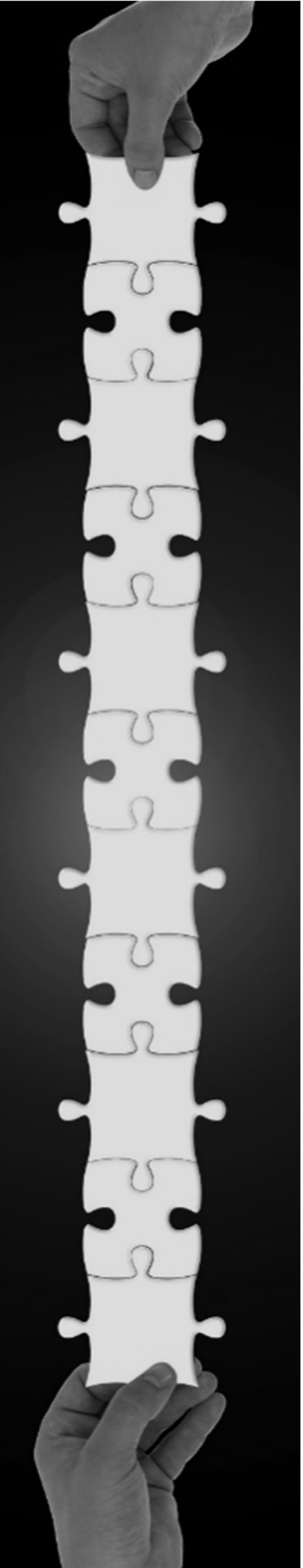



Solving the Puzzle

# Understanding the Implementation Guide

*This introductory chapter, **Solving the Puzzle**, describes how to understand and use the Implementation Guide. It expands on each of the nine strategic pathways of the Integrated Geospatial Information Framework (IGIF) and provides the 'what' – the specific guidance and options to be taken by countries in implementing the IGIF. It captures strategic to operational needs with guiding principles, actions, deliverables, outcomes and resources. The aim is to provide guidance for governments to establish 'nationally' integrated geospatial information frameworks in countries in such a way that transformational change is enabled, visible and sustainable.*

## *Executive Summary*

Geospatial information is a critical component of the national infrastructure and knowledge economy – a blueprint of what happens where, and the means to integrate and leverage a wide variety of government services. It provides the integrative platform and 'glue' for all digital data that has, or can have, a location dimension to it. All countries and all sectors need geospatial information and enabling technologies for making decisions on national policy, strategic priorities and sustainable development.

However, many countries continue to face a series of impediments that exacerbate their ability and 'opportunity' to participate fully in transformational change with geospatial information capabilities. Yet, this change is essential to support national development, economic prosperity, and through that, a global and thriving information economy. Many countries still need to bridge the geospatial digital divide. Bridging this divide requires building capacity for people, establishing governance, and implementing data, technology and processes to sustain national geospatial information capabilities. This is achieved through the implementation of an integrated geospatial information framework aligned to national strategies and arrangements so that it can be anchored into national development priorities.

The Integrated Geospatial Information Framework (IGIF) provides a basis and guide for developing, integrating, strengthening and maximizing geospatial information management and related resources in all countries. It will assist countries in finding

sustainable solutions for social, economic and environmental development, to influence inclusive and transformative societal change for all citizens according to national priorities and circumstances, and to leave no one behind.

The IGIF comprises three parts as separate, but connected, documents: Part 1 is an Overarching Strategic Framework; Part 2 is an Implementation Guide; and Part 3 is a Country-level Action Plan. The three parts comprise a comprehensive Integrated Geospatial Information Framework that serve a country's needs in addressing economic, social and environmental factors, which depend on location information in a continually changing world. The Implementation Guide communicates to the user 'what' is needed to establish, implement, strengthen, improve, and maintain a national geospatial information management system and capability.

The IGIF focuses on geospatial information that is integrated with any other meaningful data to solve societal and environmental problems. It acts as a catalyst for economic growth and opportunity, and stimulates improved decision-making for national development priorities and the Sustainable Development Goals (SDGs).

The Implementation Guide illustrates how the IGIF builds on previous efforts in planning and implementing National Spatial Data Infrastructures (NSDIs). NSDI implementations have historically focused on the collection of data and the implementation of technologies. In contrast, the IGIF additionally focuses on the governance, policy, financial, capacity and engagement processes necessary to collect, maintain, integrate and share geospatial information, through all levels of government and society, in a modern and enabling technology environment.

With the data revolution, and now with digital transformation disrupting traditional methods of data delivery and dissemination, users have typically not understood or appreciated the value and need for integrated geospatial information as a way to expand and improve the usefulness of the diversity of their data. Such data has, as its common element, location information. Once the location (for example coordinates or a geocode) is included, trends, relationships, geographic comparisons, comparative analytics and other important connections become evident, especially when mapped and visualized.

While the concept and relevance of the IGIF, as an integrative framework, appears to be new it is anchored by and builds substantially upon an existing body of work produced by UN-GGIM through its Subcommittee, Expert and Working Groups, and Thematic Networks. These works have served as sources of information for each strategic pathway in the Implementation Guide. This will continue to be the case.

To be maintained in the years ahead as a 'living document' the Implementation Guide will remain dynamic, continue to evolve, and will respond to a changing data and technology paradigm as a valuable resource for Member States.

# 1. Introduction

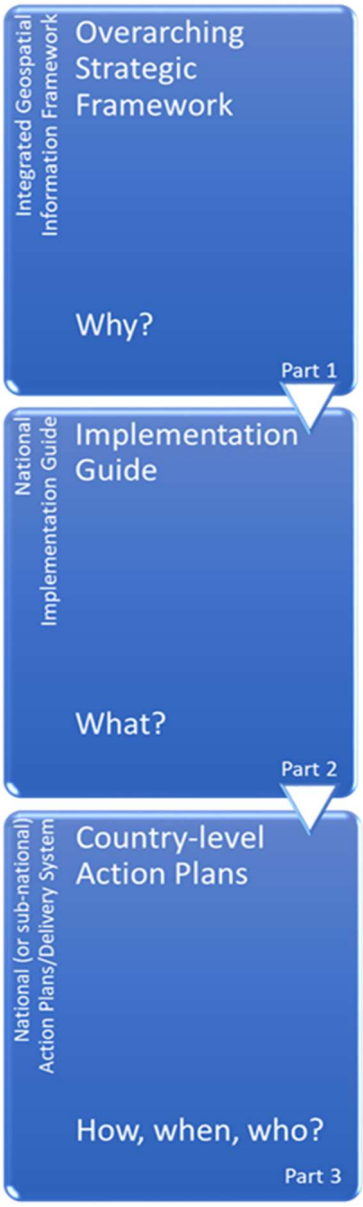


***Figure 1:*** *The 3 component documents of the Integrated Geospatial Information Framework (IGIF).*

The Integrated Geospatial Information Framework (IGIF) aims to translate high-level, strategic geospatial information concepts into practical implementation guidance and action for use by Member States, and has been developed with the knowledge that it will be a living document, to be further refined as technologies, processes, knowledge and experience evolve.

***What is the relationship between the Implementation Guide and the other two parts of the Framework?***

Part 1 of the IGIF, the Overarching Strategic Framework, is the strategic policy guide for Member States to reference when developing and strengthening their national and sub-national geospatial information management systems and capabilities (Figure 1). It presents a forward-looking and aspirational geospatial framework built on national needs and circumstances. As an introduction to the IGIF, the intended audience includes groups such as national leaders, political leaders, organizational managers, the business community and academia. The intent of this first document is to educate these key 'decision-maker' groups of the important contribution geospatial information is able to provide towards maintaining and advancing the economic, social, and environmental conditions and impacts on the nation, government and communities.

