ARTP), whilst the Agency of Informatics of the State (ADIE) provides the national government systems and ICT tools to deliver e-government services to the population. However, little of this infrastructure development has spread to second-tier cities and to the rural South and South West of the country.

Despite these developments, several pilot countries highlighted specific challenges. They include:

- In **Bangladesh**, lack of open access to data has been noted as a major obstacle for the data revolution in Bangladesh. While the BBS publishes its data in digital format, raw data is not available, which is a barrier for using BBS data by other entities. The administrative data of government ministries and departments are not available online, and some data may not be collected in digital format at all. Another related issue to accessibility is the time lag, as it can take three to five years for data to be available, which diminishes the usefulness of the data.
- In **Moldova**, issues around data openness and interoperability have not been fully resolved. Central public administration authorities manage more than 80

departmental information systems that use data banks and sectoral databases, classifiers, registries and standards developed over many years. Interoperability requires re-engineering business processes within the various entities at the central and local levels, a process that requires financial, human and institutional resources. Bureaucratic resistance to change further compounds the problem.

- In **Senegal**, it was noted that the prevailing bureaucracy and observed resistance hinder current efforts of the ADIE to digitize all ministries and government entities. Although the ADIE is responsible for implementing ICT in government departments, 80 percent of expenditure devoted to them by the government is beyond its control. The agency itself suffers from a lack of consistent funding.
- In **Swaziland**, poor infrastructure and limited access to technology might constitute the weakest link in the data value chain from production to analysis, use and dissemination. The assessment indicated low and declining statistical capacity in the country due to lack of statistical structures and programs, limited human resources, as well as inadequate ICT infrastructure and financial resources. Thus, for instance, mobile communication and Internet access remain mostly limited to urban areas, with many rural areas including schools, clinics and shopping centres lacking access to computing and Internet services. Key areas that were flagged for improvement include: the existing poor supercomputing infrastructure for data analysis and storage; telecommunication networks to enable seamless collection and exchange of data among stakeholders; dashboard/monitoring tools for real time visualization and analysis of data from various sources; and open platforms and standards for publishing and disseminating public data in reusable formats.



IV

Facilitating the data revolution: emerging trends and recommendations

Achieving better quality, timely data in support of the SDGs will require a step-change in the ways governments, NSOs, civil society and even the private sector operate. While NSOs will remain the key stakeholders in the process of generating data to monitor and manage sustainable development at the national level, they must work within the context of a broader ecosystem that includes additional data producers including local and regional governments, private companies, civil society, academia, and the wider public. The emerging recommendations below are provided in light of the assessments made across the six pilot countries of the data ecosystem-mapping project and vary for each stakeholder.

1. Recommendations for NSOs

Evolve from sole data producers to coordinators, managing various data inputs from the broader ecosystem, ensuring data quality, comparability and harmonization (Bangladesh, Moldova, Swaziland, Trinidad and Tobago). There is a critical need for greater dialogue between data communities, particularly between data producers and data users, planners and policy makers, chambers of commerce and industry, trade unions, and NGOs, amongst other stakeholders. In Moldova, it was suggested that limitations of the data regulatory framework could be at least partly resolved or mitigated by strengthening the coordination role of NBS within the national statistical system. The national report from Swaziland suggested that the position of the NSDS Coordinator (of the Central Statistical Office) be regularized within the structures of the NSS. Likewise, statistics committees should become regularized within sectors to build sector-wide capacity over time. Technical coordination tools should also be designed and implemented. Finally, following international best practice, the report from Swaziland recommended that user-producer coordination should take the form of inter-ministerial committees of users and producers of data chaired by high-level persons that would convene regularly and overseen by technical working groups or task forces for key sectoral areas. This would ensure that data streams are relevant and useful for national policy makers and other stakeholders.

Implement statistical advocacy programmes aimed at the general public as well as policy-makers to ensure data users and other stakeholders are made more aware of the value of data and how to access and use it. Several country studies pointed out that lack of knowledge in the importance of data has hindered development policy work (Mongolia, Swaziland, Trinidad and Tobago). Redressing this entails educating (and ultimately reaching a consensus amongst) necessary stakeholders to reach a sufficient understanding of data and statistical concepts and trends occurring globally and locally. Decision-makers need to better understand the data revolution and how to harness it for development purposes. This requires greater leadership and institutional engagement in all data-related activities.

Ensure the availability of and access to data and statistics disaggregated by income, gender, age, race and other relevant factors in national contexts (Bangladesh). To be useful, data must be of high quality, at a level of disaggregation that is appropriate to the issue at hand, and must be made accessible to those who want or need to use them. This requires a comprehensive needs assessment of key data sources, noting the frequency of the associated data, the level of disaggregation and the rigor

(through comparison with international estimates and benchmarking against countries with similar socio-economic or geographic characteristics). For this to occur existing data archives need to be identified and delivered to relevant ministries to be used to measure progress on the SDG indicators. It might also require redesigning existing data surveys to integrate new disaggregation criteria.

Unify databases and develop or adopt uniform data standards including metadata, sharing, interoperability and other standards needed to support the statistical data ecosystem (Mongolia, Swaziland, Trinidad and Tobago). Ensuring comparability and standardization of data is important, as this allows data from different sources and databases or time periods to be combined. In Mongolia, it was suggested that a national standard to “provide a common language to make data to be understood between different stakeholders or systems to enable collaborations, interoperability, data exchange and consistency” be adopted. In Swaziland, it was recommended that Central Statistical Office (CSO) spearhead the development and promotion of national statistical standards, including adapting international statistical standards to statistical work across the NSS, to ensure data quality and comparability. Meanwhile, in Trinidad and Tobago, the focus was on creating an overarching National Statistical Council (NSC) and National Statistical Institute (NSI), which could provide oversight governance and coordination to ensure greater sharing, interoperability and uniform standards.

Improve both physical and ICT infrastructure for statistics, whilst incorporating new data collection tools and big data technologies into SDG monitoring frameworks (Senegal, Mongolia, Moldova, Swaziland). Several countries cited the need for additional investment in physical infrastructure (offices, office equipment, transport, etc.) to improve statistical work across government departments, as well as access to ICTs to achieve development goals. This will also require integrating ICTs into statistical processes with a view to automating, strengthening and standardizing these, facilitating data management, enabling complex data analyses and improving data dissemination. New data collection tools and innovative methods such as earth observations, geospatial mapping, new sensors, and cell phone based data also need to be considered, as does a focus on neglected—often rural—areas outside capital regions. Where it does not already exist, countries need to develop an ICT infrastructure strategy that can be used together with the national e-strategy, in alignment with the NSDS. The Swaziland report, for example, suggested that this strategy be one of several initiatives to be included in a roadmap for tying the data revolution to the implementation and monitoring of the SDGs, as well as providing support to the NSDS.

