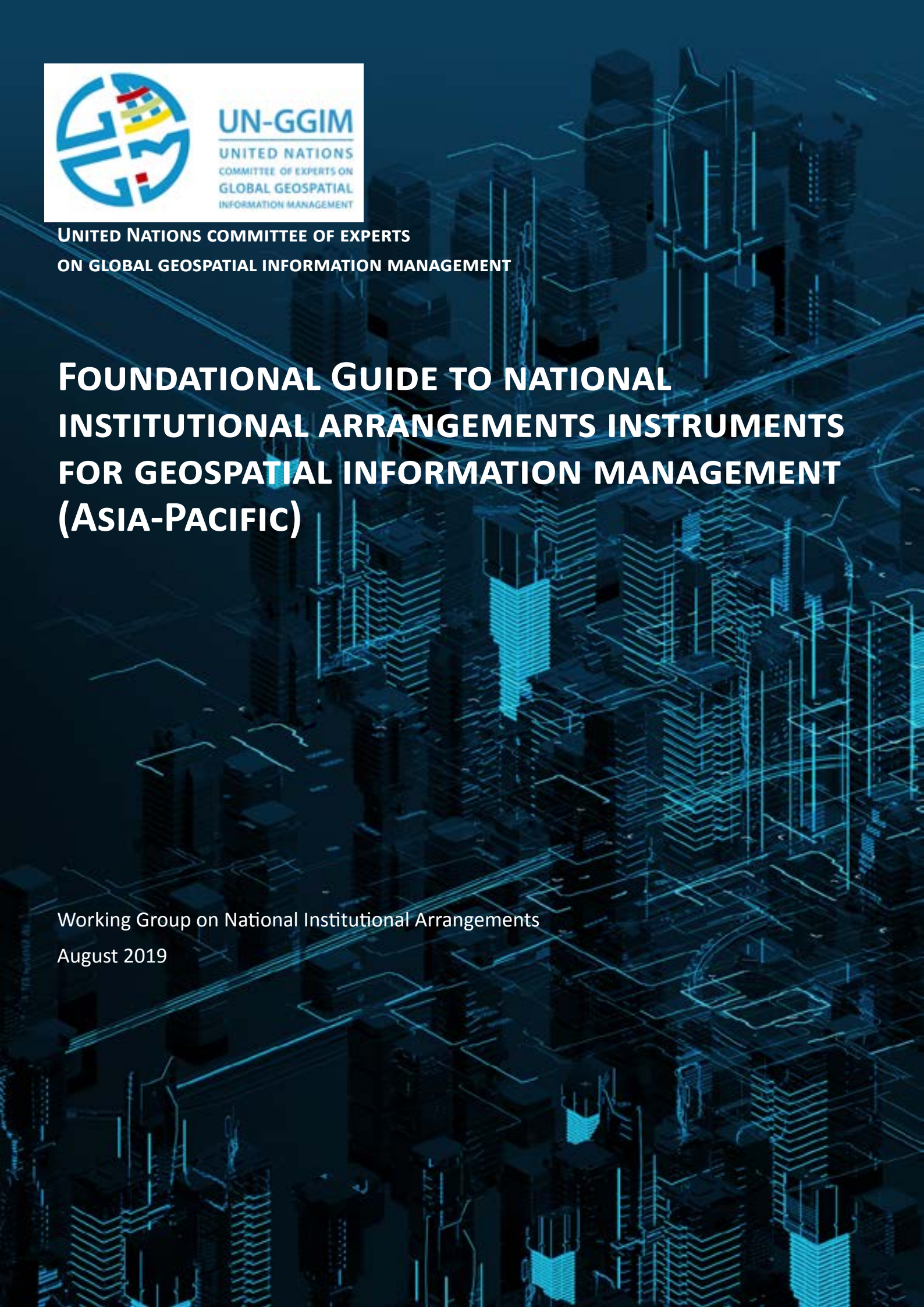


UN-GGIM
UNITED NATIONS
COMMITTEE OF EXPERTS ON
GLOBAL GEOSPATIAL
INFORMATION MANAGEMENT

United Nations Committee of Experts
on Global Geospatial Information Management

Foundational Guide to national institutional arrangements instruments for geospatial information management (Asia-Pacific)

Working Group on National Institutional Arrangements

August 2019

Contents

Version 1 – Published August 2019

This Guide has been prepared by the UN-GGIM Working Group on National Institutional Arrangements.

Excerpt from the decisions of the Eighth Session of the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM). Held from 1-3 August 2018 at the United Nations Headquarters in New York.

Decision 8/105

Trends in national institutional arrangements in global geospatial information management

The Committee of Experts on Global Geospatial Information Management:

(b) Noted that the work plan for the period 2018–2019 contained one major task, namely, the preparation of an easy-to-understand guide that would elaborate on each of the seven structural and six managerial instruments in the context of geospatial information management, on the basis of the framework set out in the report entitled "National institutional arrangements: instruments, principles and guidelines"

EXECUTIVE SUMMARY

This 'Foundational Guide to National Institutional Arrangements Instruments for Geospatial Information Management (Asia-Pacific)' aims to facilitate the use of National Institutional Arrangements (NIA) principles and instruments by users not familiar with geospatial information management concepts. It builds upon earlier work done by the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) in developing an overarching framework as an integrated process for implementing NIA in geospatial information management, as well as the Overarching Strategic Framework in Part 1 of the Integrated Geospatial Information Framework (IGIF) that was jointly developed by the UN and World Bank. 13 structural and managerial NIA instruments underpin the framework, and this Guide attempts to provide detailed guidelines and recommendations for Member States to adopt the instruments.

In the Guide, the recommendations for the NIA instruments in Chapter 3 are based on known practices from the Asia-Pacific region. Recommendations for the regions of Africa, the Americas, Arab States and Europe can be developed in later stages. Within each sub-chapter, the guidelines for each instrument are elaborated according to the implementation needs and approach of the Asia-Pacific region. These are supported by examples of known practices from the region. A self-assessment framework is offered in Chapter 2 to help Member States understand their needs and adopt the recommendations in an informed manner. This framework consists of a proposed roadmap of institutional design for the NIA instruments, and an accompanying checklist to help users gauge their adoption of the instruments.

1. INTRODUCTION

1.1 Introduction

The global importance of National Institutional Arrangements (NIA) in geospatial information management was recognized by the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) at its third session in July 2013 when it identified the need for countries to examine institutional arrangements in geospatial information management, and thereby provide governments with options on how best to create national geospatial entities.

The Working Group on National Institutional Arrangements (NIA-WG) has since worked with Member States and regional and international entities to identify good practices related to NIA for geospatial information management, noting that there is no single universal solution or model that fits all countries. It developed an overarching framework for NIA, inclusive of the instruments, principles and guidelines. Further, the Committee endorsed the overarching framework as an integrated process for implementing national institutional arrangements in geospatial information management for Member States, commended the compendium of good practices as a tangible means of demonstrating models of institutional arrangements across geographic regions, and encouraged Member States to contribute to that effort.

The Committee of Experts also agreed that a practical and commendable next step of the Working Group was to develop a 'Foundational Guide to NIA Instruments for Geospatial Information Management', in order to facilitate the use of the framework's principles and instruments by users who were not familiar with geospatial information management concepts.

1.2 Principles for effective National Institutional Arrangements

Principles can be defined to be the fundamental beliefs that frame and structure the entire set of NIA instruments and what they seek to achieve. They assist governments in approaching the barriers and challenges in implementing NIA in the context of geospatial information management.

The following principles are considered to be applicable to NIA in the context of geospatial information management:

A. **Geospatial Advocacy**: is reinforced by steadfast advocates promoting the use of high quality geospatial information critical for evidence-based analysis and informed policy decision-making in support of sustainable development, economic growth, poverty eradication, peace and security, disaster risk reduction, and climate change adaption.

B. **Coordination:** enhance the voluntary or forced alignment of tasks and efforts of relevant geospatial information organizations within a national institutional setting.

C. **Collaboration:** encourage (inter)national collaborations among key geospatial information organizations fundamental to the facilitation of improvements in the development, management, use and exchange of geospatial information, as well as the integration of statistical data and other information, to create new knowledge and supply products and services meeting user needs.

D. **Agility and Adaptiveness**: address and take advantage of institutional, technological and other ad-

vancements in support of the development and delivery of products and services. This flexibility requires considering the rapid and often unpredictable changes in information technologies, geospatial information management approaches, financial resources, legal systems and cultures of each Member State. Specific national, social, economic, and regulatory implications need to be considered when organizations develop NIAs, and when governments develop policies to promote NIAs and review the implementations.

E. **Performance:** improve the overall efficiency of geospatial information management to avoid the expensive and unnecessary duplication of data collection efforts, and to promote further cost effectiveness by describing good practices in geospatial information management. NIAs need to cover the development of new reward structures and the adaptation of existing ones, including recognition of geospatial information management activities in tenure and promotion review in order to address the possible problems of insufficient incentives for stakeholders or lessening efforts by geospatial data producers on relevant activities.

F. **Open Data:** where feasible adopt policies that maximize access to and use of open and unrestrictive geospatial information at the lowest possible cost for innovation, efficient and effective decision-making and a spatially enabled society. NIAs need to provide a suitable environment for allowing open access to geospatial information in an easy, timely, user-friendly way, and preferably via the Internet.

G. **Use of and adherence to geospatial standards**: embrace the development of, adherence to, and use of nationally and internationally recognized geospatial standards and interoperable geo-processing technologies. Utilization of standards and interoperable technologies will facilitate the effective and efficient creation, sharing, exchange and use of geospatial data, the open transfer of data among organizations, platforms and applications, and encourage innovation, reduce transaction costs, increase transparency, allow (inter)national compatibility and cooperation within the market place. In this interoperability context, NIAs need to cover to pay due attention to the relevant international geospatial standards. Member States and key institutions should cooperate with international organizations charged with developing new standards.