The Overarching Strategic Framework sets the context of **'why'** geospatial information management needs to be strengthened and why it is a critical element of a nation's national priorities and development. It focusses on the role of geospatial information in the digital age and how that information is integral to government functions at all levels. The Overarching Strategic Framework communicates this via vision and mission statements, seven (7) underpinning principles, eight (8) goals and nine (9) strategic pathways, all of which are aligned to strategic national to global drivers. The roadmap for implementing the Framework occurs primarily through the nine strategic pathways. These lead to an approach that considers national circumstances, priorities and perspectives as a means for governments to establish more effective geospatial information management arrangements.

The Overarching Strategic Framework is designed to stimulate action towards bridging the geospatial digital divide, to find sustainable solutions for social, economic and environmental development, and to influence inclusive and transformative societal change for all citizens according to national priorities and circumstances.

Part 2 of the IGIF, the Implementation Guide, describes **'what'** actions can be undertaken to strengthen geospatial information management. The Guide is a reference resource that provides information for governments to design, plan, establish, implement and maintain nationally integrated geospatial information frameworks in their country in such a way that transformational change is enabled, visible and sustainable.

The Implementation Guide provides guidance and options through nine strategic pathways: governance and institutions, policy and legal, financial, data, innovation, standards, partnerships, capacity and education, and communication and engagement (Figure 2). Each strategic pathway forms a separate and uniformly structured chapter in the Implementation Guide. The structure includes an approach and four key elements that are necessary to strengthening geospatial information management. The approach is complemented by an introductory explanation and the rationale behind the approach. Each strategic pathway also includes a series of actions and guiding principles recommended for consideration, as well as a list of deliverables and outcomes that countries can expect as a result of completing the actions.

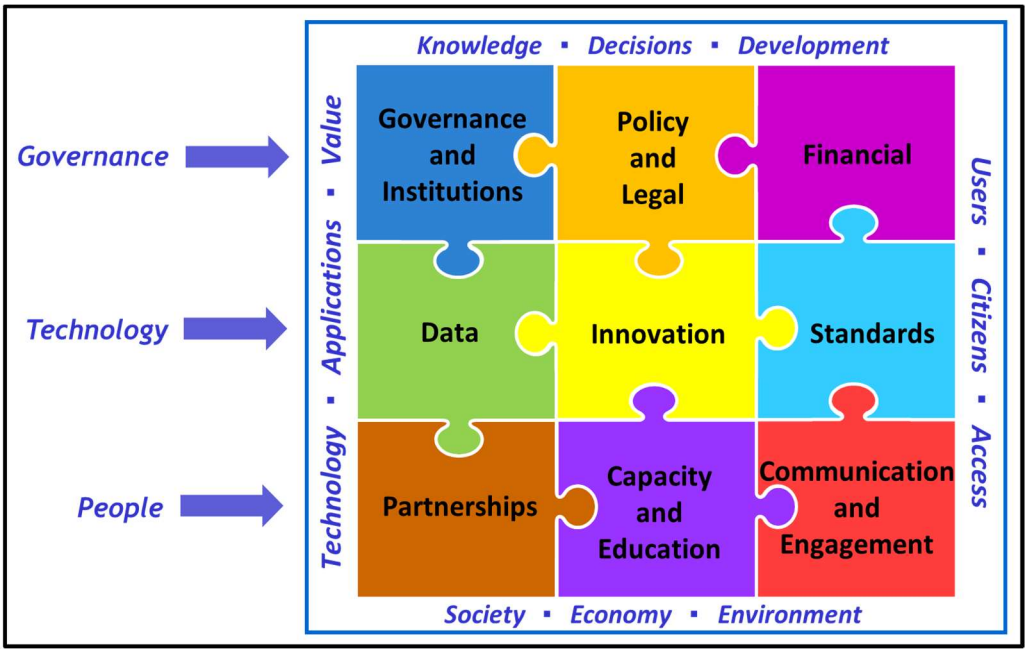


***Figure 2:*** *The Implementation Guide is anchored by nine strategic pathways, and expands on each of these, providing the specific guidance and options to be taken by countries.*

As shown in Figure 2, the nine strategic pathways are organized in response to three principle areas of influence: governance, technology, and people.

- Governance is essential to achieving integrated geospatial information management. It includes institutional arrangements, policy and legal requirements, and financial concerns that need to be factored into any sustainable geospatial information program or project.
- Technology influences geospatial location data, innovations, and the required standards that respond to continually evolving needs, demands, and uses.
- The people aspect is arguably the most important component, as it is the people who are the Framework enablers – performing all the tasks needed for a successful IGIF – often through partnerships and in collaboration with others. Having the necessary skills and knowledge is crucial to success, requiring capacity and education programs, and ongoing communication and engagement.

Recognizing that every country is at different levels of maturity in their geospatial development journey, the Implementation Guide is not intended to be prescriptive, but rather to provide guidance. The guidance is comprehensive, but still general enough to be applicable to all countries, and sufficiently flexible so that each country can develop their own plan of actions to meet their national priorities and circumstances. Each strategic pathway chapter has a standard structure and form for consistency and clarity. Graphics are included to summarize information and provide the user with a handy reference guide. Finally, each chapter provides appendices and information on additional resources and references.

Part 3 of the IGIF, the Country-level Action Plan, is specific to and completed by each country. Country-level Action Plan templates are available for countries to use and detail **'how'** the guiding principles, options, and actions specified in the Implementation Guide will be carried out, when and by whom. The Country-level Action Plan is informed by the processes, templates and tools that are available through the Guide. Completing these steps is necessary to first develop a national action plan, and then operationalize the IGIF through its subsequent implementation, and aligned with national priorities. Importantly, the Country-level Action Plan is a plan, not a program that is implemented.

Each Country-level Action Plan is unique to a country. It explains where each country is at in terms of their capabilities and capacity, and reflects decisions made to advance and/or enhance national geospatial arrangements within that country, and where they want to be after planning for their IGIF. Decisions are made based on various factors that differ among countries. National priorities and circumstances are two primary deciding factors. The guiding force in determining an Action plan is 'What is most important and most needed for national geospatial capabilities?'

One significant difference between Part 2, the Implementation Guide, and Part 3, the Country-level Action Plan, is that the Guide is general and can apply to any country looking for information on each of the nine strategic pathways of the IGIF. The Country-level Action Plan is country-specific and likely only applies to that country. That said, sharing the experience of developing an Action Plan among different countries is highly encouraged. Such shared knowledge will prove beneficial in replicating good experiences and avoiding difficulties.

While this introductory chapter focuses primarily on Part 2, additional information about the Country-level Action Plans is provided toward the end of this chapter.

***What is the purpose of the Implementation Guide, and what is it to be used for?***

**The Implementation Guide is a reference resource that defines, describes and offers helpful guidance and options on actions to be taken for each of the nine strategic pathways.**

The Implementation Guide is a reference resource that defines, describes, and offers helpful guidance and options on actions to be taken for each of the nine strategic pathways. While each pathway addresses a component of the IGIF, there are often interrelated linkages, actions and associations with one or more of the other strategic pathways. The Guide mentions where the relationships between the different pathways occur so that users can see and utilize these connections.

The Guide facilitates not only the interlinkages between the nine strategic pathways but provides guidance for strengthening the functional working relationships between and across the different levels of government within a country. It also offers information for different types of users, who may range from those nations learning to build their geospatial capabilities to those who have mature systems that need to respond to growing societal demands.

The strategic pathways are deliberately presented as separate pieces of a jigsaw puzzle in recognition that there are many aspects and dimensions to each individual pathway which can be addressed singularly. It is when the pieces are all joined together and united as one that the Framework is connected, integrated and able to be fully implemented.

At first view, some of the strategic pathways may not be immediately obvious as being required for a successful geospatial information program. However, as each of the chapters will describe, the relevance and connectivity soon become both obvious and compelling. Figure 2 also illustrates the multiple benefits that can be realised when the strategic pathways are implemented together.

Through the strategic pathways, the Guide tells the user what is needed to establish, implement, and/or maintain a national (or sub-national) geospatial information system. It also suggests and recommends a series of actions that may be required in order to be successful. This is helpful in gaining new knowledge or validating geospatial programs already in place. However, the Guide does not

describe how to implement the many points offered, as it is not intended to be prescriptive. The Country-level Action Plans will do that.