Engage further with national universities and other relevant tertiary level institutions to work in partnership to provide appropriate training and assist in data collection and analysis efforts. For instance, in Trinidad and Tobago, it was proposed that the University of the West Indies be approached to establish a Statistical and Geospatial Research and Development Centre to support the work of the NSO. This effort can potentially be duplicated across countries. Similarly, in Senegal it was recommended that ENSAE (the National School of Statistics and Economic Analysis) establish channels of collaboration with universities and training schools, in accordance with the decree of creation and operation. Agreements could be signed and applied on joint courses,

which strengthen academic capabilities in specific courses for statisticians. Meanwhile, in Swaziland, it was recommended that a national institute for training statisticians be planned and funded. Programmes to develop degree and accreditation qualifications for statisticians were also recommended for development in collaboration with the University of Swaziland. Finally, it was suggested that the University of Swaziland and other academic institutions be commissioned to develop relevant curricula for statisticians in Swaziland.

Identify and address appropriate training needs of staff of agencies dealing with data and statistics and ensure resources and opportunities are in place to have these needs met. Several country studies pointed out the need for upgrading human resource capacity within statistical offices. For instance, the country report from Bangladesh called for technical training not just for members of the national statistical organization but also for all stakeholders. In Senegal, it was suggested that the NSS provide internship opportunities to statistics students to mitigate the lack of human resources for statistical production at the sectoral and local levels. The country report from Swaziland, meanwhile, recommended improving human capital for statistical work across the NSS, through using skills and career development and staff motivation strategies and processes to assure quality. In Trinidad and Tobago, competitive compensation packages, high quality academic programmes, local statistical professional bodies and service providers, and eventual access to continuous professional development programmes were flagged as important ways in which to ensure professionals stay updated on rapid developments related to data and statistics.

2. Recommendations for governments

Establish, where they do not already exist, country-specific structures and mechanisms for coordination, particularly between data-producing government agencies and between government and non-official sources of data for better tracking of SDG targets and indicators (Bangladesh, Mongolia, Swaziland, Trinidad and Tobago). Examples include inter-agency statistical committees, thematic technical committees and communities of practice. These committees could also be developed in a staged fashion to strengthen institutional capacity and nurture a new data culture for the data revolution (Swaziland national report). The country report from Swaziland further recommended that the CSO be transformed into a National Statistical Bureau (NSB) and an autonomous agency, fully funded by government. It would be act as the principal data collecting and disseminating agency responsible for coordinating, monitoring and supervising the NSS. In Trinidad and Tobago, for example, there was a strong call to establish a National Statistical Council (NSC) premised on membership from all government agencies that comprise the national statistical system. This includes the Central Statistical Office, the Central Bank of Trinidad and Tobago, the Ministry of Health, the Ministry of Labour, the Meteorological Services of Trinidad and Tobago, the Ministry of Trade and Industry, and other relevant organizations and private sector stakeholders. It was suggested that the NSC be chaired by an independent industry specialist or by the Director of Statistics. In this way, the NSC will provide oversight governance and coordination to the National Statistics Institute, which it hopes will be launched by January 2017. A similar approach was echoed in Bangladesh, where the national report suggest-

ed that the BBS may benefit from establishing a platform for coordination, which could include all related agencies and stakeholders—both governmental and non-governmental. This platform could also draft guidelines for data validation and ensure quality of the data collected.

Design and implement an incentive structure to motivate government departments to share existing administrative and other data (Moldova, Mongolia, Swaziland, Trinidad and Tobago). Many government institutions are already independently collecting different types of data. At the same time, there is a huge amount of administrative data that remains unused or locked within agencies or sector-related organizations. Some examples of incentives to catalyse data sharing include encouragement of inter-agency competition, such that each relevant department or agency develops their own data dissemination platforms. Conversely, a pathway could be created for greater partnerships between two or more separate government agencies or departments to undertake analysis requiring multiple or merged sources of data across two fields or areas (i.e. education outcomes and income; health and gender; rural development and migration, etc.). For example, in Trinidad and Tobago, there has been some discussion on preparing and signing MOUs between (and amongst) relevant organizations and the NSC as an interim measure while appropriate legislation is prepared to ensure that departments produce and share data according to requirements set by the National Statistical Institute. In Moldova, obtaining information for several missing SDG indicators will require that the country strengthen the quality and use of administrative data sources. This will require the development of mechanisms for cooperation and collaboration among all data community stakeholders by area. It may also require government policy, resolutions or incentives to unlock and collect this data from private and other sources. Therefore, there is a need for a reward structure for performance or innovation between government departments to incentivize greater partnerships (Card et al., 2001).

Motivate the private sector to share their data with government institutions through tax incentives, information exchange, and involvement in different donor-sponsored or government-sponsored sector programs and initiatives. A case study of the health sector in Mongolia found that private hospitals are increasingly providing health services to the public and that they have accumulated significant amounts of health data, which could be used for government decision-making in this sector. Therefore, greater collaboration between the private sector and government can result in better overall data sharing. For this to happen, regulatory frameworks that ensure robust data privacy and protection, whilst also promoting the release of data and capacity building for data innovation are necessary.

Enact more comprehensive legislation related to data and statistics. The need for additional legislative change was a common recommendation across most pilot countries. For instance, in Mongolia, the statistics authority and national statistical system are described in the law, but their delineation is not clear. The country report pointed to the need to develop a legal framework to support the data revolution by carefully balancing sensitive aspects such as privacy and human rights on one hand with removing blocks and creating incentives and support mechanisms to stimulate the data

revolution on the other. In Trinidad and Tobago, legislation should be developed to govern the functioning of official data producers that have been created solely by cabinet decision. Meanwhile, in Swaziland, the existing Statistics Act, which dates back to 1967, does not provide authority for the CSO to develop and coordinate the NSS to satisfy the requirements of monitoring and implementation of the SDGs. As a result, key 'adjustments' were recommended for its existing Statistics Act, including provisions for institutionalizing the Inter-Agency Statistics Committee (IaSC) and sector statistics committees as coordinating bodies for statistical development, and underpinning the Statistics Act with the requirement that all Ministries, Departments and Agencies (MDAs) have a statistics unit and a statistical programme. Some countries also lack a clear legal framework for non-traditional data producers (for example, civil society organizations) to collect data, which must be rectified. Finally, additional laws and policies may need to be designed across countries to govern data sharing to ensure uniformity in approach across data communities.