H. **Adherence to law:** observe laws, regulations and administrative practices of the Member States, within which they operate, as well as international laws and conventions, avoid conflict of interest and make stakeholders aware of those laws and conventions, which govern and are related to operations. The national security as well as intellectual property of geospatial data creators and providers are to be acknowledged and protected. The NIAs should facilitate, institutionalize and respect the legal rights and legitimate interest of all relevant stakeholders.

I. **Accountability:** facilitate trust amongst geospatial data creators, providers and users, create a clear understanding of geospatial data through the publication of metadata, including information on ownership and intellectual property rights, access and usage conditions and technical specifications (in particular currency, data models, quality and accuracy definitions). This will support informed and fit for purpose use and interpretation of geospatial data. Data creators and providers are responsible for compliance to the specifications of geospatial datasets made available for consumption and use. NIAs need to tackle this data accountability issue and allocate responsible institutions.

J. **Transparency:** identify sources and the processes that are used to create and provide official geospatial data. Information on geospatial data-producing organizations, documentation on the geospatial

data (metadata) as well as processes and specifications of conditions attached to the use of these data needs to be available in a transparent way, ideally through the Internet.

K. **Respect and confidentiality**: exhibit high levels of responsibility and consideration to stakeholders in the execution of daily operations. Particular care is to be exercised to protect the confidentiality of geospatial information that may adversely impact an individual, community and/or Member State. Personal data is to be especially respected and protected. NIAs should promote explicit, formal practices such as the development of rules and regulations, regarding the responsibilities of the various parties involved in the geospatial information management activities. These practices could pertain to authorship, producer credits, ownership, dissemination, usage restrictions, financial arrangements, ethical rules, licensing terms, liability, and sustainable archiving. Specific attention needs to be devoted to supporting the use of techniques to guarantee the integrity and security of geospatial information.

L. **Standards of Service**: employ good practices of NIAs and solutions, and pursue excellence in the delivery of geospatial data and services. Appropriate access, fairness and equity are to be accorded to all stakeholders. Equality addresses power inequalities (be they political, economic, legal, or cultural) and requires the extension of development gains to the most excluded groups and individuals. Institutions that ensure non-discrimination and equality can mitigate the burden of possible geospatial information management actions on the most vulnerable.

M. **Expertise:** institutionalize to arrange value of national expertise in geospatial information knowledge and expertise in order to, where appropriate, comment on and validate the quality of geospatial datasets covering national territory, seeking their overall consistency, in order to advise on matters of application, interpretation and use of geospatial information. The associated NIAs need to be based on the relevant professional standards and values embodied in the codes of conduct of the communities involved.

N. **Participation and Inclusion:** empower through representation in government and through other (e.g. administrative and local) mechanisms facilitating free, active and meaningful participation in decision-making processes making use of geospatial information. Meaningful and free participation of citizens and stakeholders in decision-making processes could contribute to the overall adaptability and stability of institutions and promotes innovative policy dialogues.

1.3 Description of NIA instruments

Institutional arrangements may be realized by creating new, or changing existing, structures or management forms within the government; and hence instruments can be either structural or managerial.

Structural instruments refer to the structures of the organizations responsible for geospatial information; while managerial instruments refer to procedures, incentives and values which plan, monitor and evaluate the use of resources or the implementation of policies (refer to Table 1 below).

Table 1: Classification of NIA-instruments into structural and managerial instruments

Structural	Managerial

S1. Establishment of coordinating functions or entities S2. Reshuffling division of competences S3. Establishment of a legal framework S4. Regulated markets S5. Systems for information exchange and sharing S6. Entities for collective decision-making S7. Partnerships	M1. Strategic planning M2. Financial management: input-oriented M3. Financial management: performance-oriented M4. Financial management: joined up working and cooperation M5. Inter-organizational culture and knowledge management M6. Capacity building

S1. Establishment of coordinating functions or entities. This instrument aims to establish coordinating structures for geospatial information management, through influencing lines of control and clearly-allocated roles and responsibilities among strategic and operational functions. It helps to streamline, monitor and control the implementation of agreed-upon objectives, goals or policies.

The coordinating structures may involve a coordinator, respectively an individual or unit whose only or main function is to coordinate the geospatial information management activities of the different organizations in an inter-organizational system; and a lead organization which has besides its coordinating function, some operational line functions. Their coordinating power is mostly stipulated and enforced by laws and statutes. The exact position of the coordinating entity *vis-à-vis* other organizations may determine to what extent hierarchical authority and power as resource is available.

S2. Reshuffling of competencies. This instrument aims to enable the creation or re-structuring of institutional forms for geospatial information management, in response to changing contextual pressures or policy needs. This helps ensure agility and adaptiveness. A well-known example is the reshuffling of competencies between ministries or departments in response to changing contextual pressures. NIA is enhanced by bringing related activities together by merging organizations or by separating them from other organizations with completely different activities. In addition, this instrument also takes into account the issue of (de)centralizing activities.

S3. Establishment of a legal framework. This instrument aims to establish regulatory frameworks for geospatial information management and their associated legal conditions, in order to uphold the legal rights and legitimate interests of all relevant stakeholders.

These frameworks consist of a broad set of rules and regulations that organise the management of geospatial information at different administrative levels, which are not necessarily developed specifically for a particular subject, but may have been created for other purposes in society and are now applied to the management of basic reference datasets. This can include legislation that deals with (digital) information, (open) data, standards or content, such as freedom of information, intellectual property rights or the protection of personal data. It can also involve legislation and policy with an even broader scope, such as tort liability and contract law, which apply to any kind of actor, situation or object falling within the field of application.

S4. Regulated markets. This instrument aims to form regulated markets that create stimuli and sanctions to induce appropriate behaviours of geospatial information management in public organizations, based on price mechanisms. The institutional arrangement of tasks and activities by different organizations is done through mechanisms of price and competition, offer and demand. Funding mechanisms and incentives are crucial to providers of geospatial information that may be funded by open data policies or sales to their customers and purchasers. Such markets are generally created by government and, depending on the kind

and number of users and providers, the kind and level of competition and the level of regulation, the market can be internal or external.

S5. Systems for information exchange and sharing. This instrument aims to develop policy and technical systems that help geospatial information to be managed, shared and used effectively throughout the NSDI. It enables geospatial information flows and exchange to be better organized.

The focus would be on both technical ICT systems as a basis for making information accessible as well as on the content of the information systems. For example, the development of national geoportals as a key element of geospatial data infrastructures – which are web portals or clearinghouses used to effectively find and access geospatial information and associated geospatial services (e.g. display, editing, analysis) through distributed nodes, are a good example of this instrument in the context of geospatial information management. The instrument may also induce organizations to take into account the actions of other organizations through processes of mutual adjustment. Through new or re-oriented flows and systems of information, decision-making organizations can be better informed about the latest developments and activities in line with those of organizations. Information from various organizations can also be integrated in a government-wide information system, giving a strategic overview of government activities.

S6. Entities for collective decision-making. This instrument aims to set up entities in which key stakeholders of geospatial information management can make binding decisions affecting multiple actors collectively. This helps ensure accountability and facilitate meaningful, inclusive participation. It involves the establishment of strategic decision-making boards consisting of senior officials of different organizations belonging to the policy domain of geospatial information management, in order to collectively set out strategy and control the implementation of it. Such joint decision-making bodies enable joint planning and joint working more easily than weaker forms of cooperation.

S7. Partnerships. This instrument aims to help two or more organizations establish partnerships within and across sectors, in order to stimulate synergy and innovation in achieving common geospatial information management goals.

It involves the creation of a common organization controlled by its ‘parent’ organizations in partnership, demonstrating the most extreme form of cooperation. This enables the achievement of goals that these organizations are collectively responsible for, or simply perform joint tasks. Applying this structural NIA-instrument obviously stimulates ownership and creativity, but also assumes substantial autonomy, a common vision, and sufficient goodwill and capacity at organizational level to make collaboration possible. Public partnership can take myriad forms, but can be broadly categorised into: government to government partnerships (G2G); government to business (G2B); and government to community or citizen (G2C).

M1. Strategic planning. This instrument aims to enable geospatial information management strategy plans to be developed effectively and holistically according to NSDI goals, in order to drive NSDI activities across organisations, sectors and timeframes. It refers to the existence, implementation status and political support of these strategy plans in which activities of public organizations are aligned to a system of interconnected levels of plans, objectives and targets. NIA is fostered by giving individual organizations clear objectives and targets within a framework of broader inter-organizational or even government-wide goals. These different levels of plans are linked to one another to avoid duplication, gaps and to enhance the pursuit of overarching goals. These plans are monitored and evaluated, after which plans can be adjusted and fine-tuned.

M2. Financial management: input-oriented. This instrument aims to create hierarchical, input-oriented budget processes connected to policy priorities and wider objectives, in order to plan and allocate funding and resources for geospatial information management. It encompasses processes and instruments

of budgeting, accounting and auditing, which may include budgetary guidelines and framework letters, expenditure review committees, bilateral negotiations and conflict resolution processes, as well as formats, systems and provisions for accounting and audits. Through the instrument, the budget process defines what resources related to geospatial information management should be spent on, and in necessary detail. There is not much autonomy for organizations to spend the budget as they see fit. Through the budget, policy priorities are set and communicated downwards.

M3. Financial management: performance-oriented. This instrument aims to create frameworks and processes for providing incentives to organizational units to improve their performance in geospatial information management, through a result-oriented approach. In this instrument, the budget is linked to the expected or past performance (price times quantity: p*Q) of the organizations, and financial sanctions in case of underperformance are possible. Such budgeting is a pre-condition of creating (quasi-)markets.

M4. Financial management fostering joined up working and cooperation. This instrument aims to enable organisations to set up joint or common financing programmes through a collaborative approach, in order to achieve cross-cutting objectives in geospatial information management.

In such a perspective, the focus of the financial management system is on the consolidation of financial and performance information, and new budget formats, across organizations and policy fields. It is geared towards horizontal policies (for example, outcome- or programme-based budgets related to geospatial information management), as well as joined and exchangeable budgets. If organizational or individual incentives for collaboration are present in financial management systems, they are heavily geared towards joined-up activities and cooperation. Such financial management systems oriented towards collaboration will usually include great flexibilities for budget shifts between organizations and years, a limitation of input controls, as well as longer time-span.