As a country embarks on their IGIF journey, the Implementation Guide can be used in different ways. For countries wanting to understand the full scope of the IGIF, reading the Guide from beginning to end may be preferred. Other countries may choose to proceed with their Action Plans (Part 3) and use the Guide as a reference while pursuing their goals and objectives to assure they have covered the relevant points of each pathway. Countries with mature or maturing geospatial information systems may choose to use the Implementation Guide as a validation of their current systems and to identify any gaps in meeting the integration challenges for their country. These are examples of how the Guide may be used but it is not a comprehensive list.

**The Implementation Guide leverages the work of UN-GGIM and the requirements of the SDGs to address the geospatial information management needs of developing countries in particular.**

***What are the origins of the IGIF and its three connected Parts?***

When UN-GGIM was established by the Economic and Social Council (ECOSOC) in 2011, there was a general sense of the need for coordination and collaboration among national mapping and national geospatial information organizations. The same need existed for private sector companies and international societies focused on various topics of geospatial science. In determining an initial inventory of issues in geospatial information management in 2012, topics of global interest, particularly for developing countries, began to quickly emerge for UN-GGIM.

Beginning with a need for a common geodetic reference frame, eventually introduced by the island nation of Fiji to the UN General Assembly, the governance, architecture and work within UN-GGIM evolved and offered more topics that would benefit Member States and the global to local agenda. The UN-GGIM Subcommittee, Expert and Working Groups are available on the UN-GGIM website[1]. Some examples include:

- The Subcommittee on Geodesy provides global guidance on issues relating to the ongoing maintenance, sustainability and enhancement of the Global Geodetic Reference Frame (GGRF);
- The Expert Group on the Integration of Statistical and Geospatial Information, was realized through collaboration with the UN Statistical Commission and has developed the Global Statistical Geospatial Framework;
- The Working Group on Global Fundamental Geospatial Data Themes leveraged experiences from successful national geospatial programs to meet the needs of

[1] Connections to the UN-GGIM Subcommittee, Expert and Working Groups Working Groups are accessible at: http://ggim.un.org/UNGGIM-expert-and-working-groups/.

less developed nations by focusing on the most important geospatial data that potentially has the greatest impact for a developing country;

- The Expert Group on Land Administration and Management has been addressing the multi-faceted challenges in ensuring good land governance, property rights, and ownership; and
- The Working Group on Legal and Policy Frameworks for Geospatial Information Management deals with a complex topic largely ignored until recently by the global geospatial community.

The Sustainable Development Goals (SDGs) were adopted in 2015 by the UN General Assembly as part of the 2030 Agenda for Sustainable Development (United Nations, 2015). The diversity of the 17 goals, 169 targets, and 232 global indicators demand the need for reliable methodologies, data, and proven techniques in order to comply with each indicator. The SDGs require timely and reliable data to measure and monitor progress, from a local to global level. Much of this data is statistical, and most of it dependent on geospatial information. The absence of useful geospatial information negates chances of measuring a target and goal, while the existence of effective geospatial information now means that the use of data needed for an indicator, that previously fell below a useful threshold, is now elevated.

The IGIF, and the Implementation Guide in particular, integrates the work of UN-GGIM with the needs of the global development agendas, and leveraged by drivers such as the SDGs, in its implementation. The results and on-going work of the UN-GGIM Subcommittee. Expert and Working Groups serve as a continual source for information provided by the pathways in the Implementation Guide. As UN-GGIM addresses new topics in the geospatial arena, results of those efforts will be reflected, as appropriate, in future versions of the IGIF and this Implementation Guide.

## 2. Linkages to the NSDI

Geospatial information is a nation's 'digital currency' for evidence-based decision-making. It has emerged as a major contributor to economic transformation in many countries and is a critical component of a national infrastructure and knowledge economy. Through National Spatial Data Infrastructures (NSDIs), geospatial information can provide the means to integrate a wide variety of government services that contribute to economic growth, national security, sustainable social development, environmental sustainability and national prosperity.

Yet, as has been noted by UN-GGIM over a number of years, there is still a considerable lack of awareness and understanding of the vital and integrative role of geospatial information and related enabling architectures, such as NSDIs, in contributing to national development. These NSDIs have historically focused on the technical aspects of collecting, maintaining and then sharing the various themes or layers of geospatial information, throughout all levels of government and society. The Implementation Guide illustrates how the IGIF builds on the previous and considerable efforts in planning and implementing national and regional Spatial Data Infrastructures (SDIs).

**The Implementation Guide illustrates how the IGIF builds on the previous and considerable efforts in planning and implementing national and regional Spatial Data Infrastructures (SDIs).**

***What are the differences between the traditional regional and national spatial data infrastructures (SDIs) and the IGIF?***

National circumstances are a primary force guiding the need for and management of geospatial information capabilities. Our human activity is the dominant catalyst of change on the environment and various natural ecosystems. This means that everyone's actions have an impact on our planet's future, no matter how small or inconsequential they may seem. Local geospatial information capacities and capabilities contribute valuable information for local decision-making and management, and inform national decisions.

In addition, regional and global needs also justify investment in the creation and maintenance of a geospatial framework. At the global level, the SDGs operate as a reminder of the critical importance of geospatial information as countries consume and evaluate the information from the Implementation Guide, working toward developing and ultimately implementing their Country-level Action Plans.

The benefits of a collective regional approach toward coordinating national efforts on geospatial information management are realized through formal and informal harmonization methods. In Europe, one example of a coordinated formal regional approach is the Infrastructure for Spatial Information in the European Community (INSPIRE) Directive.

INSPIRE is a legislative framework which aims to create a European Union SDI for the purposes of ensuring that geospatial information can be more accessible and interoperable to support primary environmental policies and policy-making, including sustainable development, across Europe. Entered into force in May 2007 by the European Union, INSPIRE provides an SDI framework based on the infrastructures for spatial information established and operated by the Member States of the European Union for 34 spatial data themes. These data themes are compatible and shared according to common implementing rules that are supplemented with measures at the community level (European Union, 2007). It is

intended that full operational implementation of INSPIRE is to be presented to the European Parliament by the end of 2021.

Africa's 'Agenda 2063: The Africa We Want' (African Union Commission, 2015) is another example of a plan for a coordinated regional transformation. An excerpt of a vision for action includes:

*"…a long-term 50-year development trajectory for Africa is important as Africa needs to revise and adapt its development agenda due to ongoing structural transformations; increased peace and reduction in the number of conflicts; renewed economic growth and social progress; the need for people centered development, gender equality and youth empowerment…"*

In order to accomplish this vision and to realize benefits of action, there will be:

"*…increased levels of regional and continental integration…There will be free movement of goods, services and capital; and persons travelling to any member state could get the visa at the point of entry…"*

This level of integration is not feasible without geospatial information. Geographical boundaries, cultural and physical features, demographics, natural resources and other influences, such as socio-economic drivers, have an impact on the movements referenced above and can be reflected and managed in geospatial information systems.

Within the Africa context, there are two other regional SDI initiatives underway, both led by the regional committee of UN-GGIM for Africa and supported by the United Nations Economic Commission for Africa (UNECA). 'Geospatial Information for Sustainable Development in Africa' is embodied in the African Action Plan on Global Geospatial Information Management 2016-2030 (UNECA, 2016) as a geospatial implementation tool of UN-GGIM Africa. This document focuses on four key areas: geospatial information policy and governance; common framework and tools; capacity building and knowledge transfer; and international coordination, collaboration and cooperation in meeting regional and global needs.

A detailed NSDI initiative is the project aimed at **'**Strengthening the Capacities of ECA Member States to Develop Geospatial Information Services in Support of the Implementation and Monitoring of the Sustainable Development Goals' (UNECA, 2019). This review and assessment recognizes the numerous past efforts to develop NSDIs in Africa, and concludes that implementations to date have been 'bottom-up' and lack input from the relevant stakeholders and decision-makers as champions and contributors. This has resulted in Africa lagging further behind other regions and in fact widening the geospatial digital divide. The assessment concludes that African countries need to change course and follow a 'top-down' and product-based

NSDI implementation by involving and engaging high-level policy decision-makers from the start.