Better coordinate donor assistance and engage in innovative partnerships. It is important that a productive partnership be created between national governments and donors to ensure that their support achieves its intended purpose, namely the exchange and development of know-how and technical expertise to build sustainable national capacities to produce and use statistics.



Source: Cartagena Data Festival, April 2015

In Swaziland for example, the government has shown its intention to collaborate with the donor community and has initiated annual meetings (donors' retreats). Further actions such as the adoption of monitoring and evaluation systems, standard reporting requirements and use of country systems need to be further explored.

Develop a comprehensive estimate of finance needs and mobilize resources for statistics. In Bangladesh, monitoring of the new agenda will create a large data gap. Filling that gap necessitates capacity building within both government and NGOs, while will require significant financing. The BBS has prepared a cost estimate for their projects, but there has not yet been a comprehensive stocktaking. Meanwhile in Swaziland, many sectors do not have a dedicated budget for statistics. It is therefore necessary to scale up advocacy for the establishment of a statistical programme with an associated budget for all MDAs. Capacity will also have to be built to prepare good proposals for submission to donors for funding. In addition, there is a need to create a dedicated fund (or financial institutions) capable of helping to fund the NSS and production and use of statistics.

Box 3 PARIS21's Advanced Data Planning Tool (ADAPT)

Adapting to the new data landscape is vital for National Statistical Offices responsible for coordinating data producers in the national statistical system to respond to the Sustainable Development Goals (SDGs). ADAPT helps data producers in the national statistical system consult, cost and chart their indicators as defined by the national development plan. The tool is aimed at countries trying to meet the demands of global agencies monitoring the SDGs and put these in context with their own national priorities.

THE 3 CS TO ADAPT

CONSULTING: ADAPT assists in the national consultative process of defining a monitoring framework for development.

COSTING: ADAPT's Costing Module provides solutions for statistical agencies interested in systematically estimating the cost of undertaking data collection operations.

CHARTING: Charting helps a country develop their roadmap for achieving a data revolution for sustainable development and visualize gaps in financing, data, reporting and disaggregation.

Source: <http://www.paris21.org/ADAPT>

3. Recommendations for non-official data producers

Participate in dialogues to identify social, environmental and governance risks and collaborate to find solutions. There is a need for civil society organizations and the private sector—who are both producers and users of data—to increase their inter-

face with each other, as well as governments, to share data and processing methods. They have the power to hold governments to account using evidence and feedback on the impact of their policies and actions, whilst also helping communities to develop greater data literacy by training individuals to use and generate data. Increasing dialogue between national statistical offices and non-governmental data producers could present unique opportunities for collaboration and finding solutions across sectors, in the process feeding into official SDG monitoring efforts.

Engage in partnerships within local networks, issue platforms and sector initiatives. As civil society are large users of data, increasingly using it to drive advocacy, accountability and programming efforts, participating in local networks, issue platforms and sector initiatives could help them to both unlock more resources to build their capacities and to push for data to be open and accessible to all.

Support development and dissemination of standards for measurement, reporting, certification of corporate sustainability. Civil society could support initiatives aimed at developing a consensus on principles and standards around data collection and sharing in order to enable more collaboration, interoperability, data exchange and data consistency between different stakeholders.

4. Recommendations for academic and tertiary institutions

Undertake innovative research in new technologies, platforms, data and knowledge generation, and sharing to provide long-term perspectives and resources at all levels. Academic institutions have a role to play in formulating and leading cutting-edge research on knowledge, data generation and sharing. Advanced curricula and education programmes for statisticians and data managers should be organized with the aim of strengthening their technical, innovative and leadership skills to transform statistical offices from information collectors to knowledge builders.

5. Recommendations for donors and development partners

Provide coordinated support and resources for statistics. Donors need to better harmonize their interventions, including through engaging in more partnerships with both governments and other donors. While cooperation among donors is increasing, this has to be formalized to enhance strategic support to the development efforts of governments.

6. Country-specific recommendations

The proposals listed above were the most common across countries. They were viewed as being essential to allow data producers to benefit from the common collection,



Source: Cartagena Data Festival, April 2015

processing and preparation of statistical data, whilst leveraging technology and open data facilities to track progress on the achievement of the SDGs. In addition to these, several country-specific challenges were identified and recommendations made. These included the following:

In **Bangladesh**, an assessment of the data available for SDG 16 found that a large amount of this data will be administrative data. This means that the same agency may play roles in both implementing and monitoring the SDGs, raising concerns about the objectivity and impartiality of data. Consequently, a clear demarcation between implementation and monitoring agencies, as well as strong mechanisms to ensure data quality, is essential.

In **Mongolia**, the need to plan for and provide financing for required surveys in state budgets was emphasized as was the need to make it a priority for financial support from international donor organizations. An assessment of the health sector also found that the collection and monitoring of SDG indicators will require substantial additional investment in software and big-data processing programs in order to consolidate the data collected by government and international organizations in existing databases, such as Health Info.

In **Moldova**, delineating, at the stage of nationalization, the role of each institution responsible for producing and reporting SDG indicators was underlined. It was suggested

that responsibilities specific to data processes be assigned to only one institution so as to use resources efficiently, to avoid duplication of data collection and processing tasks, and reduce the reporting burden. In addition, there was a strong recommendation to update survey and census questionnaires for data collection more consistently. For example, health related databases are so advanced in the country that it provides an extra onus for the Health Development Centre to update its data collection methods. Not doing so can often result in the lack of utilization of the existing potential of available data that can be used for monitoring and evaluating SDG-related indicators.

In **Senegal**, several recommendations for ‘quick wins’ were provided. First, it was suggested that the “statistics revolution” will be achieved only if it is preceded by a “mentality revolution” particularly among official data producers, regarding compliance with the regulatory provisions. It is also urgently necessary to strengthen the capacity of members of the ANSD and other data producers—official and unofficial—on the 2030 Agenda to ensure they understand relevant issues at the national level. The NSO must also identify and designate operational focal points in local authorities (county councils, multi-purpose centres, etc.) and network for data collection. The government must also develop and propose a framework for collection and production of additional statistics and disaggregated data to inform priority SDGs indicators for Senegal and train people in its use. The activity may take the form of a service concession between ANSD and informal producers (civil society, private sector, universities, etc.) to ensure the quality of data produced.