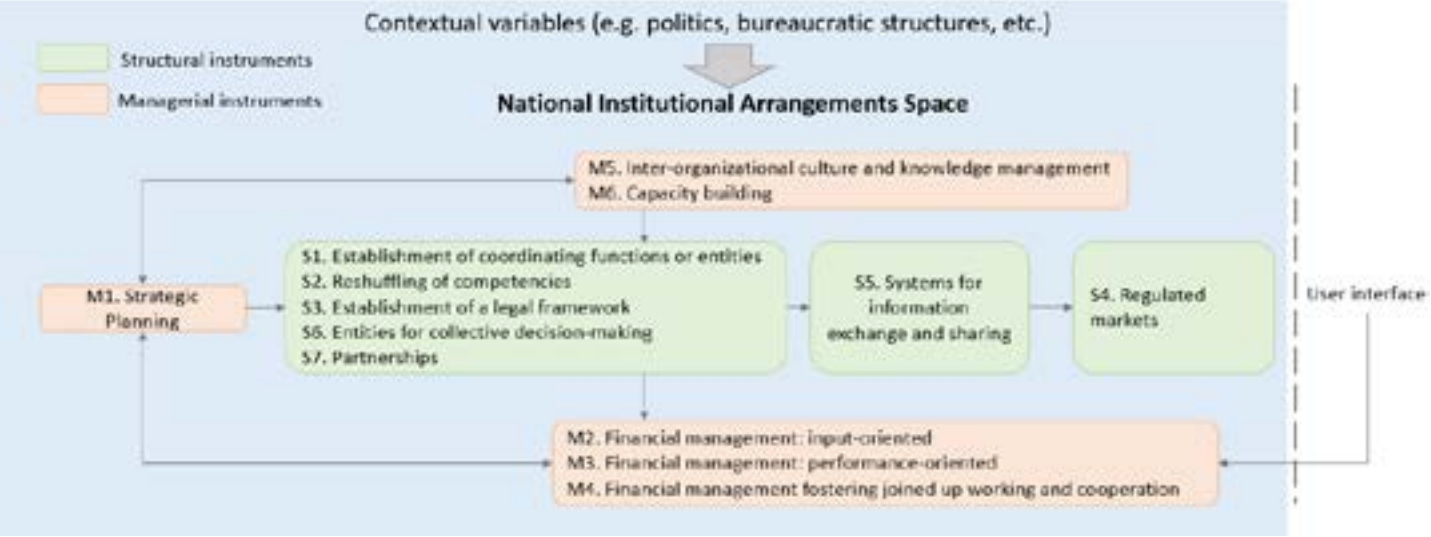
M5. Inter-organizational culture and knowledge management. This instrument aims to foster shared visions, values, norms and knowledge among organizations, through the creation and growth of inter-organizational networks for geospatial information management. It focuses on human resources as an important component of national institutional arrangements, as part of a network-based approach. The instrument could be implemented through the development of cross-cutting skills among staff; common education or common training; management development; mobility of staff between organizations; and the creation of systems for inter-organizational career management. The introduction of behavioural and ethical codes for relevant staff members may be another vehicle for creating and cultivating such common values and norms.

M6. Capacity building. This instrument aims to help individuals and institutions develop competency and awareness for effective geospatial information management, by establishing strategies for capacity assessment and development. For example, the development of a competency framework to articulate the skillsets and knowledge required to function in the geospatial industry could serve as a basis for capacity assessment and development. Facilitating education and skills training at all levels, from building basic awareness to the development of specialist skills could help to ensure a sustainable pipeline of talent for the geospatial information workforce.

2. SELF-ASSESSMENT FRAMEWORK

This chapter aims to inform and monitor the adoption of recommendations for the NIA instruments in Chapter 3. Chapter 2.1 offers a possible roadmap for implementing the NIA instruments by considering them holistically, in combination and connection with one another. This is accompanied by a self-assessment checklist in Chapter 2.2, which aims to help users gauge the current status and level of adoption of each NIA instrument in their National Spatial Data Infrastructures. Through the checklist, users can assess their implementation needs and decide on an overall implementation approach according to the proposed roadmap. Accordingly, users can target specific recommendations for each NIA instrument in Chapter 3, according to the overall approach decided.

2.1 Proposed roadmap of institutional design for geospatial information management.



2.2 Self-assessment checklist

Instrument	Checklist Question	Please indicate (Yes/ No)
S1. Establishment of coordinating functions or entities.	Are there functions or entities established to co-ordinate the geospatial information management activities of different organizations, e.g. a coordination body?	
	Does the coordinating entity coordinate the main producers and users of geospatial information?	
	Is there a coordination structure with clearly allocated rules, or responsibility tasks allocated among the stakeholders?	
S2. Reshuffling of competencies.	Are there mechanisms for creating or changing new structures, such as mechanisms for merging organizations (for bringing activities together) or separating organizations (for doing completely different activities)?	
	Do the mechanisms enable the reshuffling of competencies among public agencies or private companies for integrating or de-centralising activities?	
S3. Establishment of a legal framework.	Is there a regulatory framework for geospatial information management at different administrative levels and the associated legal conditions?	
	Are there any regulations for data management, such as digitalisation, intellectual property rights, freedom of information, standards, open data, data sharing and access, etc.?	
	Are there legislations and policies with an even broader scope, such as tort liability and contract law?	
S4. Regulated markets.	Are there mechanisms of price (setting) and competition that stimulate the provision of geospatial data, such as an open data policy?	
	Are there data licensing frameworks or pricing policies for the sale of geospatial data and services to the industry or general public?	
S5. Systems for information exchange and sharing.	Is there a government-wide information system for integrating information flows and exchange among various agencies, such as a central geoportal?	
	Is there a national information system for integrating information flows and exchange between government agencies and the public, such as a public-facing geoportal?	

S6. Entities for collective decision-making.	Is there an apex decision-making body, or strategic decision-making boards consisting of senior officials of different organizations in the policy domain of geospatial information management?	
	Do the decision-making bodies comprise the main producers and users of geospatial information?	
S7. Partnerships.	Are there government to government (G2G) partnerships in the context of geospatial information management?	
	Are there government to business (G2B) partnerships?	
	Are there government to community or citizen (G2C) partnerships?	
	Are there government to tertiary educational institutions partnerships towards fostering robust geospatial-based Research and Development?	
M1. Strategic planning.	Is there any overarching strategy plan that aligns organizations' activities with a system of interconnected levels of plans, objectives and targets?	
	Does the overarching strategy plan give relevant organizations clear objectives and targets within a framework of broader inter-organizational or even government-wide goals?	
	Is the strategy plan monitored and evaluated?	
M2. Financial management: input-oriented.	Does your financial management system have processes of budgeting, accounting and auditing for geospatial information management activities?	
	Are there clear budgetary guidelines for determining what resources related to geospatial information management should be spent on?	
M3. Financial management: performance-oriented.	Are there monetary or non-monetary incentives provided for the improvement of organizational performance?	
	Are the incentives aligned with organizational objectives, such as strategic or business plans?	
	Are there performance monitoring procedures and tools, frameworks and models used?	
M4. Financial management fostering joined up working and cooperation.	Does your financial management system allow for the consolidation of financial and performance information across organizations?	
	Is there flexibility for budget shifts between organizations and years?	

M5. Inter-organizational culture and knowledge management.	Are there inter-organizational initiatives aimed at fostering shared visions, values and norms among organizations, such as the introduction of behavioral and ethical codes for relevant staff members?	
	Are there inter-organizational initiatives aimed at fostering knowledge among organizations, such as common education or training, mobility of staff among organizations, and the creation of systems for inter-organizational career management?	
M6. Capacity building.	Are there strategies for capacity building or development to strengthen geospatial information management?	
	Are there relevant initiatives for capacity building or development, such as education and skills training?	
	Do the initiatives cover different levels, from basic awareness to specialist skills?	

3. GUIDE TO NIA INSTRUMENTS IN THE ASIA-PACIFIC REGION

This chapter provides guidelines and recommendations for adopting the NIA instruments in the Asia-Pacific region. It describes the steps and guidelines for implementing the instruments, as well as examples of known practices of the instruments. Not all instruments can be expected to be applicable, and Member States can focus on the most relevant ones according to the self-assessment framework in Chapter 2.

3.1 Establishment of coordinating functions or entities

1. Develop a Geospatial Information Management Strategy

Description

Stakeholders, including main producers and users of geospatial information across the public and private sectors and civil society, are engaged through a strategic workshop and consultation process. The vision, mission and objectives of the geospatial information management initiative are identified in relation to broader policy priorities.

Implementation Guidelines

Geospatial information management strategies are initially developed as framework plans and mechanisms o manage and share geospatial information efficiently. They are composed of the basic NSDI components of institutional frameworks, standards, clearinghouses, and policies, which aim to make available fundamental and thematic data for use focused on a specific domain or several niche ones. These strategies can arise by law, executive orders, or policy processes, and are led by geospatial-related agencies.

The strategies may be developed as a series of plans, while others may develop into full-fledged master plans with defined objectives and action plans, involving extensive consultation processes with stakeholders. This may be driven by wider policy priorities such as ICT and e-government, which leads to increased demand for geospatial information across sectors.

Known Practices

Malaysia: The National Infrastructure for Land Information System (NaLIS), led by the Department of Survey and Mapping, was formed in 1997 by an executive order by the Chief Secretary, to promote the efficient sharing and exchange of geospatial information among Land-related Agencies. In 2002, NaLIS transitioned to the Malaysian Geospatial Data Infrastructure (MyGDI), to increase efficiency of SDI implementation and account for wider needs of stakeholders including non Land-related Agencies and the public. MyGDI is led by the national geospatial agency, Malaysian Centre for Geospatial Data Infrastructure (MaCGDI)[1].