Another data harmonization method is the formal or informal (voluntary) relationship between different levels of government. For countries that have local capacity and capabilities, this is often the most authoritative source of geospatial information and is based on local knowledge and the need to plan and respond to local circumstances and priorities. Local level information contributes to decision-making at a national scale and in the national interest and maximizes the benefits of that local knowledge and expertise. Harmonizing across different local governments is a case study on the importance of applying standards and interoperability for geospatial information. Taking that information to the global level further illustrates the value of such standards and interoperability.

**The IGIF, as an integrated framework, allows those countries that have already implemented NSDI capabilities to build upon this existing progress and investment to further develop national geospatial capability.**

***What additional value and benefit is the IGIF able to bring to national spatial data infrastructure (NSDI) development?***

Efforts at collecting, maintaining and coordinating national geospatial information through NSDIs began in the early 1990s. In 1992 the United States Office of Management and Budget, in establishing the Federal Geographic Data Committee, defined the NSDI as the *"technology, policies, standards, human resources and related activities to acquire, process, distribute, use, maintain and preserve spatial data"* (OMB, 1992, revised 2002).

Over time, the literature has provided many similar definitions that generally reflect NSDIs as being: *"coordinated actions of nations and organizations that promote awareness and implementation of complimentary policies, common standards and effective mechanisms for the development and availability of interoperable digital geographic data and technologies to support decision making at all scales for multiple purposes".* Such NSDI concepts, while reflecting the primary focus on geospatial data and its use, validated the essential role geospatial information would play in modern society and still apply today. The aim is to deliver as much publicly collected geospatial information as possible and make it widely accessible and available in a timely manner and at minimum cost (Scott and Rajabifard, 2017).

The long-standing virtues of NSDIs have been their ability to promote geospatial data sharing throughout all levels of government and society, enabling effective use of geospatial data for sustainable national development and other every day requirements. The Implementation Guide augments and builds upon these existing benefits and practices, providing a holistic, integrated national information system.

Earlier successes of national mapping and national geospatial organizations focused on acquiring and maintaining a core set of geospatial information that was disseminated as standard products for common use by a rather narrow user

community. With exposure to more and more location-based geospatial information, combined with technologies that have democratized the user experience, particularly through smart phones and related devices, the needs, demands, and expectations have shifted the role of national mapping and geospatial organizations. Standard data products are insufficient in responding to user-centric needs, demands, and expectations.

The IGIF is more comprehensive, as it also recognizes two factors that now challenge the limitations of a traditional NSDI. The first is the recent and growing availability of more diverse data and more data types and needs that are now more relevant and dependent on geospatial data than were originally considered. This reflects both technology evolution and the new and emerging data ecosystem that is more dependent on 'location' and 'integration. Big data, structured and unstructured data, and other realities pressure the current limitation of NSDI structures, as more of these external data add potential value to everyday queries for information. Further, some data are geospatially referenced while others are not.

The second limitation is the need for data integration and analysis. Traditional NSDIs are very structured (stovepipes) repositories of valuable geospatial information, with defined and managed (separate) data sets and themes, such as transport networks (road, rail, waterways, etc.), elevation and depth, boundaries (legal, administrative, and statistical), addresses, and water. Today, these data assets must meet diverse and specific local and national requirements and need to be 'integrated' with other data and sectors.

Data integration is needed between and among the various geospatial data themes such as the relationship between a road and a boundary. More importantly, integration is needed between geospatial data themes and geospatially referenced statistical data. Statistics are gathered and summarized according to the topic and point or area of interest. In a geospatial context, point locations and/or boundaries of these additional thematic areas are needed to analyze and map the results. These geospatial data elements are sometimes missing or are not integrated with other relevant geospatial data themes that are needed for analysis and use.

The principal focus of NSDIs is geospatial data. What is needed to establish or maintain an integrated national geospatial program is not sufficiently addressed by the NSDI. Historically, efforts at achieving an NSDI have focused on creating an NSDI rather than developing national geospatial capacity to address priority societal, economic and environmental decisions. Efforts have not been integrated into the broader requirements and mandates of government.

While an NSDI is a core and valuable component, a national geospatial program is much more than the data. The IGIF, as an integrated framework, helps in other ways. It allows those countries that have already successfully implemented NSDI capabilities, and achieved several of the strategic pathways, to build upon this existing progress and investment. More importantly, the IGIF offers a new paradigm and mechanism to further strengthen nationally integrated geospatial information management and the desired transformational change that is required.

The Implementation Guide captures and explains these differences in defining each of the interrelated nine strategic pathways required for an integrated national geospatial program. The approach, and comprehensive guidance for countries, recognizes the importance of capacity and capability development from the outset, beginning with the process to develop and prepare a Country-level Action Plan, a process that is participatory and inclusive for whole-of-government

However, those countries that are yet to embark on the NSDI now have an opportunity to 'leapfrog' existing concepts and processes. By going through this process, countries will, by definition, build their NSDI along with improved governance, enabling technology and people management, and with a greater understanding and communication of the value of geospatial information as a national asset.

## 3. Describing the Guide

**Each of the nine strategic pathway chapters provide the specific guidance and options to be taken by countries in implementing the IGIF and follow a consistent structure and form for ease of use.**

The remaining chapters of the Implementation Guide expand on each of the nine strategic pathways (Figure 2), providing the specific guidance and options to be taken by countries in implementing the IGIF. The nine inter-related pathways that have been developed reflect all the component parts of what forms a nationally integrated geospatial information program. Each of the chapters follow a consistent structure and form for ease of use. The jigsaw puzzle graphic was chosen to show that the pathways are interconnected with one another and across the entire three-by-three pattern of pathways. The variable shape also implies that the information offered about the strategic pathway is comprehensive but not exhaustive – and no two pathways are the same.

The Implementation Guide is intended to provide enough information for background in integrated geospatial information management topics that can lead to successful implementations. The graphic visualizations, which are consistent for each pathway, are key aides to assist in navigating through each of the chapters of the Guide.

The Guide is not prescriptive and is not a step-by-step recipe for success. It does not aim to answer all questions on the subject. This type of approach is not possible as each nation has its own set of national priorities and circumstances. Rather, it serves as a reference and resource for basic understanding while providing additional links and references to other information for further reading, research, and study. For many, the Guide will be sufficient for their needs; for others, it may be useful as a starting point. The guidance in the Implementation Guide should be adjusted and applied by each country to meet their priorities and circumstances.

## Chapter structure and form:

Each chapter contains the sections briefly described below. Some content applies to more than one strategic pathway. Rather than repeat this information in more than one chapter, the content appears in the most appropriate pathway for explanation and is referenced, sometimes by hyperlinks, in the other chapters.

- **Abstract** – The abstract provides an abridged summary of each of the strategic pathways and provides a direct linkage to the Overarching Strategic Framework. It includes the objective of the strategic pathway theme.
- **Summary** – The summary is a high-level three-page synopsis of the strategic pathway with its value proposition for the IGIF and includes the four key 'elements' that are unique to each strategic pathway. The summary also includes a graphic that illustrates the overall structure for the pathway showing the four key elements, guiding principles, actions and interrelated actions, and the tools provided in the appendices to support the achievement of the outcomes. Of note is that the three-page summary is designed for a second purpose, that of serving as a separate communication flyer for general understanding.
- **Introduction** – The introduction sets the stage for the uniqueness of the strategic pathway and establishes what the chapter is about. It highlights the main points included in the pathway theme, as well as some of its general content.
- **Context and Rationale** – The context and rationale describe why the strategic pathway is necessary in establishing and maintaining a national geospatial program. Background information is provided offering additional perspective, as well as reasoning and justification for why this is one of the nine pathways.
- **Approach** – The approach to the chapter further describes the unique part that the strategic pathway plays in a nationally integrated geospatial program. Importantly, it includes a graphic visualization that captures what is in the

summary diagram but goes into greater detail for the user on the most important concepts. In these graphics, items are hyperlinked for ease of search and navigation within the chapter.