In **Swaziland**, the first critical need was identified to be the capacity building of the CSO. Thereafter, supporting other data communities through facilitating the participation of agencies, as the UN and other international funders need to be prioritized. It was further recommended that the interface between the national statistical system (NSS) and data users be strengthened as part of capacity development efforts within the Swaziland NSS.

V

Conclusion

A data revolution is underway, one that is reshaping how knowledge is produced and used, policy is formulated, and governance is redefined and enacted around the world. While significant strides have been made with respect to upgrading data and statistical systems since the adoption of the MDGs, the 2030 Agenda encompasses a far broader ambition requiring better, more timely and reliable data on a wider variety of indicators. Thus its adoption by countries around the world necessitates an even more significant increase in the data that is available to, and used by, governments, civil society, the private sector, academia and international organizations to begin tracking progress towards the achievement of the SDGs.

In fact, while the ‘data deluge’ of recent years is well-known, an in-depth assessment of the data ecosystems in six pilot countries—Bangladesh, Moldova, Mongolia, Senegal, Swaziland, and Trinidad and Tobago—revealed a significant level of variance in findings: each country had differing data-related capacities, processes, policies, national priorities and approaches in addition to unique, country and region-specific data challenges and opportunities for implementing and monitoring the SDGs. Yet, the data ecosystems mapping exercise found that most countries have some capacity to track progress on various SDG indicators, with many already possessing survey, census, administrative and even perception data for at least some goals of the new development agenda.

Much more needs to be done to upgrade data and statistical systems across all countries. For instance, the development of datasets of different quality, accuracies, scales and reference systems was stated to be a cause for concern in several countries, as was the lack of adherence to common standards and the significant lack of information sharing and coordination between data producing agencies. This is compounded by low levels of data literacy amongst the general population in some countries, a phenomenon evident even amongst staff within some central statistical offices, who sometimes lack the analytical capacity and training to carry out data processing and analysis work in a rapidly changing technology context. Moreover, existing data sometimes remains unused as some government agencies are either unwilling to share it, or are unaware of its potential usefulness for implementing and monitoring the SDGs. However, these shortcomings can be instructive in and of themselves: they demonstrate which areas do not receive sufficient attention, where institutional capacity may be insufficient, or where deeper analyses or resources are required to better assess what needs to be measured and how.

Given these stated challenges, several common recommendations were made across countries. Most country reports underlined the pivotal role of NSOs, but they also argued that statistical offices need to play a greater coordination role in ensuring the timely and more open flow of information between different organizations—both official and nonofficial—within the statistical system at the national level. Country reports also variously underlined the importance of introducing uniform standards for data collection, launching statistical advocacy programmes to facilitate data literacy amongst the general population, ensuring the availability of, and access to, disaggregated data and statistics, improving data-related legislation, ensuring transparency and open data and improving both physical and ICT infrastructure for statistics, all whilst incorporating new data collection tools and big data technologies into SDG monitoring frameworks.

These were just a few of many more country-specific recommendations, which ranged from implementing policies for improving data quality and reliability to increasing financing for surveys in state budgets, and delineating the role of each institution responsible for producing and reporting SDG indicators.

Each pilot country study also hinted at the importance of the growing roles of civil society, the private sector and academia within the data ecosystem. For instance, these organizations can be data producers as well as data users. As a result, they can provide complementary information and statistics for governments, ensuring in the process, greater accountability and transparency from governments and other development actors. Civil society and the private sector could also play a critical role in transforming data into a more readily useable format. Achieving the SDGs will require, therefore, integrated and coordinated action by all stakeholders on all pillars of sustainable development (social, environmental and economic) within all countries.

Taken together, the data ecosystem mapping exercise comprises a preliminary step towards a fully developed culture of statistical literacy within countries, and to supporting a more sophisticated, end-to-end approach to data production, use, analytics, visualization, and communication. The SDGs, meanwhile, present a strategic opportunity to build on the momentum of the data revolution and to bring about a shift in the way governments and the public sector use data and statistics. Therefore, one of the main questions emerging from the context of the SDGs and the proliferation of data is: within what sort of governance frameworks will these new data collection and analyses systems operate? In fact, many of the decisions around strategy, funding and transparency are political decisions that require leadership and vision. Therefore ideally, it is up to governments, as the ultimate guarantors of the public good, to put in place rules and systems to realize a strategic vision for nurturing and harnessing the data revolution. Both domestic and international development communities, including civil society, private sector and academia have a responsibility for advocating for and supporting national efforts to build open, inclusive and participatory national statistical systems. Working together, all data stakeholders can ensure, through building capacities, as well as collaborative partnerships and fostering innovations, that progress towards the SDGs is fully realized in countries around the world.



Source: Cartagena Data Festival, April 2015

References

Card, David, Raj Chetty, Martin Feldstein and Emmanuel Saez, 2011. “Expanding Access to Administrative Data for Research in the United States.” Accessible at: <https://eml.berkeley.edu/~saez/card-chetty-feldstein-saezNSF10dataaccess.pdf>.

IBM, undated. “Bringing big data to the enterprise.” Website, IBM. Available at: <https://www-01.ibm.com/software/data/bigdata/what-is-big-data.html>

SINTEF, 2013. “Big Data – for better or worse”, Website, SINTEF. Available at <http://www.sintef.no/en/latest-news/big-data-for-better-or-worse/>

Sachs, Jeffrey D., 2015. “Data for development,” Website, Project Syndicate, 2015. Available at: <https://www.project-syndicate.org/commentary/sustainable-development-data-by-jeffrey-d-sachs-2015-05>.

UN (United Nations), 2013. A new global partnership: Eradicate poverty and transform economies through sustainable development. The Report of the High-Level Panel of Eminent Persons on the Post-2015 Development Agenda. New York: UN.

UN-IEAG (United Nations – Independent Expert Advisory Group on a Data Revolution for Sustainable Development), 2014. A World that Counts: Mobilizing the Data Revolution for Sustainable Development. New York: IEAG.

National reports from the six pilot countries of Bangladesh, Moldova, Mongolia, Senegal, Swaziland and Trinidad and Tobago.