Philippines: Strategy for promotion and coordination of geographic information development and use was developed in 1993 by Memorandum Order. This led to the formulation of the Philippines NSDI framework plan in 2001 to establish a technical, operational and legal framework for the management of geographic information. Eventually, the Philippines Geospatial Data Infrastructure (PGDI) Master Plan 2011-2020 was created to achieve the vision of a spatially-enabled nation for sustainable economic, environmental and social development. It articulates the objectives and action plans for various NSDI components across ICT infrastructure, governance structure, policies standards and change management, data, capability development and geoportal[2].

2. Appoint a Steering Committee

Description

A Steering Committee is appointed to provide leadership and direction for the geospatial information management strategy. Terms of Reference, roles and responsibilities, and code of conduct are drafted.

1 http://www.csdila.unimelb.edu.au/projects/Integrated/Int_Template_Malaysia.pdf
2 http://www.csdila.unimelb.edu.au/projects/Integrated/Int_Template_Philippines.pdf

Implementation Guidelines

Coordinating or steering committees are formed to provide executive leadership and guidance for the geospatial information management strategies. This includes overseeing working group activities; planning financial, manpower and technological resources; monitoring implementation and progress; and promoting partnerships. These committees can develop from specialised functional committees or task forces focused on domain-specific activities or GIS management in the early stages of development of the geospatial information management strategies.

The committees are chaired by the Prime Minister/Deputy Prime Minister, a member of the Cabinet, or the Ministry overseeing the geospatial information management strategy. Geospatial-related agencies can co-chair the committees, or be appointed as secretariats that supports administrative tasks, such as preparation of meeting minutes and reports, drafting of policies and guidelines and liaison with stakeholders. On the other hand, the committees can also come in the form of networks of stakeholder agencies led by geospatial-related agencies.

Known Practices

Japan: Following the Article 10 of NSDI act, or the Basic Act on the Advancement of Utilizing Geospatial Information (AUGI), the government developed the cooperation system among relevant administrative organs. The Deputy Chief Cabinet Secretariat serves as the chair of the committee for AUGI, and the Cabinet Secretariat serves as the secretariat of the AUGI office. Director-Generals of related ministries and agencies are the members. The NSDI act defines the responsibilities of the governments and recommendations toward the private sector[3].

Malaysia: The NaLIS Coordinating Committee was formed to steer the production and use of critical land information through NaLIS for planning and development of land resources, with the Department of Survey and Mapping Malaysia as the secretariat. Subsequently, the MyGDI National Coordinating Committee replaced the NaLIS Coordinating Committee, with MaCGDI as the secretariat and its reporting ministry, the Ministry of Natural Resources and Environment, as the chair. It specifies principles and guidelines for the development of MyGDI, coordinates and monitors its implementation as well as requirements for financial, manpower and technological resources[4].

Philippines: The IATFGI (Inter-agency Task Force on Geographic Information), led by the National Mapping and Resource Information Authority (NAMRIA), was set up to promote and coordinate geographic information development and use by Memorandum Order in 1993. It reviewed policies and directions for GIS management and projects, as well as coordinated activities of agencies involved in geographic information. As part of the PGDI Master Plan, the PGDI Steering Committee was set up to provide executive leadership for the coordination of activities among agencies, with NAMRIA as the technical and administrative secretariat and its reporting ministry, the Department of Environment and Natural Resources, as the chair[5].

3 http://www.cas.go.jp/jp/seisaku/sokuitiri/; http://www.gsi.go.jp/common/000002047.pdf
4 https://www.fig.net/organisation/comm/7/activities/reports/events/penang97/penang972.htm
5 http://www.csdila.unimelb.edu.au/projects/Integrated/Int_Template_Philippines.pdf

3. Establish a Geospatial Information Coordination Unit and specialist working groups

Description

A Geospatial Information Coordination Unit is established to coordinate and be accountable for geospatial information management activities. This is followed by the establishment of data, technical, policy, financial and capacity building working groups to advise the Coordination Unit and Steering Committee. A governance model is developed to define the roles and responsibilities of key institutions, and processes and procedures that serve as bi-directional communication channels for geospatial information management.

Implementation Guidelines

Technical working groups are set up to lead the implementation of projects and activities, develop standards and specifications, and address issues and challenges, under the guidance of the coordinating or steering committees. These working groups may be cross-agency ones, organized into functional areas such as clearinghouse, data management and standards, and capacity building, or sectors such as socio-economics, infrastructure and the environment; or agency-specific ones at the local government level.

As geospatial information management strategies develop into full-fledged master plans or policy frameworks, inter-agency planning and management committees may be set up to oversee and manage project planning and development amongst the technical working groups. On the other hand, geospatial agencies may also act as coordination units for networks of agencies.

At the same time, other inter-agency sub-committees such as advisory committees, mapping and data committees, and consultants can be formed to strengthen the governance model, which begin to be defined and formalized in policy documents. Technical working groups composed of representatives, data custodians and geoportal administrators at the agency, or state or local government level, are also institutionalized in the form of nodes as part of a geospatial information sharing network.

Known Practices

Indonesia: Under Presidential Regulation No. 27/2014, a network of nodes at the provincial and city level are set up to connect data centres and custodians at the local government to the national geoportal. The Geospatial Information Agency, BIG, provides coordination and guidance as the network node connector. It supervises functions and procedures among network nodes, builds and maintains access systems among them, as well as develop policies and guidelines[6].

6 Adi Rusmanto, Dodi Sukmayadi, Nurwadjedi. 10 May 2016. The Role and Function of Geospatial Information Authority (BIG) on the National Planning and Development.

Malaysia: Under the NaLIS Coordinating Committee, sub-committees on clearinghouse, standards, metadata and framework were set up to implement strategies in their respective functional areas. These sub-committees were expanded into technical committees, which coordinated, monitored and implemented activities in their respective functions, with the transition from NaLIS to MyGDI. At the same time, the MyGDI Planning and Implementation Committee was set up to coordinate these technical committees and oversee project management. The National Mapping Committee also coordinates mapping and geospatial data activities, such as data collection and dissemination[7].

Philippines: A Project Management Team was created to oversee and manage the activities related to project planning and execution of the PGDI Master Plan, as well as implementation and operation of the Geoportal. Technical Working Groups were created to implement standards and activities as well as resolve challenges. As the PGDI matures, other advisory committees are also set up to provide guidance on new focus areas whenever needed. At the agency level, agency PGDI committees and nodes are also set up to govern individual agencies' GIS programmes and the provision of data to the national geoportal[8].

3.2 Reshuffling of competencies

1. Identify required business processes in relation to geospatial information management strategy and action plan

Description

Needed functions, competencies and activities in the action plan of the geospatial information management strategy are identified.

Implementation Guidelines

Needed changes to business processes are identified as a result of challenges faced in supporting national agendas during NSDI implementation, and raised during forums such as cabinet meetings; or as part of wider institutional reforms and restructuring in the government. Mandate for coordination, optimisation of processes, as well as expansion of scope of authority for NSDI development could be needed changes to functions and activities in geospatial information management.

Known Practices

Indonesia: Previously, the National Mapping and Surveying Agency coordinated NSDI development under Presidential Decree No. 85/2007. However, the need for a more coordinated approach toward the avail-

7 https://www.mygeoportal.gov.my/ms/node/77

8 The Philippine Geospatial Data Infrastructure (PGDI) Master Plan 2011-2020, v1.0

ability and accessibility of geospatial information arose when the issue of disparate mapping systems and overlapping data for national planning and development was raised in various forums. In particular, the mismatch of forest boundary data between the Ministry of the Environment and the Ministry of Forestry was highlighted, during a cabinet meeting between the President and the REDD+ Agency, which was in charge of strategies for reducing emissions from deforestation and forest degradation[9].

Malaysia: Greater efficiency of NSDI implementation was identified as part of suggestions to restructure Government agencies at the Committee Meeting to Study Organizational Structures under the New Malaysian Remuneration Scheme No. 13/2002. The National Land Information System (NaLIS), led by the Department of Survey and Mapping, was created in 1997 to coordinate the management and sharing of land information among land-related agencies. Due to policy priorities in e-government, wider policy initiatives are needed to make available and use geospatial information[10][11].

2. Evaluate impact on existing organisations

Description

Stocktake of functions, competencies and activities of relevant organisations is conducted, in order to identify gaps in them. Required changes in functions, competencies and activities among relevant organisations are identified.

Implementation Guidelines

Needed changes to business processes for geospatial information management may be evaluated as part of government-wide efforts to rationalise human resources or streamline functions to meet key policy goals, or as part of efforts focused on streamlining geospatial information management. This involves stocktaking the functions, competencies and activities of organisations involved in collecting and producing geospatial information, as well as those of existing agencies or units overseeing geospatial information management. Gaps and needed changes are then assessed in relation to the current mandate and effectiveness of these bodies for implementing needed new business processes, as part of Cabinet or committee meetings for creating legislation or implementing institutional reform.

Known Practices

Indonesia: Evaluation of the availability, accessibility and integration of authoritative geospatial data arose following the cabinet meeting between the President and the REDD+ Agency. Overlapping geospatial data production functions across agencies was understood to be a cause, and this led to the need for national centralisation of a geo-reference system, geo-database, geo-standard, data custodian, and data version,

9 B. van Loenen et al. (eds.), Open Data Exposed, Information Technology and Law Series 30, https://doi.org/10.1007/978-94-6265-261-3_1

10 https://ngis.mygeoportal.gov.my/sites/default/files/Media/ngis2/kk01.pdf

11 http://www.csdila.unimelb.edu.au/projects/Integrated/Int_Template_Malaysia.pdf

also later known as the One Map Policy[12][13].

3. Determine organisational changes needed

Description

Assessment is done on the need for creation or restructuring of institutional forms, such as through merger and separation, and the need for integration or de-centralisation of activities among organisations. The potential costs and benefits of organizational changes are evaluated.

Implementation Guidelines

Based on assessed gaps and needed changes, governments assess what organisational changes can be made to achieve greater savings and efficiency, as part of Cabinet or committee meetings for creating legislation or implementing institutional reform. These changes could involve strengthening existing mandates of geospatial agencies or units, such as through expansion of their functions and their transfer among ministries, or creating new agencies to coordinate geospatial information management in a centralised manner.