- **Elements** – Each chapter contains four key elements as the principle components for the strategic pathway. The aim of the pathway is to achieve these four key elements, which must therefore be considered when making decisions and planning what actions are to be included in the Country-level Action Plans. The elements are those defined in the Overarching Strategic Framework and are described in further detail within the chapter.
- **Guiding Principles** – The guiding principles are the values that guide countries throughout their IGIF strategic pathway journey and help them to stay on course. They reflect what is important for success, and frame the outcomes to be delivered through the strategic pathway actions and interrelated actions.
- **Actions** – The actions serve as a means and road map that specify the activities and recommended steps for achieving the four key elements of the pathway. Within each chapter the actions are presented graphically as a structured step-by-step sequence, as well as a less-structured series of steps. Interrelated and/or prerequisite actions that need to be achieved prior to, or in conjunction with, the strategic pathway actions are also presented – along with the required tools. A large portion of the chapter is dedicated to describing these actions and their many options.
- **Deliverables** – The deliverables are the products derived as a result of applying the actions from the strategic pathway.
- **Outcomes** – The outcomes are the results from the actions and deliverables from the pathway.
- **Resources** – The resources include additional sources of information that can further support the theme of the strategic pathway.
- **References** – Provides applicable references for the chapter.

## Strategic pathways:

As shown in Figure 2, the nine interrelated strategic pathways have been developed to reflect all the component parts of an integrated national geospatial information program, and organized in response to three principal areas of equally shared influence: these being aspects related to overarching national governance; the underlying data and enabling technology, and the importance of people in the geospatial information life cycle. **Governance** influences: Governance and

Institutions; Policy and Legal; and Financial. **Technology** influences: Data; Innovation, and Standards. **People** influences: Partnerships; Capacity and Education; and Communication and Engagement.

The objective of the strategic pathways is to provide the 'implementation roadmap' to guide governments towards implementing integrated geospatial information systems in a way that will deliver a vision for sustainable social, economic and environmental development. Each strategic pathway has its own purpose, function, and characteristics. Some characteristics apply to more than one pathway and, in some cases, may apply to all pathways. For example, while the function of monitoring and evaluation is most appropriate as part of Strategic Pathway 1: Governance and Institutions, it is also appropriate for measuring the success of progress in other pathways.

**Governance and Institutions** strategic pathway establishes the leadership, governance model, institutional arrangements and a clear value proposition to strengthen multi-disciplinary and multi-sectoral participation in, and a commitment to, achieving an Integrated Geospatial Information Framework. Good governance and cooperative institutional arrangements are a priority in any geospatial information reform agenda. They enable geospatial information challenges to be met head on, provide flexibility to accommodate the rapidly changing environment, and the ability to embrace community and business participation within a culture of digital reform and transformation.

**Policy and Legal** strategic pathway establishes a robust policy and legal framework that is essential for instituting effective, efficient and secure management and exchange of geospatial information – nationally and sub-nationally. Policy and legal frameworks are particularly important as they impact many other strategic pathways. Considered as providing instruments, some of which are binding, while others are non-binding, this strategic pathway addresses the wide range of legal and policy issues that impact the collection, use, storage and distribution of geospatial information.

**Financial** pathway establishes the business model, develops financial partnerships, and identifies the investment needs and means of financing for delivering integrated geospatial information management. It also recognizes the benefits realization milestones that will achieve and maintain momentum. The financing required will typically come to fruition when governments can see evidence that geospatial information will deliver social, economic and environmental benefits to a country, and that there is a corresponding and credible plan to realize these targeted benefits.

**Data** strategic pathway establishes a geospatial data framework and custodianship guidelines for best practice collection and management of integrated geospatial information that is appropriate to ensure cross sector and multidisciplinary collaboration. Having access to the right data and at the right time is crucial to good decision-making. It is data that provides new levels of insight into our past, present and future. For this reason, governments, businesses and the community need to know they are using the most accurate and authoritative data for planning, analysis, navigation and visualization – good data underpins good decisions.

**Innovation** strategic pathway recognizes that technology and processes are continuously evolving, creating enhanced opportunities for innovation and creativity that enable governments to quickly bridge the geospatial digital divide. For many governments, promoting and ensuring that there is innovation throughout the 'length, breadth and depth' of mechanisms towards strengthening national geospatial information management has the potential to have the most significant impact on stimulating, triggering and embracing rapid change, to bridge the geospatial digital divide and reap the dividends of digital transformation.

**Standards** strategic pathway establishes the importance of adopting best practice standards and compliance mechanisms that enable data and technology interoperability. These are fundamental to the delivery of relevant, integrated geospatial information and location-based knowledge creation. An inclusive governance process and policy environment are essential to assure consistent usage of standards and to promote local, regional, and international compatibility. Standards support a more agile and adaptable process for the application of geospatial information for policy and decision-making.

**Partnerships** strategic pathway establishes cross-sector and interdisciplinary cooperation, coordination and collaboration with all levels of government, the geospatial industry,[2] private sector, academia, and the international community, as an important premise to developing and sustaining an enduring nationally integrated geospatial information framework. Partnerships should always be actively explored. They bring together different strengths and perspectives that stimulate creativity and innovation, often through unique capabilities, and drive achievements towards common goals.

**Capacity and Education** strategic pathway establishes enduring capacity development programs and education systems so that geospatial information management and entrepreneurship can be sustained in the longer term.

[2] In some countries and regions, Africa in particular, the term 'geospatial industry' is an inclusive term that captures the entire geospatial sector as a 'geospatial discipline'.

Knowledge, skills, education, training, opportunity, and continual development are key components for organizations, individuals, and communities to consider.

**Communication and Engagement** strategic pathway recognizes that stakeholder identification, user engagement and strategic communication are essential to successfully deliver integrated geospatial information management arrangements, nationally and sub-nationally, for sustainable social, economic and environmental development. Communications and engagement develop and sustains effective, trusted and collaborative relationships with stakeholders. Successfully undertaken, it raises awareness and advocacy to the community, businesses, professionals, decision-makers and politicians of the relevance, contributions and benefits of integrated geospatial information management at all levels.

## 4. Validating the Guide

For many countries, initiating the development of a national geospatial program can be a daunting task. Guiding a national strategy, starting a new geospatial capability, developing and/or improving an existing capability, validating existing arrangements and structures, etc. are not easy or straightforward. For other countries, attempts at initiating and maintaining a geospatial program has resulted in challenges and difficulties. Still other countries, which have successful national geospatial programs, seek validation or confirmation of their implementations in order to meet the growing demands of data use by more types of users over time.

**In response to the many challenges and interests faced by more than 110 Member States, the Implementation Guide contains all the necessary components and tools to assist in the successful development of a national geospatial information program.**

In response to the many challenges and interests faced by Member States, it has been vital to ensure that the Implementation Guide contains all the necessary components and tools to assist countries in their efforts to successfully develop, augment and maintain a nationally integrated geospatial information management program and associated arrangements. Therefore, with the continued support of the World Bank and other international partners the UN-GGIM Secretariat has, from the outset, initiated an ongoing inclusive global engagement and consultative process to develop the Guide constructively with countries. This approach has the benefit of ensuring that, as a methodological framework, the IGIF and the Implementation Guide is truly 'country owned, and country led'.