VI

Annex: country overviews

Bangladesh

In Bangladesh, data on development progress mainly originate from three national censuses, five regular surveys, several irregular (ad hoc) surveys and administrative records. A large part of the data and information on indicators related to measuring progress towards MDG attainment is collected through these means. As part of the data ecosystem mapping project, Bangladesh undertook an analysis of the 23 indicators of SDG 16. An analysis of the indicators for SDG 16 found that: a) data is readily available for only five indicators; b) data is not readily available for nine indicators, requiring further modification; c) data is not available for seven indicators; and d) two indicators are not applicable for Bangladesh.

Data-related initiatives

- The BBS produces the majority of available data on development issues in Bangladesh. It conducts a number of sample surveys each year either as a regular activity or on an ad hoc basis.
- A number of other government entities collect data on a wide range of topics. Often these data are generated to serve an entity's specific data requirements.
- Besides government entities, academics and the research community, CSOs and development partners produce data on development issues in line with their own data requirements
- Bangladesh's national statistical system has gone through several reforms in recent years. Concerted efforts have been made to make additional data available on more indicators.
- Since the inception of the SDGs, a number of programmes to improve data-related capacity were introduced. Improvements in data availability, quality assurance and the timeliness and accessibility of data have been seen.
- BBS has taken initiative to sign formal data exchange protocols with certain local, regional and international organisations and development partners.
- The BBS also maintains geographic information systems for producing data and making better use of digital mapping.
- BBS prepared a National Strategy for the Development of Statistics (NSDS) for Bangladesh covering the 2013–23 period.
- Besides the BBS, a number of other government entities are undertaking various activities to improve their respective statistical systems, including the Bangladesh Bank and the Ministry of Finance.

Challenges and gaps

With regard to SDGs data requirements, Bangladesh will need to undertake serious efforts to address emerging demands. Serious data scarcity was found for areas such as ‘life below water’, ‘sustainable cities and communities’, ‘responsible consumption and production’, ‘hunger’, and ‘quality education’, each having less than 50 per cent of the required data available. It is worth noting that each of these areas is new to the SDGs. There is also a dearth of data for indicators related to governance, environmental sustainability and global partnership. Key challenges include:

- Very few regular surveys are conducted by the BBS and the data generated by other government entities is often found to be inadequate in terms of procedures, methodology, timeliness, coverage and quality. Often data are not reliable, representative or comparable.
- Several government entities that provided data for MDG indicators do not have clear data dissemination strategies.
- The BBS website has a storage capacity of three terabytes (BBS 2013), but it is arguably not interactive enough when compared to global standards. Notably, the website provides metadata for many but not all indicators. Information on how data are collected and compiled for most indicators is only provided in printed publications. In some cases, however, the processes are not adequately clarified and interpretation is difficult.
- Administrative data is much less likely to have been collected following international definitions and their quality often fails to meet set standards. In addition, administrative data is often not collected in a usable format.
- The reliance on administrative and private data for tracking indicators for SDG 16, could require a greater degree of validation of the data by the BBS.
- Lack of open access to data has been noted as a major obstacle for data revolution in Bangladesh. While BBS publishes its data in digital format, raw data is not available, which is a barrier for using BBS data by other entities.
- In Bangladesh, it can take even 3-5 years for data to be available which diminishes the utility of the data.
- A large number of government agencies will be in charge of collecting data, thus the possibility of duplication is present.
- Meeting both finance and human resources needs will be a key challenge for the government.

Recommendations

- In order to coordinate the large number of official and non-official data stakeholders, BBS may wish to establish a platform including all related agencies and actors. This platform can make a guideline for data validation and ensure quality of the data collected.
- In order to make administrative organs of the government fit for supplying data suitable for SDG 16, capacity building will be necessary, both in terms of finances and human resources. Perception data will also be necessary to track other indicators. As the BBS does not collect perception data, outsourcing collection to private collectors may be necessary.
- Putting more stringent processes in place to validate data may be necessary due to increasing reliance on administrative and privately sourced data.
- Redesigning the existing data surveys to integrate new disaggregation will also need to be discussed.
- Capacity building and technical training will be necessary not only for the NSO, but for all key stakeholders. The government must also develop a comprehensive estimate of finance needs and a plan on how to meet them.
- Coordinated and calculated action by all data stakeholders will be necessary.

Mongolia

It was found that 228 out of 241 indicators for the SDGs were applicable for Mongolia. Sixty indicators are directly available from the current statistical framework, while 11 can be generated after further calculation. However, 157 are not available and need further research for other potential sources. 106 indicators out of 241 are not aligned with international methodology.

Data-related initiatives

Mongolia has engaged in a three-stage national program related to improving statistical and data systems over the past ten years. This has included:

- Stage 1: 2006 – 2010 – The goal was to improve the overall capacity of the NSO (HR capacity, official Statistical framework etc.)
- Stage 2: 2011 – 2015 – This stage was aimed at improving the institutional framework and organizational structure, statistical data dissemination and statistical methods of the NSO, and introducing advanced ICT technologies.
- Stage 3: 2016 - 2020 – This stage is ongoing and aims to introduce more advanced technologies for seeking additional data sources, bringing the latest international advances and standards to the country, and setting a nationwide data standard in support of the data revolution.

In addition to this, Mongolia has undertaken a number of activities related to the dissemination of data, as well as communication and relations with major stakeholders. For instance:

- A steering committee with nine working groups has been established under the Prime Minister's office for SDG implementation. Within one of the working groups, the NRSO plays a key leadership role.
- The NRSO has joined a working group of SDGs in Asia, which includes membership from Pakistan, Malaysia and Kazakhstan.
- Mongolia is in the process of creating a unified database of the government with a common standard (standard, code, classification etc.)
- Two assessments have been conducted:
 - Joint Review of National Data Availability for SDGs by NSO and UNDP in December, 2015
 - A re-assessment of National Data Availability for SDGS by NSO in March, 2016

- An exercise to find non-traditional sources to fill data gaps has been completed. This included research into using big data tools (e.g., Hadoop, DataCleaner, RapidMiner)

Mongolia has further:

- Enacted several regulations such as the Civil Code, the Law on Privacy and other related legal acts to protect privacy.
- Undertaken a database correlation among ministries and government agencies
- Created and used a “government unified database” (*National Program for Statistics Sector Development, Objective 1, Goal 3.1.2, Objective 2, Goal 9.1.2*)

Challenges and gaps

Key challenges described in the Mongolia report include the following:

- There is tremendous amount of data located on “shelves” and in computers at *soum* (town) and *khoroо* (district) level hospitals, as well as private health institutions, that has not been delivered to statistical offices;
- Data is often derived from different databases using different standards, which thereafter gets ‘unified’ only at the Ministry level;
- Questionnaires and forms to request data remain outdated as they do not get periodically updated;
- There is insufficient knowledge of, and use, of research completed by international organizations;
- Data on certain goals and indicators is particularly sparse. For example, in the health sector, there is almost no information in the country on substance use, disorders, harmful use of alcohol, and mortality rate attributed to air pollution or mortality rate attributed to unsafe water, unsafe sanitation or lack of hygiene
- While there are quite a number of databases created which attempt to collect, systemize and use data in the health sector in an appropriate and useful way, most of these databases do not “talk” to each other—that is, they are separate databases whose data cannot be consolidated or aggregated without difficulty.
- The development of the ICT sector and health-related databases is so advanced, that the health agency is unable to cope with the current pace of data flow and is unable to exploit the existing potential of available data, which can be used to monitor and calculate health-related SDG indicators.