Known Practices

Indonesia: State Law No. 4/2011 was developed to implement the One Map Policy. This involved creating wider mandate for coordinating the availability and accessibility of basic and thematic geospatial information among agencies, as well as driving other aspects of NSDI development. Unifying the mandate for these activities under a government agency was assessed to be needed in State Law No. 4/2011. Increase in budget for effective mandate was also considered[14].

4. Formulate and implement approach to reshuffling competencies

Description

The timeline and resources needed to execute reshuffling of competencies are identified. A new governance model, which defines roles and responsibilities of key institutions, and processes and procedures that serve as communication channels for geospatial information management, is established. The value and benefits of the reshuffling of competencies are also communicated to decision-makers.

12 B. van Loenen et al. (eds.), Open Data Exposed, Information Technology and Law Series 30, https://doi.org/10.1007/978-94-6265-261-3_1

13 https://unstats.un.org/Unsd/geoinfo/RCC/docs/rccap19/crp/E_Conf.102_CRP8_COUNTRY%20REPORT%20Indonesia%20fin.pdf

14 https://scholarcommons.sc.edu/cgi/viewcontent.cgi?article=1132&context=senior_theses

Implementation Guidelines

The needed organisational changes may be implemented through legislation or institutional reform, and may be built upon existing governance models and geospatial information management initiatives.

Known Practices

Indonesia: Under State Law No. 4/2011, Bakosurtanal, the National Coordinating Agency for Surveys and Mapping was restructured into BIG, the Geospatial Information Agency, with broader mandate to produce basic geospatial information, which included national base maps and geodetic control networks, as well as thematic geospatial information to be produced using the basic geospatial information. BIG would also report to the Ministry of Development and Planning, which was responsible for formulating budget allocation and would facilitate budget allocation needed for coordination of geospatial information. In addition, it would be responsible to provide infrastructures for geospatial information, including policies, institutional aspect, technologies, standards and human resources[1516].

Malaysia: NaLIS was restructured into the Malaysian Geospatial Data Infrastructure (MyGDI), with broader mandate for geospatial information management beyond land information. The Malaysian Centre for Geospatial Data Infrastructure (MaCGDI) was created to lead the development and implementation of MyGDI under the Ministry of Natural Resources and Environment, taking over the role of NaLIS Secretariat that was under the Ministry of Land and Cooperative Development. MacGDI's key functions included facilitating the sharing and dissemination of geospatial data, formulation of policies and standards, and provision of professional services related to the geospatial industry[17].

3.3 Establishment of a legal framework

1. Determine policy and developmental needs in relation to geospatial information management strategy and action plan

Description

Needed policies, systems and institutions in the action plan of the geospatial information management strategy are identified.

15 http://ggim.un.org/meetings/2011-1st_HLF-Korea/documents/WP22_Indonesia.pdf
16 http://www.un-ggim-ap.org/article/Information/unggimap_meetings/plenary/2nd/2nd_Indonesia.pdf
17 https://www.mygeoportal.gov.my/macgdi-vs-mygdi

Implementation Guidelines

Regional and national development programmes, or geospatial plans and strategies, may serve as the basis of policy needs for centralising geospatial functions and tasks, setting up geospatial data infrastructures and improving geospatial capabilities. In the regional or national development programmes, geospatial information management may be identified to be key components and strategies. This is evident in countries where geospatial information supports critical national agendas such as sustainable development, environmental and natural resources management and disaster management.

Known Practices

Indonesia: The Indonesian NSDI was created in 2007 to reduce duplication of geospatial information production and management among agencies, as well as make data more

accessible to the public. The continuing need for mandate of governance and institutional arrangements formed the basis of key policy needs as Indonesia's NSDI evolved, due to Indonesia's complex geographical and political landscape, which led to the assessment that conditions of geospatial information management seemed messy[18].

Japan: A liaison committee of Ministries and Agencies on GIS was set up in 1995 to promote the organised use of GIS after the Kobe earthquake provided lessons on the potential of GIS for prompt emergency responses and quick recovery. Since then, much progress was made on the development of nationwide base geospatial data and data standards, which led to demand for more detailed, more frequently updated, and interoperable geospatial data by government agencies and private sector organisations. This gave rise to the need for nationwide Fundamental Geospatial Datasets as the source of geospatial reference information. Trends in the development of GPS and Positioning, Navigation and Timing also demonstrated the importance of their use for enhancing efficiency in government administrations and creating advanced geospatial services[19].

Philippines: Building the Philippine Geodetic Reference System for surveying and mapping activities formed key policy needs in the 1980s due to the need for natural resources management and sustainable development. This gave rise to the need to create the National Mapping and Resource Information Authority (NAMRIA) to establish and maintain the geodetic reference system. The Philippine Development Plan 2011-2016 and further programmes for climate change and natural resources management led to evolving needs to leverage and strengthen the geodetic reference system[20][21].

18 https://scholarcommons.sc.edu/cgi/viewcontent.cgi?article=1132&context=senior_theses

19 https://www.gsi.go.jp/common/000045515.pdf

20 http://www.congress.gov.ph/legisdocs/basic_17/HB01145.pdf

21 http://www.officialgazette.gov.ph/downloads/2011/05may/Phil-Dev-Plan-2011-2016-Chapter-10-BSA.pdf

2. Review policy frameworks and legislations

Description

The need for legislation, and rules and regulations to support needed policies is reviewed, as well as existing policy frameworks and legislations in the governance model for geospatial information management that can be leveraged upon to develop needed rules and regulations. Policy and legislative gaps are identified before policy frameworks and legislations are developed.

Implementation Guidelines

Legislation may act as both the implementation basis and instrument of geospatial information management strategies within wider national programmes, and can be developed in tandem with these strategies. In such cases, they may develop in response to specific strategies or policy needs that arise during the implementation of the national programmes. This is evident in countries where geospatial information supports critical national agendas such as sustainable development and disaster management, and legislation plays an important role in the effective implementation of geospatial information management strategies, either by presidential decree or by state law. In these cases, challenges in coordinating and lack of mandate gave rise to legislation for establishing NSDI.

Legislation may support the incremental development of NSDIs, in addition to NSDI master plans, and may build on prior legislation aimed at establishing basic functions and systems for survey and mapping. Legislation for policies that are more specific and narrower in scale may be created by the national geospatial agency.

Known Practices

Indonesia: New legislation was needed to establish the Indonesian NSDI, which formed the basis for subsequent ones with evolving NSDI policy needs, such as the One Map Policy for establishing a single geo-reference system, geo-database, geo-standard, data custodian, and data version. To implement the One Map Policy effectively, mandate of governance and institutional arrangements needed to be refined and strengthened continually according to implementation challenges[22][23].

Philippines: New legislation was needed to establish the Philippine Geodetic Reference System, which formed the basis for subsequent ones with evolving policy needs to leverage and strengthen the Philippine Geodetic Reference System, such as the upgrading of the System and the use of topographic base maps and other thematic maps for programmes in climate change and natural resources management[24].

22 https://unstats.un.org/Unsd/geoinfo/RCC/docs/rccap19/crp/E_Conf.102_CRP8_COUNTRY%20REPORT%20Indonesia%20fin.pdf;

23 https://www.fig.net/resources/proceedings/fig_proceedings/fig2016/papers/ts01f/TS01F_narieswari_8172.pdf

24 http://ggim.un.org/country-reports/documents/Philippines-2012-country-report.pdf

3. Develop a legal framework based on the policy frameworks and legislations

Description

A set of rules and regulations is developed to meet policy and developmental needs in geospatial information management. Roles and responsibilities of different parties at different administrative levels are defined according to the governance model for geospatial information management.

Implementation Guidelines

An inter-linked system of regulations covering various aspects of NSDIs, such as data acquisition and geodetic reference systems, is set up as geospatial information management strategies progress. These regulations build upon and reinforce each other. These regulations may provide the basis for governance models for geospatial information management strategies. The regulations are developed to establish or give powers to national geospatial agencies as well as mandate coordination in geospatial information management among these agencies and other stakeholders across the federal, state and local levels. In several cases, the regulations strengthen policy frameworks such as NSDI master plans.

Known Practices

Indonesia: The Presidential Regulation No. 85/2007 was enacted to develop the National Spatial Data Network; consisting of network nodes responsible for acquiring, maintaining and updating geospatial data, and a network node connector, the National Mapping and Surveying Agency; in order to establish the Indonesian NSDI. State Law No. 4/2011 was subsequently enacted to implement the One Map Policy by providing a legal framework for data integration, availability and accessibility, and appointing a National Geospatial Agency as the network node connector with wider mandate to create basic and thematic geospatial information and coordinate NSDI development. Presidential Regulation No. 27/2014 and Presidential Regulation No. 9/2016 were subsequently enacted to enhance the National Spatial Data into the National Geospatial Information Network that incorporates wider capacity building and technology adoption activities and non-government members; and accelerate the implementation of the One Map Policy respectively, building upon the earlier regulations[25][26].

Japan: In Japan, Survey Act (originally, Law No. 188, 1949) has been enforced to ensure efficiency and accuracy in surveys by setting rules and avoiding redundancy. GSI, as the competent authority of the Survey Act, lays out the basic rules of survey and seeks to improve the national survey system[27][28].

In addition, The Basic Act on the Advancement of Utilizing Geospatial Information (hereinafter,"AUGI"), which is dubbed NSDI Act of Japan, was enacted on May 30, 2007. The purpose is to advance policies con-

25 http://www.un-ggim-ap.org/article/Information/unggimap_meetings/plenary/2nd/2nd_Indonesia.pdf
26 http://www.un-ggim-ap.org/article/Information/unggimap_meetings/plenary/2nd/2nd_Indonesia.pdf
27 http://www.gsi.go.jp/ENGLISH/page_e30028.html
28 http://www.gsi.go.jp/common/000081422.pdf

cerning AUGI in a comprehensive and well-planned manner by establishing basic principles and clarifying the responsibilities of State and local governments as well as defining basic elements for policies on AUGI, in view of the fact that AUGI is essential in establishing the economy and society in which the people can live their lives securely and abundantly at present and in the future. A cooperation system was developed among relevant administrative organs, including the Committee for AUGI[29][30].