Therefore, from March to November 2019, the Secretariat has convened twelve IGIF expert workshops and consultative meetings with a broad range of stakeholders from countries, academia, industry and the private sector, and from all geographic regions. In this process, 113 Member States were formally represented and participated, many several times. These expert consultations have yielded an enormous wealth of diverse information and guidance that has greatly contributed to, informed, and enhanced the purpose, structure and substance of

this Information Guide, as well as the Country-level Action Plans. Of particular note were several three-day regional workshops for developing countries convened in Chile, China, Ethiopia (twice), Malaysia and Rwanda. The inputs provided, and subsequent iterative development, has ensured the Implementation Guide provides the robust guidance, consensus and options that it does today. Notably, the consultations have extended the substance and content of the Guide – including the inclusion of this opening chapter 'Solving the Puzzle'.

During this consultative process, a detailed report on the development of the Implementation Guide was submitted to the ninth session of UN-GGIM in August 2019.[3] A half-day Forum on Operationalizing the IGIF[4] was also convened to provide additional opportunity for further discussion. UN-GGIM welcomed the series of extensive and productive expert consultative meetings that had been convened to develop and refine the Implementation Guide in preparation for subsequent and broader global consultations with Member States and other key stakeholders.

It is noted that the many consultations and discussions that have ensued with more than half of the world's Member States have identified and reaffirmed a persistent issue for the global geospatial community; the lack of awareness and understanding of the vital and integrative role of geospatial information and related enabling architectures, such as NSDIs, in contributing to national development. Strategic Pathway 1: Governance and Institutions, and Strategic Pathway 9: Communication and Engagement, the two pathways that bookend all other pathways, have been identified as the most critical to achieve if we are to ensure that countries are able to establish and sustain nationally integrated geospatial information management capabilities.

Why is this the case? Because strong leadership and commitment is ultimately required. Leadership drives change and is realized through the implementation of a national geospatial strategy that clearly describes the country's strategic priorities and how geospatial information can be applied to address these priorities. Leadership requires vision, the capacity to take positive steps, and knowing the tactics to achieve the vision. With strong leadership, anything is possible; without leadership, very little is achievable – including the implementation of the IGIF.

In a similar vein, constant and ongoing communication and engagement is required to raise awareness and advocacy to the community, businesses, professionals,

[3] http://ggim.un.org/meetings/GGIM-committee/9th-Session/documents/E-C.20-2020-6-Add_1_IGIF.pdf

[4] http://ggim.un.org/meetings/GGIM-committee/9th-Session/side_events/Concept_Note_IGIF_%20Forum_29July2019.pdf

decision-makers and politicians of the relevance, contributions and benefits of integrated geospatial information management at all levels. Amid rapidly evolving technologies, changing societal norms and economic outlooks, and against a backdrop of many competing priorities and agendas, it is critical to be able to communicate the value that geospatial information brings to national development, governments, and the broader community.

Understanding and articulating the difference between the IGIF and NSDIs, and the linkages between the two, has undoubtedly been the major topic of discussion in all consultations. As a result, linkages to the NSDI is a key focus in this opening chapter, illustrating how the IGIF builds on the considerable efforts in planning for and implementing national and regional SDIs.

# 5. How the Guide Will be Managed and Used

***How will the IGIF and Implementation Guide be managed in the future?***

**The IGIF, and its Implementation Guide, have been formally recognized and endorsed by the Member States of UN-GGIM. Developed by countries for countries, the IGIF is now anchored to UN-GGIM's program of work.**

The IGIF, and its Implementation Guide, have been formally recognized and endorsed by the Member States of UN-GGIM. It is now anchored to the program of work as a dedicated item on the UN-GGIM agenda. Importantly, the IGIF has been 'developed by countries for countries' with a specific focus on ensuring the effective use of geospatial information management in a nation to measure, monitor and achieve sustainable social, economic and environmental development. It forms the basis and guide for developing, integrating and strengthening geospatial information management, and to assist countries in bridging the geospatial digital divide, according to national priorities.

Therefore, the IGIF will be maintained in the years ahead. It will be a 'living document'; it will remain dynamic, continue to evolve, and will respond to a changing data and technology paradigm. It will be periodically reviewed and improved as needs require in a similar manner as the Future Trends Report. In this regard, the UN-GGIM Bureau and Secretariat will continue to provide the ongoing management and oversight of the IGIF so that it continues to serve as a guide for all countries. Progress will continue to be reported to, and guidance sought from, UN-GGIM.

***How is the Implementation Guide best used?***

There is no set method for using the Implementation Guide. It is designed with various options in mind so that users can decide the best approach to meet their needs. Each chapter has a standard structure and form as described earlier. If, for example, a user wanted to view actions required for several pathways, they can be found in the same order in each chapter. Different types of graphics are used for

**Each of the nine strategic pathway chapters provide the specific guidance and options to be taken by countries in implementing the IGIF and follow a consistent structure and form for ease of use.**

quick searches and for users who prefer a more visual discovery technique. Key words will be hyperlinked throughout the chapters, including key words in the graphics, so that searches are quick and easy. More detailed information can then be found in the text.

As the Implementation Guide does not address every aspect of each strategic pathway, the last section of each chapter provides information on additional resources and references. The IGIF builds on the work of the UN-GGIM Subcommittee, Expert and Working Groups, which are referenced as appropriate. Where documents and resources have been created from the work of these groups, references to the work are included in the chapters rather than unnecessarily recreating the same work.

In addition, appendices are provided separately for each chapter. These expand on some points raised in the chapter, including additional examples for better understanding, country case studies of examples, circumstances that may be of interest, and other helpful information such as tools to help apply some of the guidance offered in the chapter. Information in the appendices varies across the different chapters.

***Where to start with the Implementation Guide and its management?***

Success in implementing a nation's IGIF is improved with a well-organized and structured governance plan. Strategic Pathway 1: Governance and Leadership, notes that "Good governance and cooperative institutional arrangements are the first priority in the geospatial information reform agenda." Therefore, the governance approaches outlined in this strategic pathway are recommended for managing and using the IGIF and the Implementation Guide. As a first step, it is suggested to follow the guidance offered in the four key elements, beginning with establishing a governance model followed by identifying the leadership team. Next, define the roles and responsibilities for tasks as part of the institutional arrangements across government. Lastly, establish a process for measuring and monitoring progress. This contributes to the value proposition which completes the four governance and leadership elements. An example of assistance in managing the IGIF is provided through the Country-level Action Plan template that guides an organization through the most important parts of a national geospatial information program, and aligned with the strategic pathways described in the Guide.

A nationally integrated geospatial information program requires a significant investment but has benefits in advancing the priorities and circumstances of a nation. Given its importance, having appropriate and constructive oversight is recommended. Invitations to senior leaders from partner agencies and stakeholder organizations to serve in an advisory capacity helps to assure involvement and

commitment from those whose support is needed for the IGIF. In addition, consider having an independent set of experts periodically evaluate plans and implementations for the IGIF. Including experts with expertise from other international efforts will also contribute to the program's success.

## 6. Interrelated Actions

**There are many aspects and dimensions to each of the strategic pathways. No matter which approach is taken, there are multiple 'interrelated actions' that occur across the pathways.**

As described in the Introduction to this chapter, there are many aspects and dimensions to each of the nine strategic pathways which can be addressed singularly, and it is when they are all joined together the IGIF is connected, integrated and able to be fully implemented. Therefore, in their implementation process, countries may wish to identify and address a single strategic pathway at a time, a combination of several pathways, or all nine of the pathways, in their efforts to establish a nationally integrated geospatial information framework.

No matter which approach is taken, the relevance and connectivity across the strategic pathways becomes obvious as the 'actions' are implemented and achieved for the four key elements for each pathway. While most of these actions implemented may be unique to each strategic pathway, there are several interrelated and/or prerequisite actions detailed in other strategic pathways that may also need to be completed. These can be prerequisite actions (from other pathways) that need to be achieved prior to, or in conjunction with, the strategic pathway actions of interest. Tools to assist in completing the actions are available in the appendices to the relevant strategic pathway chapter(s).

By way of example, and with reference to Figure 3, implementing Strategic Pathway 4: Data, requires four key elements to be implemented: priority data themes; guidelines for custodianship, acquisition and management; streamlined data supply chains and well-coordinated data curation and delivery mechanisms.