- There is insufficient personnel and deficient human resources in the field of health data processing and statistics, particularly in rural areas

Recommendations

It was suggested, based on an assessment of the health sector in Mongolia that the country:

- Adopt a legal framework to support the revolution by carefully considering sensitive aspects such as privacy, human rights on the one hand and removing blocks, providing incentives and support mechanisms to stimulate data revolution on the other hand.
- Invest in data, providing resources to institutions where statistical or technical capacity is weak;
- Develop infrastructure and implement standards to continuously improve and maintain data quality and usability; keep data open and usable by all.
- Invest substantially in software and big-data processing programs in order to consolidate data collected through efforts of government and international organizations in existing databases and to develop reliable, high-quality data on a range of new subjects
- Develop a national standard to declare a common language between different stakeholders to as to enable comparability, greater collaborations, interoperability, data exchange, consistency and aggregation of data produced by both government and non-government sources.
- Launch statistical advocacy and education programmes to ensure policy-makers are aware of the data revolution and the core value of data, including what can be done with data.
- Undertake a deep analysis of existing literature and research by international organizations to identify what types of existing data can be obtained from those reports;
- Partner with agencies, including international organizations that are already conducting surveys on a regular basis on key issues such as health for inclusion into official statistics;
- Unearth administrative data that has been 'shelved' or unused in particular institutions like private hospitals and transfer this to statistical offices. Government policies and resolutions are needed to collect this data from private and other sources.
- Update questionnaires and forms requesting data, which includes asking more questions covering newer areas, to improve data collection from primary sources

- Change existing ways of data collection by taking advantage of new innovative technologies
- Plan and insert financing for required surveys to state budget or request this financing from international donor organizations;
- Improve human resources and statistical capacity;
- Improve already existing institutional setups, procedures and systems, as well as the data value chain through increasing the types of data acquired from primary sources (district and *soum* level hospitals, health sector research data, etc.)
- Motivate private sector in sharing their data with government institution through tax incentives, information exchange, involvement in different donor-sponsored or government sponsored health sector programs and initiatives.

Moldova

Moldova carried out a desk review, identified stakeholders and organized five workshops as part of the data ecosystem mapping project. An initial review found that 211 out of 230 global SDG indicators are relevant for Moldova. Data for 50 percent of this is unavailable and a further 17 percent only partially available. However, data for 33 percent of indicators is fully available.

Data-related initiatives

Moldova has:

- Begun to harmonize national capacities with some international data standards
- Enacted many regulations at the national or institutions level, including the mandate to collect and disseminate data
- Ensured that it is digitally well-off on average: ITC development index (61/166); UN E-Governance Index (66/193); Network preparedness index (68/143); Global cyber-security index (16/29).

Challenges and gaps

- The Moldova data system still suffers from: inconsistent methodology, multiplicity of data sources, and weak capacity of data providers and data users.
- The weakest regulations in the country (related to data) are in the area of IT
- Most of indicators are not disaggregated by sex, age, and geographical territory; and even existing disaggregated indicators are often not disseminated and are not easily accessible.
- There is limited information for decision makers to analyse the current situation, develop policies, monitor their implementation and evaluate impact, as well as to assess to what extent Moldova is fulfilling its obligations under economic, social and cultural rights.
- Availability of indicators by area: measuring environment and energy and governance is a challenge due to lack of indicators
- Human resources: Lack of relevant skills and high turnover; lack of trainings; IT systems vs. data; limited use of data softs
- Need for capacity to process big volumes of data

- Lack of analytical capacity
- Limited offer of interactive tools – reliance on traditional tools to use data;
- Some data actors lack access to digital services;
- Commitment to combat “passive transparency”
- Limited use of visual data tools;
- Funding is often donor-driven and public funding is stable but insufficient. There is a lack of funding for: a) distribution and analysis of data; and b) human resources on trainings

Recommendations

There is a need for:

- A stronger coordination role for NBS;
- Regulation for interaction between public authorities on generation and use of data;
- Unified procedures for codification, common nomenclatures and classifiers and increased responsibility for their use;
- Capacity to process big volumes of data

Planned next steps for the government include:

- Setting up the National Committee on the SD;
- Instating the State Chancellery as the coordination focal point;
- Streamlining the policy framework;
- Undertaking a mid-term review of the SDG nationalization and MD 2020;
- Ensuring open data and open procurement;
- Adopting the SSN and the central role of NBS.

The government of Moldova also intends to:

- Pay attention to data disclosure
- Consolidate data generation

- Encourage citizens' engagement
- Emphasize the use of IT
- Examine the national strategic policy framework 2012-2015 (n.b. - 25 strategii sectoriale),
- Look at relevant statistics development strategy (draft) and how it responds to M&E needs (based on UNSTAT and EUROSTAT methodologies)
- Facilitate the creation of an informational society;
- Mainstream and consolidate sector data centers and ensure interoperability of data (MCloud)
- Promote the 'digital by default' agenda (E-Transformation)

Senegal

In Senegal, seven SDGs are considered high priority, namely SDG 6 on water and sanitation, SDG 15 on terrestrial ecosystems, SDG 1 on poverty, SDG 2 on hunger, food security and nutrition, SDG 13 on climate change, SDG 7 on energy and SDG 4 on quality of education.