Philippines: Executive Order 192, 1987 was enacted to create NAMRIA to establish and maintain the Philippine Geodetic Reference System, and Executive Order 45 s. 1993 was passed to establish the Philippine Reference System, 1992 or PRS92, that served as the standard reference for the Philippine Geodetic Reference System. Administrative Order 16, July 2011 was subsequently enacted to leverage PRS92 for climate change and natural resources management programmes, by directing government entities to coordinate with NAMRIA in the acquisition of data from airborne and space-borne platforms for production of topographic base maps and other thematic maps. The NAMRIA Modernisation Act (2016), also known as the NAMRIA Modernisation Programme, builds upon the earlier regulations by enhancing NAMRIA's capabilities for the production & management of geospatial products and services, as well as the integration and dissemination of geospatial data. The Programme also involves upgrading PRS92 by unifying the national vertical datum and strengthening core competencies in geodesy[31][32].

3.4 Regulated markets

1. Identify required regulated markets in relation to geospatial information management strategy and action plan

Description

Baseline assessment of the data provision and sharing landscape is conducted and gaps are identified. Required mechanisms for regulated markets, e.g. competition, funding, etc., are then determined.

Implementation Guidelines

Regional and national agendas like sustainable development, transparent public governance, and science and innovation may spur the need for access to searchable, understandable data, and form the basis for regulated markets for geospatial information management. As members of the Open Government Partnership (OGP), governments may launch OGP initiatives that would lay the foundation for national open data initiatives for both geospatial and non-geospatial data.

This may inform existing policies for open geospatial data, and warrant clear frameworks for geospatial data sharing and pricing at the same time with growing distinction between treatment of open and classified data. Such policies and frameworks may be discussed and developed in meetings and workshops held by technical committees, the coordination unit within the NSDI, or task forces; and may be informed by studies conducted by the government on implementation needs and barriers.

29 http://www.gsi.go.jp/common/000045515.pdf
30 http://www.gsi.go.jp/common/000002047.pdf
31 http://www.congress.gov.ph/legisdocs/basic_17/HB01145.pdf
32 https://server2.denr.gov.ph/uploads/rmdd/malacanangadministrativeorderno16.pdf

Known Practices

Australia: The National Innovation and Science Agenda, which aimed to deliver new sources of growth and maintain economic competitiveness, identified government leadership in innovation and data as a key pillar. One of the initiatives was to promote innovation and optimise use of public data, by removing barriers between different data holdings across government. This would involve making non-sensitive data openly available by default through data.gov.au to enable the private sector to create new and innovative products and business models[33].

Indonesia: Open data programmes had its roots in the 'Reformasi' movement in the 1990's that saw increased need for transparency, accountability, and better governance. This drove the participation of Indonesia in the Open Government Partnership as a founding member, as well as the enactment of the Public Information Openness Act in 2008 and the launch of the Open Government Initiative in 2012 that led to open data initiatives. At the same time, the One Map Policy was launched in 2011 to focus on improving geospatial data availability and accessibility, including open geospatial data, in order to reduce duplicative efforts to produce datasets. Studies were also conducted to assess the landscape of open data and provide recommendations for effective implementation[3435].

Philippines: As a founding member of the Open Government Partnership, Philippines was committed to promoting transparency and strengthening governance. This led to the conceptualisation of the Open Data Philippines programme in 2012, covering both geospatial and non-geospatial data. Subsequently, a Task Force and Project Management Office were formed to engage potential partners in the development of an open government data portal and processes and policies, as well as review existing open data initiatives. The World Bank was engaged as a partner to offer technical assistance in the development of the Open Data Philippines programme[36].

2. Formulate national policies and programmes to create regulated markets

Description

Policies such as open data programmes and data licensing frameworks are developed according to the governance model for geospatial information management. Champion agencies to drive the policies are identified, and the roles and responsibilities of relevant stakeholders defined. Processes and procedures that serve as communication channels for geospatial information provision and sharing are also developed.

33 https://www.industry.gov.au/sites/g/files/net3906/f/July%202018/document/pdf/national-innovation-and-science-agenda-report.pdf
34 https://www.itu.int/dms_pub/itu-s/opb/journal/S-JOURNAL-ICTS.V1I2-2018-9-PDF-E.pdf
35 www.opengovpartnership.org/countries/indonesia
36 https://data.gov.ph/sites/default/files/GAA%20General%20Provisions%202015.pdf

Implementation Guidelines

Legal and budgetary basis for open data and data licensing frameworks may be created through laws, such as legislation on annual expenditure. Otherwise, these frameworks may be launched as formal programmes or formulated as policies within existing geospatial information management strategies. The laws, programmes and policies may be overarching ones that pertain to both geospatial and non-geospatial data, or separate but complementary ones for geospatial and non-geospatial data, and may be led by the Prime Minister or President's Office, Budget Office, national development agency, or national geospatial agency.

Inter-agency task forces or steering committees may oversee the proper implementation of open data programmes based on local and international standards, identify champion agencies, and ensure the alignment of open data policies to government data disclosure initiatives. On the other hand, national geospatial agencies formulate and lead geospatial data sharing and licensing policies, such as data pricing guidelines or data dissemination workflows, based on existing governance models for geospatial information management. They may work with the task forces or steering committees to drive these efforts.

Known Practices

Australia: The Public Data Policy Statement, led by the Department of the Prime Minister and Cabinet, was released by the Australian Government in 2015 as part of the National Innovation and Science Agenda. It committed Commonwealth Government entities to optimise the use and reuse of public data, release non-sensitive data as open by default, and collaborate with the private and research sectors to extend the value of public data for the benefit of the Australian public[37].

Indonesia: The One Data Indonesia Decree was initiated in 2018 to harmonise data production, data governance and dissemination for open geospatial and non-geospatial data. The Decree gave robustness and sustainability to the Indonesian Open Data Portal that was launched in 2014 under strategic national policy plans and programmes such as the Medium-Term National Development Plan 2015-2019 and the Presidential Priority Programmes[38].

Open geospatial data was developed through the NSDI programme, led by BIG, the Geospatial Information Agency, in which State Law No. 4/2011 that launched the One Map Policy categorised most basic geospatial information was categorised as open information. Around the same time, the Presidential Regulation No. 27/2014 expanded the National Geospatial Information Network to include non-governmental organisations, businesses and citizens.

Open geospatial data is informed by the One Data Indonesia programme, which follows policies and standards set by the One Map Policy for geospatial data, while the One Map Policy benefits from the Programme's mandate and framework for developing open geospatial data. The alignment of both programmes is reflected in the governance structure of the One Data Indonesia programme, consisting of a Steering Committee chaired by the Ministry of National Development Planning, One Data Forum comprising BIG and Statistics Indonesia as supervising agencies, and geospatial and statistical data custodians in agencies[39].

37 https://www.pmc.gov.au/public-data/public-data-policy

38 B. van Loenen et al. (eds.), Open Data Exposed, Information Technology and Law Series 30, https://doi.org/10.1007/978-94-6265-261-3_1

39 B. van Loenen et al. (eds.), Open Data Exposed, Information Technology and Law Series 30, https://doi.org/10.1007/978-94-6265-261-3_1

Malaysia: Guidelines for Data Pricing and Geospatial Data Distribution, as well as for Sharing and Dissemination of Geospatial Information, were discussed and set through workshops attended by various Federal Government agencies, State and Local Authorities, led by the Malaysian Centre for Geospatial Data Infrastructure (MaCGDI). The guidelines were approved at a National MyGDI Coordinating Committee meeting[4041].

Philippines: The Open Data Philippines programme was launched in 2014 under the 2015 General Appropriations Act, which defines the expenditure programme for 2015, to bring together existing open data initiatives, such as those of the Philippines Statistics Authority and Department of Budget & Management. It is led by an inter-agency Task Force comprised of the Office of the Presidential Spokesperson, Presidential Communications Development and Strategic Planning Office, and Department of Budget and Management.

The Task Force oversees the development of the Open Government Data portal, formulation of data disclosure policies, as well as the promotion and socialisation of the Programme; in alignment with the Good Governance and Anti-Corruption Plan, Open Government Partnership and international practices of open data. The task Force is supported by the Project Management Office, which functions as an inter-agency secretariat unit that oversees the day-to-day matters of the programme[42].

3. Develop action plan and guidelines to implement the policies

Description

Technical requirements for implementation, e.g. open data portal, are gathered; and funding, capabilities and infrastructure to support the sharing and provision of data are built.

Implementation Guidelines

Implementation guidelines for open data and data licensing policies are formulated and disseminated through policy documents and circulars, either pertaining to both geospatial and non-geospatial data, or geospatial data only. For formal open data programmes being launched apart from geospatial information management strategies, these guidelines may be accompanied by more specific action plans that aim to define governance roles, set up open data portals, and conduct capacity building and outreach. Otherwise, the guidelines specific to geospatial data are implemented as part of geospatial information management strategies and leveraging on the national geoportal.

40 https://www.mygeoportal.gov.my/sites/default/files/attachments/SP%201-2005%20Penentuan%20Harga%20%26%20Penyebaran%20Data%20Geospatial.pdf

41 https://www.mygeoportal.gov.my/sites/default/files/attachments/Surat%20Pekeliling%20Penyebaran%20%26%20Perkongsian%20maklumat%20Geospatial_bil12012.pdf

42 https://data.gov.ph/sites/default/files/Open%20Data%20Philippines%20Action%20Plan%202014-2016.pdf

Known Practices

Australia: Releasing high-value datasets and enabling data-driven innovation was one of 15 commitments of the First Open Government National Action Plan for 2016 to 2018, which aimed to advance transparency, accountability, public participation and technological innovation in Australia. This commitment involved developing open dialogue between government and non-government sectors to identify characteristics of high-value data and stimulate greater use and re-use of public data through innovative approaches, following the release of the Public Data Policy Statement.