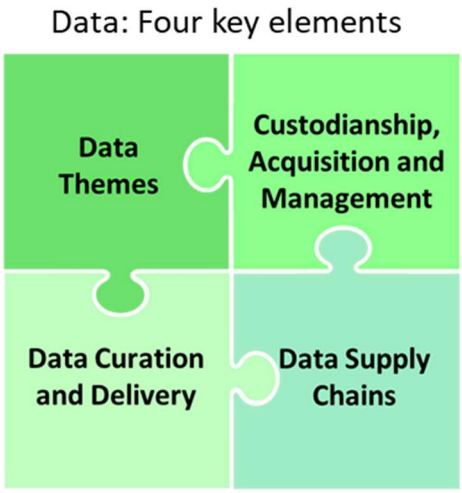


***Figure 3:** Strategic Pathway 4: Data, contains four key elements to be implemented.*

With reference to Figure 4, one of the six categories of action is 'Managing Data Sustainably'. This category has 5 specific actions that need to be addressed for the strategic pathway: Data Custodianship Policy and Guidelines; Data Governance; Maintained Metadata; Storage and Retrieval Systems; and Data Release. Tools (as templates, guidelines and examples) are also available to assist. However, to fully

implement Managing Data Sustainably, a number of interrelated actions may also be required, some of which will be prerequisite or required actions.

Managing Data Sustainably will almost certainly require a Geospatial Information Coordination Unit (Strategic Pathway 1); a Policy Framework (Strategic Pathway 2); Data Standards (Strategic Pathway 6); and Storage Solutions (Strategic Pathway 5). Although perhaps not an initial requirement, it would be valuable to also have a Governance Model and a Geospatial Steering Committee (Strategic Pathway 1) in place.


***Figure 4:*** *For implementing the category of action 'Managing Data Sustainably', the above actions, tools and interrelated actions will be required. Note the associated icons, which are used consistently in this manner throughout all strategic pathways.*

As another example, a category of action in Strategic Pathway 1: Governance and Institutions is 'Setting Direction'. This involves specific actions such as undertaking a Strategic Alignment Study and developing a Geospatial Information Management Strategy. These are actions directly related to completing the requirements for Governance and Institutions. However, there will also be a number of interrelated actions from other strategic pathways that will contribute to Setting Direction. These could be a Stakeholder Engagement Strategy (Strategic Pathway 9); a Business Model (Strategic Pathway 2); and Formalized Data Supply Chains (Strategic Pathway 4). Each of these comprise 'interrelated actions' from other strategic pathways that contribute to delivering the action on Setting Direction in Strategic Pathway 1.

# 7. Country-level Action Plans

This section describes Part 3 of the IGIF, the Country-level Action Plan. It is the process of building an IGIF for a nation, beginning with specific plans that align with a nation's priorities and circumstances. A Country-level Action Plan references the specific guidance, options and actions provided in the Implementation Guide and addresses each of the strategic pathways while considering the strategic and operational needs of a country when implementing the IGIF. It is important to recognize that the Country-level Action Plan is a plan, not a program that is implemented. It can be viewed as the 'requirements document' for national geospatial implementation; discovery, actions, decision points, etc.

**Country-level Action Plans reference the specific guidance, options and actions provided in the Implementation Guide and address each of the strategic pathways while considering the strategic and operational needs of a country when implementing the IGIF.**

A Country-level Action Plan includes a number of activities that provide a roadmap for a successful implementation of an IGIF for a nation. It follows a very specific set of actions as introduced in the Implementation Guide. The Action Plan begins with an execution plan that identifies the project scope and schedule for the activities to be undertaken. At this stage, the schedule reflects major milestones that end with a completed plan when all of the activities are identified. Some of the activities may already be done and are simply added to the plan. For example, if a country has an existing geospatial strategic plan with vision and mission statements, followed by objectives to accomplish the vision, then these are added to the execution plan and the milestone schedule shows them as completed.

The next phase in a Country-level Action Plan focuses on conducting a needs assessment and formulating a gap analysis. The needs assessment includes activities such as determining current capabilities, while also indicating what is a realistic desired performance (where they want to be) based on country priorities. A baseline survey is completed to gather detailed information about the current geospatial information management environment in a country. The survey, which is aligned to each of the nine strategic pathways from the Guide, is useful for many purposes, one of which is to help in understanding gaps in a nation's current capabilities. These gaps indicate what functions and capabilities may need attention. The gaps also serve as an indication as to where financial and operational investments are needed. Having an initial baseline survey provides a benchmark for measuring progress when conducting future surveys.

Within this second phase of the Country-level Action Plan, other activities contribute to the needs assessment and gap analysis. Conducting an environmental scan of internal and external factors that have an impact on geospatial information management is such an activity. In one approach, a nation can evaluate the technological, economic, social, and political factors influencing integrated geospatial information management. In another approach, internal factors are

evaluated such as current skills, needed policies, new applications, and the impact of obsolete technology.

Identifying and engaging with stakeholders in the second phase is important for IGIF success. National mapping and geospatial organizations likely need to engage with new partners and stakeholders in this modern, data-rich environment. Aligning integrated geospatial information management activities to what matters most for a country enables higher performance and value by optimizing the contributions of organizations in terms of people, processes and inputs, thereby minimizing waste of effort and resources.

The result of each of the steps within the second phase is a needs assessment and gap analysis report. The report feeds into the third and final phase which is the creation of the Country-level Action Plan itself. The Country-level Action Plan provides detailed steps towards achieving the short and long-term strategic goals and actions needed for strengthening integrated geospatial information management. The Action Plan draws on the recommended methods documented in the Implementation Guide, along with justification of the approach. A detailed Action Plan template is organized using each of the strategic pathways and guides countries, step-by-step, toward completing the plan.

The Country-level Action Plan template has a consistent structure and form, similar to the consistency of the structure and form of the Implementation Guide, for each of the strategic pathways. Examples of the template structure for each pathway include agencies involved, proposed approach, actions and implementation timeframe (schedule), deliverables and outcomes, risks and mitigation, budget estimation and funding status.

Based on decisions made by the country, activities (tasks) that are essential are populated in the Country-level Action Plan and further subdivided into all of the component tasks that are needed for a successful implementation of their IGIF. Each task is included in a schedule to improve the monitoring and evaluation responsibilities. Budget estimates are made for the various activities. The estimates are aggregated into an annual budget based on the schedule. Funding sources are associated with the budget and can be broken down by activity if multiple funding sources are applied, including national government funding (usually through taxation) and budget allocations from other parts of government; donor countries, NGOs, private sector, or other donor sources; and sales revenue of integrated geospatial information products.

Each step in the planning process includes tools to help a country realize success from their efforts. Each tool includes background information that explains what information is collected, why it is important, and what it will be used for within the

planning process. For every activity, a country's staff gains sustainable knowledge and skills that add to a nation's geospatial capacity in meeting its needs. This is a critically important part of the IGIF. Knowledge and experience help to assure the sustainability of the nation's integrated geospatial information capabilities into the future.

There are also different approaches for pursuing Country-level Action Plans. While the Implementation Guide was in development, it was important to determine the feasibility of creating an IGIF for developing countries. In response, an early effort by the UN Statistics Division initiated a UN Development Account Project with six countries with varying circumstances that included Least Developed Countries (LDCs), Small Island Developing States (SIDS) and Land Locked Developing Countries (LLDCs). The description above of a Country-level Action Plan reflects what has been done by the UN Development Account Project. The experiences in applying the methodology, concepts, and tools from that project have been instructive for both the country participants and the United Nations. Many adjustments were made to improve both the process and the tools.

Different Country-level Action Plans are being developed in parallel and in coordination with the Implementation Guide. They are being implemented in several ways. The UN Development Account Project is a self-paced learning and execution approach, where the work team and schedule is determined solely by each country. The World Bank has also developed an approach for Country-level Action Plans through their Technical Assistance Program that is closely aligned with the content developed for the IGIF as part of the UN efforts. The World Bank's program offers execution assistance where part of their work occurs in-country as its approach.