Data-related initiatives

- Senegal is one of the first African countries to join the Global Partnership for Sustainable Development Data (GPSDD), which was launched in September 2015.
- Senegal has participated in several initiatives to open access to data sources, and ensure free dissemination of statistical data through portals dedicated to open data.
 - The National Agency for Statistics and Demography (ANSD) participates in the “Open Data for Africa” programme of the African Development Bank (AfDB). According to the AfDB, this is an initiative designed to foster decision-making on the basis of reliable information, good governance and administrative responsibility and to monitor the progress of a wide set of national and regional development goals (Geoflash, 2014). It also allows free access to a statistical data portal that provides users with various indicators over time.
 - Another initiative of the ANSD is Stat-GIS or Geographic Information System Statistics, which is a portal available on the ANSD website. This is a visualization tool, which maps national socio-economic data and is freely access to all users. The National Statistical System web portal also provides users statistical data from various government departments. The National Archive of Senegal (ANADS) data is another initiative of the ANSD to disseminate statistical data. This is a distribution platform for micro data and metadata from several surveys and censuses.
 - The ANSD is also working with Sonatel and ORANGE as part of a pilot program called D4D (Data for Development) to exploit, disseminate and promote open data.
 - The National Geomatics Plan (NGP) in Senegal is planning to develop a tool called georeferenced digital library, which will further open access to the country’s data. An interactive portal will be set up to provide information on the nature and characteristics of geotagged data within various territories and for all sectors (Geoflash, 2014).

Through this tool, the NGP will better inform public and private organizations and citizens on geographical data available in Senegal, as well as how to access them.

- A study on monitoring the SDGs was also launched in Senegal. As part of this study, a wide range of stakeholders was consulted, including representatives from ministries, the local administration, the ANSD and its regional offices, the research centres, think tanks and universities, civil society and the private sector.

In addition, Senegal has made significant investments in the ICT sector and has been connected to the Internet since April 1996. Since the opening of the ICT sector to private investment and the development of the national strategy for ICT development in 2001, an emphasis has been placed on e-governance and strengthening of the national ICT industry. Regulation of the sector is assured through the Regulatory Authority for Telecommunications and Post (ARTP), which operates under the direct supervision of the president and has regulatory authority over the Ministry of Information and Communications. The Agency of Informatics of the State (ADIE), which replaced the former IT department of the State (EIS), provides the national government systems and ICT tools to deliver services of e-government to the population.

Challenges and gaps

- Weak coordination of the statistical system.
- Regional disparity: To date, Dakar has been the main beneficiary of improvements to access to ICT. Rural Senegal has been neglected.
- Lack of consistent funding: Senegal needs additional investment in physical infrastructure to improve access to ICT and to achieve its development goals.
- Bureaucratic hindrance: The bureaucracy and the observed resistance hinder current efforts of ADIE to digitize all ministries and government entities. Although ADIE is responsible for implementing ICT in government departments, 80 percent of the expenditure devoted to them by the government is beyond its control. The agency itself suffering from a lack of consistent funding.
- Stakeholders: While private sector representatives can be found in the CNS, it has no direct representatives of civil society and local authorities.
- Low levels of collaboration between various stakeholders: All categories of stakeholders interviewed admitted that while collaboration existed, its levels remained low, particularly with universities, research institutions and CSOs.
- Low levels of knowledge of the regulatory framework of the statistical sector: Senegal has relatively low awareness of the legislative and regulatory framework for statistics. 17.6 percent of official producers in the country are unaware of it. Almost half of the official data producers (44.1 percent) and up to 67

percent of non-official data producers are unaware of a regulatory body that oversees compliance, statistical standards and data exchange.

- Lack of adequate human resources: Nearly a quarter of structures producing official statistics do not have statisticians or data analysts.

Recommendations

- At the local level, local authorities as well as multipurpose centres should be involved in the data ecosystem given the role they could play in the production of disaggregated data at the local level and the decentralization context;
- At the departmental level, focal points could be selected in the structures that already exist and to which specific tasks could be assigned to ensure the reporting of data to the regional level;
- At the regional level, statistics hubs could be created to accompany the economic hubs and territorial hubs in the production of statistics;
- Nationally, ANSD should continue to coordinate the production of statistics. Moreover, to address the institutional instabilities (reshuffle and change of government) at the sectoral level, it is proposed to coordinate and group the production of statistics into three blocks: economic, social and environmental;
- There should be greater collaboration between data producers and users. All actors must be involved from design phase of interventions and should also be able to give their feedback on the data produced in accordance with their needs;
- A partnership should be developed between NSS data producers and other data producers to fill gaps in data availability in some areas and to also provide disaggregated data. Moreover, better communication channels between ANSD and civil society organizations could lead to better quality and reliable data.
- Civil society capacity building is necessary for optimal use of ICT.
- It is important to note that as part of the data revolution, particular attention is placed on the need to ensure that official data producers are sensitive and responsive to the needs of data users. Therefore, greater effort is required by producers to allow users to access requested information.
- Improve coordination across the NSO including through convening donors' roundtables and organizing meetings with technical and financial partners on the financing of statistical production.
- The missions and organization of regional offices for statistics and demography must be reviewed, and adequate resources (human, material and financial)

allocated, in collaboration with other government departments in charge of statistical production and local development actors.

- To ensure quality education, it was suggested that ENSAE bring more rigor in the recruitment of teachers and evaluate them annually, taking into account the opinion of the students.
- To strengthen partnerships with universities and training schools, ENSAE must establish channels of collaboration, in accordance with the decree of creation and operation.
- For better monitoring of the SDGs, the regional offices for statistics and demography should be strengthened to enable availability, time, and the collection of disaggregated data at the local level. The ANSD could, through those regional offices, set up an integrated system of collection, management and dissemination of regional and local data.
- It was recommended that decentralized technical services be strengthened by assigning a statistician in each department for processing and analysing data.
- Collaborative partnerships need to be developed between the state and private sector, and between the ANSD and NGOs, universities and research centres, to ensure effective monitoring of the SDGs.

Swaziland

The Central Statistical Office (CSO) is the cornerstone of the NSS in Swaziland. It has two roles in helping to achieve Swaziland's vision of an informed society using official statistics. One of them is leading the Official Statistics System to ensure that all government statistics efficiently meet the country's needs for relevant, trustworthy, and accessible information.

Data-related initiatives

- The Central Statistical Office (CSO) has successfully collected and analysed data to produce and disseminate the consumer price index and inflation report on a monthly basis.
- Swaziland through the CSO has continued to compile the Harmonized Consumer Price Indices (HCPI).
- The CSO has produced a draft Multiple Indicator Survey report

Challenges and gaps

The main challenges faced by the CSO include:

- Low profile, appreciation and usage of official statistics in the country;
- Inadequate capacity to coordinate the National Statistical System (NSS);
- Limited resources including human, financial and ICT infrastructure in the NSS;
- Lack of institutional capacity to produce, manage and disseminate data by the NSS;
- Unsuitable Swaziland Statistics Act to support the current and emerging needs of the development requirements, especially the SDGs.