Led by the Department of the Prime Minister and Cabinet, consultation to assess barriers to data use and identify the characteristics of 'high-value' data to develop the High-Value Dataset Framework, was conducted as part of the commitment to release high-value datasets and enable data-driven innovation. This occurred between Commonwealth Government agencies, Office of the Australian Information Commissioner, and state and territory and local governments; as well as non-government organisations, research, not-for-profit and private sectors; through roundtable discussions, forums, surveys, social media and blog posts. Guidance for streamlining data sharing processes within government and a review of public data, including geospatial data, held by government entities were also undertaken as part of the Public Data Policy Statement[43].

Data.gov.au was set up as the central platform for Australian open government data published by federal, state and local government agencies, such as the Geo-coded National Address File (G-NAF) and Administrative Boundaries datasets shared under the National Innovation and Science Agenda. Publicly-funded research data and datasets from private organisations were also made available through Data.gov.au[4445].

In addition, the Digital Earth Australia (DEA) platform was set up to share open, Analysis-Ready Earth observation data for businesses to innovate and develop information products and applications that could be applied to global challenges. DEA organises and prepares satellite data into stacks of consistent, time-stamped observations that can be quickly manipulated and analysed to provide information about a range of environmental factors such as water availability, crop health and ground cover[46].

Indonesia: Open basic geospatial information was made publicly downloadable through the national geoportal that was launched in 2012, as part of the One Map Policy. Since 2015, the Geospatial Information Agency, BIG, has provided web-tools for the public to download open geospatial datasets. On the other hand, technical guidelines and standards for the implementation of the Indonesian Open Data Portal are being developed, along with Annual National Action Plans that would serve as a national strategy for open data management[47].

Malaysia: The Malaysian Geospatial Data Infrastructure (MyGDI)'s Guideline for Data Pricing and Geospatial Data Distribution was released in 2005 as an Implementation Circular to harmonize pricing procedures for geospatial data among data provider agencies. This would help the agencies disseminate geospatial data through e-commerce and MyGDI applications. Based on these guidelines, data pricing should be based on the principle of recovering the data production costs of collection, collection, capture and conversion, and profit should not be gained. In 2012, the MyGDI's Guidelines for Sharing and Dissemination of Geospatial Information builds upon the Data Pricing Guidelines by providing direction on setting data licensing terms

43 https://ogpau.pmc.gov.au/sites/default/files/publications/australias-first-open-government-nap.pdf
44 https://data.gov.au
45 https://www.pmc.gov.au/public-data/geocoded-national-address-data
46 https://www.ga.gov.au/dea/about
47 https://www.researchgate.net/profile/Dani_Gunawan4/publication/317297385_The_Implementation_of_open_data_in_Indonesia/links/5aff78780f7e9be94bd7d588/The-Implementation-of-open-data-in-Indonesia.pdf?origin=publication_detail

and conditions, and royalties and agreements[4849].

Philippines: The Open Data Philippines Task Force issued Joint Memorandum Circular (JMC) No. 2015-01, which served as implementation guidelines for the Open Data Philippines programme, through the 2015 General Appropriations Act. The guidelines specify principles and requirements of open data policies, open data licensing, the appointment of open data champions in agencies, as well as funding. The Open Data Philippines Action Plan was launched to define programme goals and tasks of the Task Force and agencies contributing data to the Open Government Data portal, data.gov.ph[5051].

3.5 Systems for information exchange and sharing

1. Establish coordinating functions for information exchange and sharing

Description

Stakeholders, including main producers and users of geospatial information across sectors, are engaged through a strategic workshop and consultation process. Data and technical working groups are set up.

Implementation Guidelines

Networked systems characterise the coordination structures for information exchange, consisting of a central geoportal connected to agency nodes across administrative levels. In these structures, coordinating or steering committees are formed to provide executive leadership and guidance for the geospatial information management strategies. This includes overseeing working group activities; planning financial, manpower and technological resources; and monitoring implementation and progress. In certain cases, a lead geospatial agency provides coordination and guidance as part of a national geospatial information network, and supervises functions and procedures among network nodes.

Technical working groups may be set up to lead the implementation of projects and activities, and develop standards and specifications, under the guidance of the coordinating or steering committees; or institutionalized in the form of agency nodes as part of a geospatial information sharing network. They may be organised into functional areas such as clearinghouse, data management and standards, and capacity building; or sectors such as socio-economics, infrastructure and the environment.

48 https://www.mygeoportal.gov.my/sites/default/files/attachments/SP%201-2005%20Penentuan%20Harga%20%26%20Penyebaran%20Data%20Geospatial.pdf

49 https://www.mygeoportal.gov.my/sites/default/files/attachments/Surat%20Pekeliling%20Penyebaran%20%26%20Perkongsian%20maklumat%20Geospatial_bil12012.pdf

50 https://data.gov.ph/sites/default/files/Open%20Data%20Philippines%20Action%20Plan%202014-2016.pdf

51 https://data.gov.ph/about/joint-memorandum-circular-2014-01-open-data-philippines

Known Practices

Indonesia: Under Presidential Regulation No. 85/2007, Bakosurtanal, the National Coordinating Agency for Surveys and Mapping, was appointed to coordinate the National Spatial Data Network, which is a system for managing spatial data collectively across agencies in an integrated and sustainable manner. The Network consists of Bakosurtanal as a Network Node Connector, which build and maintain the Network's access system, facilitate geospatial data exchange, and provide support to the Network Nodes; and Network Nodes in agencies at all levels of government that collect, maintain and update data, provide and exchange data, as well as develop guidelines and technical standards for the data.

Bakosurtanal was restructured into BIG, the Geospatial Information Agency, under State Law No. 4/2011 to take on greater coordination mandate, and to lead the One Map Policy for building a nationally-integrated geo-reference system, geo-database, geo-standard, data custodian, and data version. The National Spatial Data Network was revised to the National Geospatial Information Network with expanded membership to include the private sector and academia, in 2014[52].

Philippines: As part of the PGDI Master Plan, the PGDI Steering Committee was set up to provide executive leadership for the coordination of activities among agencies, with the National Mapping and Resource Information Authority (NAMRIA) as the technical and administrative secretariat; and its reporting ministry, the Department of Environment and Natural Resources as its chair. A Management Team was created to manage geospatial project planning and execution, as well as the implementation and operation of the Philippine Geoportal System. Under the Steering Committee and Management Team are inter-agency technical working groups, organised into sectors, which were created to coordinate and monitor project implementation and activities, identify standards and specifications, as well as resolve challenges[53].

2. Gather stakeholder and technical requirements for information exchange and sharing

Description

Policy priorities for information exchange and sharing are identified according to the geospatial information management strategy. Data inventory, technology review and assessment, and capacity assessment are conducted according to the policy priorities. Key requirements, such as Fundamental Datasets, data standards, and hardware and software, are identified.

52 Adi Rusmanto, Dodi Sukmayadi, Nurwadjedi. 10 May 2016. The Role and Function of Geospatial Information Authority (BIG) on the National Planning and Development.

53 The Philippine Geospatial Data Infrastructure (PGDI) Master Plan 2011-2020, v1.0

Implementation Guidelines

Inter-agency technical working groups lead the gathering of data requirements, and formulation of guidelines and standards across the information sharing network through committee meetings, consultation workshops and briefings, within the overall coordination structures. These technical working groups then engage agencies to identify their strategic GI information requirements for planning and decision-making, as well as geospatial data and systems requirements e.g. data to be collected, ICT requirements (hardware, software and services), budgets and other resources. The technical working groups can be permanent or formed as needed. On the other hand, the national geospatial agency may lead the gathering of requirements and identification of data with regard to national criteria and priorities.

Known Practices

Australia: Under the leadership of ANZLIC, the Spatial Information Council, the Foundation Spatial Data Framework (FSDF) was developed as a critical information infrastructure to support the digital economy. It represented a common framework in which authoritative geographic information, which underpins or can add significant value to other information, and supports decisions across the government, industry and community, can be made available. FSDF development took place in phases.

In the first phase in 2012, FSDF themes and datasets were identified according to the criteria of whether data were geospatial, essential for public safety and wellbeing, critical for a national or government function, or contribute significantly to economic, social and environmental sustainability. Government user consultations were conducted to prioritise the data themes and datasets in the second phase, while use cases and descriptions of themes and datasets were developed in the third phase[5455].

Indonesia: Three committees, namely the Permanent Committee, National Metadata Gateway and the Geospatial Metadata Centers, were established to set up the National Geospatial Data Clearinghouse for the National Spatial Data Network. The Permanent Committee directed, administered and monitored the National Geospatial Data Clearinghouse, while the National Metadata Gateway was an inter-agency body that developed, maintained and operated the metadata gateway server that connected metadata among

54 http://fsdf.org.au/

55 https://anzlic.gov.au/sites/prod.auzlic/files/files/One_ANZ_Foundation_Spatial_Data_Framework_Booklet.pdf

Network Nodes. Geospatial Metadata Centers were units in Network Nodes that developed, maintained and operated their metadata servers.

The committees engaged data producers and users to develop metadata and its content standards, a national geospatial data directory, as well as metadata server applications for transmitting metadata from Network Nodes to the gateway server. Accordingly, central, provincial and local governments were engaged to determine funding and project milestones for the development of the Clearinghouse. Fundamental Datasets were also developed[56].

Philippines: A series of Round Table Discussions (RTD) was conducted among stakeholder agencies to gather use cases and develop implementation plans for the Philippine Geoportal Project. For example, during the second RTD, NAMRIA led the agencies' discussion on their strategic GIS use and concerns, and formulation of their Agency Geospatial Data Infrastructure (AGDI) Plans accordingly. These Plans aimed to provide basic guidelines and procedures for linking agency node portals to the Philippine Geoportal seamlessly for geospatial information sharing and use. The formulation process involved general requirements identification, such as data requirements and ICT resources needed for data

conversion and / or thematic layer production; data and migration design, such as data structures and types for data access, transfer and storage; as well as database modelling, such as determination of database logical structures and definition of data representation and relationships. The third RTD followed with the status reporting of AGDI Plan preparation[57].