Once Part 3 (Country-Level Action Plan) is completed, this concludes the planning for the IGIF. The next phase is for each country to begin the implementation of their plan. The success of each country's IGIF will depend on how well each country's Country-level Action Plan is executed.

# 8. Benefits

Understanding and realizing the benefits of the IGIF, including the outcomes and value proposition, is one of its greatest influencing factors. Specific 'outcomes' apply to each of the strategic pathways in different ways, and collectively they help shape the social, economic, and environmental benefits to the nation. Strategic Pathway 1: Governance and Institutions specifically addresses the value proposition, the economic benefit of integrated geospatial information to national

**Understanding and realizing the benefits of the IGIF, including the outcomes and value proposition, is one of its greatest influencing factors.**

priorities, including citizen and societal benefits, as one of its four key elements. Value is one example of the interrelated actions across all pathways.

The ultimate benefit of integrating and strengthening geospatial information management is that it is a strategic enabler for all levels of government and the broader community. It improves planning for economic growth and delivery of better services. It supports the delivery of the SDGs, such as poverty alleviation, socially inclusive development, protection of the environment, disaster response times, regional cooperation and transparency in governance. Further examples of real benefits, and the rationale, are detailed in the following points:

- **Economic Growth:** Managing the orderly development of land, and subsequent provision of a multitude of government and private services through infrastructure development, requires integrated planning. This is fundamental to a vibrant economy and community. Planning is underpinned by a good understanding of where things are and how they relate to each other. Business development, investment and donor opportunities, and providing and maintaining basic citizen services fairly distributed across areas of the country are examples of economic benefits to a nation. Geospatial information supports the range of services and infrastructure including roads, rail, ports, utilities, and community services such as education, health, welfare and justice. Providing whole-of-government geographically-referenced integrated data allows for optimal planning of infrastructure and services to meet future needs and economic growth.
- **Socially Inclusive Development:** Government's ability to understand and recognize the geographic distribution and demographics of people throughout the country, and respond effectively to their needs, is dependent on having sound information on which to base planning and decision-making. This information comes from a wide variety of sources and can be very limiting without a geographic context. Integrated geospatial information management enables the integration of statistical data in a geographic context. This allows effective development of government policies and the planning of government infrastructure and services for nationally and regionally balanced decision-making.
- **Poverty Alleviation and Improved Health Services:** In many countries, governments are targeting poverty reduction programs, and supporting special projects, such as health care, waste management and drinkable water. These efforts directly benefit the communities by improving their basic survival needs and establishes socio-economic status. Geospatial information supports these project objectives by making planning and program implementation far more

effective. This in turn assists in the effective delivery of critically important basic human need programs.

- **Protection of the Environment:** Many countries face a host of environmental challenges, such as land degradation, pollution and poor management of water resources, loss of biological diversity, coastal erosion, increasing scarcity of water for agriculture, waste disposal in urban areas, and traffic congestion in cities. The challenge is to balance increased development with sustainable environments. Management of natural resources, particularly with increased pressures resulting from changes on the planet, requires accurate geospatial information to understand and manage and monitor the many competing factors in the environment. In many cases, the various government agencies have their specific areas of responsibility and each retains specific geographically-related information to support that responsibility. Conversely, each needs to access data from other agencies in establishing their own natural resource management plans. Being able to share integrated geospatial information management through improved technology and methods, and a coordinated Integrated Geospatial Information Framework, will allow better-informed natural resource management decisions. This is essential as economic growth may result in unsustainable use of natural resources and unintended environmental implications for local habitats.
- **Water Resource Management:** A number of governments have a key priority to improve the accessibility to clean water supply and sanitation. To adequately serve their growing populations, agriculture in arid and semi-arid regions requires disciplined water resource management. Achievement of these goals will require an excellent foundation of geospatial information. In many situations, geospatial information on water resources is maintained within several organizations with specific responsibilities such as those responsible for Irrigation and Water Resources Management, Land Development and Water Supply and Drainage. The ability to share geospatial information management transparently across these specialist agencies means that they can then focus on their core tasks rather than diverting resources into searching for, and retrieving, data.
- **Disaster Response**: Planning, mitigating, responding to, and recovering from natural disasters, is crucial to providing safe and secure communities. Geospatial information is critical in these processes. In terms of mitigation, geospatial information contributes to the placement of early warning systems as a preventative measure prior to a pending disaster event. Knowing where vulnerable populations and critical infrastructure are located in preparation for impending natural events allows for more informed preventative actions.

Improved information sharing technologies will provide a common operating picture and up-to-date information that can be shared across the spectrum of agencies that are managing the environment and dealing with emergency situations. In emergency management terms, being able to share integrated geospatial information in real-time means the 'same Information will be delivered to all agencies at the same time'. Geospatial information is also critical in responding to the aftermath of disasters. What happens next and where actions are needed are made possible by up-to-date geospatial information.

- **Business and Industry Development:** Integrated geospatial information supports planning requirements for increasing industrial development and the growing demand for new infrastructure. In many countries, industrial activities are increasing, oftentimes providing higher-paid employment in industry and related manufacturing services. Locating where a manufacturing plant is best placed depends on several factors, most of which are determined by geospatial information; such as road, rail, and port locations, proximity to populated areas to provide the workforce, and desirable places to live for families of workers. Many of these jobs will be in urban areas, suggesting an accelerating rural–urban transition. Achieving employment growth, while improving potential adverse social and environmental impacts of urbanization, will be a key development challenge for countries. Geospatial information provides context to analyzing these types of complex and multi-dimensional situations.
- **Agricultural Productivity:** In some countries, small-scale farming has declined over the past decades due to irregular rainfall, recurrent drought and poor irrigation infrastructure. Food security in terms of availability, accessibility and affordability is uncertain, most notably in rural regions. Integrated geospatial information can be analyzed by governments to assist smaller farm holders through yield monitoring and crop stress mapping, variable rate technologies (for applying fertilizers and irrigation), soil condition mapping, salinity mapping, and the control of pests and disease outbreaks. In the longer-term this will lead to achieving higher yields, productivity and profitability in agriculture.
- **National Security:** Defense and intelligence agencies normally function in their own professional domain, including in their collection, management, and use of geospatial information. Over time, some nations have now included representatives from the defense and intelligence communities as part of the geospatial governance process to better serve the public safety and security interests within a country. Knowledge of civilian assets can sometimes help to more effectively deal with special events and circumstances. At the same time, geospatial assets from the defense and intelligence communities that are not

sensitive or classified can assist civilian agencies to leverage the national investments made for the wider use and benefit of the country.

## 9. References

African Union Commission, 2015. *Agenda 2063: The Africa We Want*. African Union Commission. https://www.un.org/en/africa/osaa/pdf/au/agenda2063.pdf

European Union, 2007. *Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE).* European Union. https://inspire.ec.europa.eu/documents/directive-20072ec-european-parliament-and-council-14-march-2007-establishing

OMB, 1992, revised 2002. *Coordination of Geographic Information and Related Spatial Data Activities.* OMB Circular N0. A-16. Revised 2002. https://www.whitehouse.gov/omb/circulars_a016_rev

Scott, G., and Rajabifard, A. 2017. *Sustainable development and geospatial information: a strategic framework for integrating a global policy agenda into national geospatial capabilities*. Geo-spatial Information Science. DOI: 10.1080/10095020.2017.1325594.

UNECA, 2016. *Geospatial Information for Sustainable Development in Africa: African Action Plan on Global Geospatial Information Management 2016-2030.* United Nations Economic Commission for Africa. https://www.uneca.org/publications/geospatial-information-sustainable-development-africa

UNECA, 2019. *Strengthening the Capacities of ECA Member States to Develop Geospatial Information Services in Support of the Implementation and Monitoring of the Sustainable Development Goals.* United Nations Economic Commission for Africa. In print.

United Nations, 2015. *Transforming our World: The 2030 Agenda for Sustainable Development.* United Nations, New York. A/RES/70/1.