Recommendations

The Swaziland country report concluded that several key actions are required to strengthen the Swaziland NSS. These include:

- Strengthening the response rate of the NSS to the data revolution and SDG initiatives;
- Building internal infrastructure of NSS data stakeholders to process data for development;

- Building capacities of the NSS to fully and ably participate in the data revolution to implement and monitor SDGs;
- Supporting the NSS to develop sector specific data and increase collaboration among data stakeholders.

To this end, the central statistical office needs to:

- Establish structures, mechanisms and tools for NSS coordination
- Establish a central repository for data and information at national level
- Develop and implement an ICT Strategy with reference to the NSDS
- Develop and implement data collection, data management, and data dissemination strategies
- Review and strengthen the organisational CSO structure
- Develop and implement an information, education and communication campaign across NSS
- Develop and implement staff development and training program
- Conduct employee engagement survey for the CSO
- Develop and implement a resource mobilization strategy for CSO & NSS

Trinidad and Tobago

Over the past two decades, Trinidad and Tobago has invested significant amount of resources in various aspects of its national statistical system. These include significant mapping and data digitization projects, the introduction of supporting infrastructure such as the implementation of modern telecommunications infrastructure, and enactment of several pieces of legislation that address issues such as freedom of information, copyright, data protection, and e-commerce. In addition, various telecommunications ventures, including the national telecommunications authority, have been established to support the NSS. There have also been efforts to draft ICT-related plans, policies and standards.

Data-related initiatives

- Trinidad and Tobago has enacted several pieces of legislation that govern various aspects of the data ecosystem. These pieces of legislation cover most of the important legal elements required for a modern and functional data ecosystem, including protection of human rights, privacy, personal information, intellectual property, private property, financial information, freedom of information, data dissemination, statistical data collection, e-commerce and computer misuse.
- Several initiatives have been launched by the Ministry of Planning and Development to support the implementation of the SDGs, including the restructuring of the Central Statistical Office into an independent National Statistical Institute (NSI).
- More than 65 government organizations in Trinidad and Tobago are involved in the collection of statistical and geospatial data to inform the development needs of the country.
- Ongoing data initiatives in the country include the digitization of the land registry of the Registrar General's Division, the upgrading of the Cadastral Management System at the Surveys and Mapping Division and the digitization of charts and records at the Meteorological Services of Trinidad and Tobago.
- The National Spatial Data Infrastructure (NSDI) Council of Trinidad and Tobago has recently been established.
- The government has installed a communications backbone (GovNeTT) to provide a platform for interconnectivity among all government ministries and organizations.
- Trinidad and Tobago has a comprehensive strategy for ICTs on paper, although this has not been adopted as official government policy to date.

- Several government agencies and organizations have clear policies with respect to accessing data and services. The Ministry of Energy and Energy Industries' website, for example, shows datasets, map products available and costs for acquiring these data sets. Land records can also be accessed through a web-service provided by the Registrar General's Division.
- The Government of Trinidad and Tobago is a signatory to regional treaties and international agreements and conventions, many of which require the provision of statistical and geospatial data.

Challenges and gaps

- Trinidad and Tobago is currently unable to meet the requirements specified in the UN Fundamental Principles of Official Statistics (Resolution 68/261).
- The provision of resources at the national level does not occur in a deliberate, organized or coordinated manner, making it difficult to predict when and how much funds would be made available to undertake necessary work to support the data ecosystem. Furthermore, competition amongst government ministries and organizations to source funding has resulted in a climate of personal ownership of resources. Collaboration and support amongst government agencies is lacking.
- The number of persons who provide statistical support is limited in the public sector with varying levels of education, training and experience. Within the Central Statistical Office, few analysts are currently able to support the types of analyses envisaged in a functional data ecosystem.
- There is a lack of specific provision in the Statistics Act or in any of the enabling legislation for government agencies that are part of the national statistical system to comply with specific requirements with respect to data formats, quality, currency, frequency and resolution. For instance, some of the major stakeholders in the data ecosystem have been established by Cabinet decision, and as such do not have any enabling legislation to support their operations nor allow the Central Statistical Office to require compliance in the provision of data or support. These include agencies such as the Office of Disaster Preparedness and Management, the Trinidad and Tobago National ICT Company Limited and other special purpose companies that support many government ministries and organizations.
- There is no national data sharing policy for the sharing or the dissemination of data in Trinidad and Tobago: Despite consensus on the importance of open data, most government organizations believe that open access should only extend to other government organizations and not to the private sector and to the general public. Therefore, drafting and passing a national data sharing policy that provides for general open access to data may be a challenge.

- The Trinidad and Tobago Bureau of Standards, the authorized agency to develop and implement data standards have not adopted or developed any national standards with respect to statistical and geospatial data to date. In addition, agencies that are part of the national statistical system do not adhere to international standards for data collection.
- Relationships between different government organizations are mostly bilateral, informal and dependent on personal contact, instead of formalized in legislation. There are few formalized relationships between government divisions, which mandate sharing data, and where they do exist, there is no evidence to suggest these are in effect.
- The perceived lack of readily available data to most citizens has led to an absence of a culture of use of data. Much more work to educate the public is needed to ensure greater data literacy.
- The lack of adequately trained and experience staff in many of the government organizations remain a challenge

Recommendations

- A National Statistical Council (NSC) should be established to provide oversight and governance to the NSI.
- Prepare MOUs between all relevant organizations and NSC;
- Draft and enact appropriate supplementary legislation to ensure compliance with the requirements set by the National Statistical Institute
- The NSC should be tasked to:
 - develop national data standards, metadata standards, data sharing, interoperability and other policies needed to support the data ecosystem;
 - develop a national protocol for statistical and geospatial data dissemination to regional and international organizations;
 - complete detailed user requirements analysis to identify the most appropriate technological solutions and personnel to meet the particular needs of each organization.
 - identify appropriate training needs of all participating organizations and ensure that opportunities are provided to meet these needs.

- The NSC should be tasked to embark on a marketing and awareness drive to ensure that data users and other stakeholders are much more aware of what is available and how to access it.
- The University of the West Indies and other relevant tertiary-level institutions should be approached to establish a Statistical and Geospatial Research and Development Centre to support the work of the NSC.