3. Operationalise systems for information exchange and sharing

Description

A governance model that defines roles and responsibilities of key institutions is established, along with processes and procedures that serve as communication channels for geospatial information exchange and sharing. Key requirements, such as geoportal implementation and adoption of data and system standards, are addressed.

Implementation Guidelines

The national geospatial agency assists data-contributing agencies to implement roadmaps, plans and timelines for sharing their data to the central geoportal, according to requirements gathered, in order to work towards full geoportal implementation. Policies, such as data standards and access frameworks, and coordination mechanisms may be set up for data management. This process can take place as part of Master Plans or Basic Plans for NSDI development, and may take place through roundtable discussions.

At the same time, technical working groups are set up at the agency level to manage the agencies' geoportals, as well as coordinate with the steering committees and coordination units on data development and

56 https://www.fig.net/resources/proceedings/fig_proceedings/jakarta/papers/ts_02/ts_02_2_puntodewo_nataprawira.pdf

57 http://www.namria.gov.ph/Downloads/Publications/NewsScoop/2013novNo55.pdf

management activities. These technical working groups may comprise agency representatives to the NSDI, the data custodians, agency geoportal administrators and data management staff. Training may also be conducted to help agencies operationalise their node geoportals and GIS systems.

Known Practices

Australia: In the fourth phase of FSDF development in 2014, ANZLIC developed policies to define a common approach to FSDF management, covering data governance, standards, access, privacy, security and intellectual property. In particular, a governance model consisting of theme sponsors, which are agencies or organisations with interest and resources to ensure wide availability of the themes; and dataset custodians, which are agencies or organisations responsible for the development and management of national foundation datasets within the scope of themes.

The policies were developed in line with broader Commonwealth government information reform, and in consideration of the broader national information management and policy environment, such as privacy and freedom of information legislations. Three-year road maps were also developed and socialised for the development and delivery of each FSDF theme. A coordination mechanism was set up for FSDF management within the roadmaps; and it comprised a Project Management Committee responsible for FSDF day-to-day management, theme leadership groups responsible for the development of the datasets within their respective themes, a technical advisory group responsible for providing technical advice to the FSDF Project Management Committee and the theme leadership groups, and an industry advisory committee for industry engagement.

In 2017, the Foundation Spatial Data Framework was transformed from a conceptual framework into a web service called the Location Information Knowledge Platform (the LINK). The LINK is a dynamic, online, cloud-based tool that provides information about where and how to access hundreds of jurisdictional datasets that contribute to the national spatial data holdings. Users are able to access trusted location information and learn more about the governance and provenance of the data[58].

Japan: Starting operation in November 2016, the G-Spatial Information Center is a data distribution support organization that acts as the central hub for effective utilization and promotion of geospatial information, linking various geospatial information centers. It forms the core infrastructure for geospatial collaboration among the industry, academia, government and citizens, and enables these sectors to contribute and use data for Research & Development and applications such as disaster response and urban planning. Local governments and companies established a collaborative model around the end of fiscal year 2015 for efficient production and updating of maps. The development of the G-Spatial Information Center is part of the Basic Plans for the Advancement of Utilizing Geospatial Information for the periods 2012-2017 and 2017-2022, which aim to scale up geospatial information utilization and create new industries and services in response to technological and social trends, respectively[59].

Next, the Geospatial Information Authority of Japan (GSI) operates the tile-based web maps, named “GSI Maps”, which are free web maps containing information such as landform classification, disaster information, and old aerial photographs. In 2014, GSI established a partner network consisting of engineers from

58 https://anzlic.gov.au/sites/prod.auzlic/files/files/One_ANZ_Foundation_Spatial_Data_Framework_Booklet.pdf

59 https://www.geospatial.jp/gp_front/

private companies and non-profit organisations capable of developing web map services and applications using GSI Tiles. The network holds meetings twice a year for information sharing and opinions exchange. In these meetings, the latest development and progress on GSI Maps are presented by GSI and the partner engineers, and demonstrations and hands-on practices are provided by the partners[6061].

4. Monitor the need for technological innovation and process improvements

Description

Technological advancements for process improvements and innovation are monitored, and information sharing and collaboration across sectors and the public are scaled up.

Implementation Guidelines

Monitoring and evaluation may be carried out at a later stage of implementation of geospatial information sharing and exchange when basic data and technical requirements have been met. This can be part of a formal reporting framework, or studies that aim to assess implementation progress and identify new requirements and solutions. R&D can also be carried out to identify innovation and collaboration opportunities.

Known Practices

Australia: In the fifth and sixth phases of FSDF development, the FSDF coordination mechanism focused on the ongoing delivery and evolution of datasets within an established reporting framework. Within this framework, the three-year roadmaps were used as benchmarks for annual vision statements and ANZLIC meeting updates. Theme sponsors and leadership groups would deliver annual vision statements containing goals and work plans for the FSDF datasets for the next year in relation to the roadmaps, before the last ANZLIC meeting of each year, and update progress at each ANZLIC meeting. In addition, the Project Management Committee would provide annual updates to ANZLIC on the ongoing governance of FSDF[62].

Indonesia: Studies were explored and conducted by BIG and academia to assess the effectiveness of geospatial information sharing since the launch of the National Spatial Data Network as a milestone of NSDI establishment under Presidential Regulation No. 85/2007. For example, in 2016, BIG, Bogor Agricultural University and the Southeast Asian Regional Centre for Tropical Biology conducted joint research on challenges underlying data sharing from the policy, institutional, technology, standard, and human resources viewpoints, as well as identified recommendations to strengthen institutional arrangements and participation as well as increase awareness. A framework for categorising stakeholders and investigating their

60 http://www.gsi.go.jp/common/000203096.pdf

61 http://ggim.un.org/meetings/GGIM-committee/7th-Session/documents/Agenda%207%20Compendium%20of%20NIA%20Good%20Practices.pdf

62 https://anzlic.gov.au/sites/prod.auzlic/files/files/One_ANZ_Foundation_Spatial_Data_Framework_Booklet.pdf

relationships was also explored in 2018 by BIG and the University of Tokyo to assess the progress of data provision and sharing through the factors of data availability, technological infrastructure, human capacity and financial resources.

The One Map Policy acceleration team was also set up under Presidential Decree No. 9/2016 to coordinate the implementation of the One Map policy strategically. This involved setting policies and targets, as well as monitoring and evaluation, for implementation of the One Map policy[63].

3.6 Entities for collective decision-making

1. Identify key stakeholders in relation to the geospatial information management strategy

Description

Key policy areas and domains for geospatial information management, e.g. land survey, R&D, urban planning, transportation, etc, are defined. The main producers and users of geospatial information, as well as stakeholders with mandate and interest in key policy areas and domains, are identified too.

Implementation Guidelines

Key stakeholders of geospatial information management are identified during the planning and consultation stages of geospatial information management plans and strategies, according to wider policy priorities such as ICT and e-government. They may include government agencies, private sector companies and academia. Key data producers and users may include those from the infrastructure and environment, health and social, defence and economic sectors; while stakeholders with interest across the sectors may include the ICT, budget, and science and technology agencies.

Known Practices

Australia and New Zealand: Recommendations for the formation of a peak national coordinating council were discussed during the national conference entitled “Better Land Related-Information for Policy Decisions” held in 1984, which was attended by representatives from the three spheres of government in Australia. These recommendations arose from the growing need for coordination of the collection and exchange of land-related information between the levels of government for decision-making. Various land information councils in each of Australia’s jurisdictions, as well as New Zealand, were engaged to be members of the council. Around the same time, the need for increased national cooperation between surveying and mapping programmes in relation to government activities led to the need for an intergovernmental committee that would supersede the National Mapping Council (NMC). Key government, academic, and private organisations from surveying and mapping programmes across Australia and New Zealand were

63 http://jurnal.big.go.id/index.php/GL/article/viewFile/483/410

engaged to form the committee[64].

Philippines: During the institutionalization stage of the Philippine Geospatial Data Infrastructure (PGDI) Master Plan, geospatial data producers and users from the government, private sector, and general public were identified from key sectors. These stakeholders were champions of geospatial information and technology in their respective sectors, as well as their agencies' geoportal-related activities[65].

Examples of key policy areas and their stakeholders include:

- Environment: Department of Environment and Natural Resources, Department of Agriculture
- Infrastructure: Department of Transportation and Communication, Department of Public Works and Highways
- Social: Department of Education, Department of Health
- Others: National Economic and Development Authority, Information and Communication Technology

2. Establish a Steering Committee

Description

A Steering Committee is appointed to provide leadership and direction for the geospatial information management strategy, and senior officials and champions in stakeholder organisations are engaged to be members. The Terms of Reference, roles and responsibilities, and code of conduct of the Steering Committee are drafted.

Implementation Guidelines

Steering Committees can be chaired by the Prime Minister or its deputy, or Secretary-General or equivalent of the ministries overseeing the national geospatial agencies. These ministries may be in the environmental or science and technology fields, due to the needed mandate for geospatial information to support critical national agendas in agriculture, natural resource management, and disaster resilience. Geospatial-related agencies may also be the secretariat of the Steering Committee. High-level representatives of stakeholder agencies may be selected to participate in the Steering Committees, and these representatives may also act as champions to promote and coordinate geospatial information management activities.

On the other hand, the committees can also come in the form of networks of stakeholder agencies led by the national geospatial agency; or a nested system of committees; where more complex political structures are involved.

64 http://www.anzlic.gov.au/

65 The Philippine Geospatial Data Infrastructure (PGDI) Master Plan 2011-2020, v1.0

Known Practices

Australia and New Zealand: Australia has a 'federal' system of government with powers divided between a central government (the Commonwealth or Federal Government) and eight regional governments (states and territories). National spatial data coordination and governance configurations reflect these realities. In Australia a range of institutional arrangements have been established to coordinate, and make decisions that guide national geospatial information activity. It is noted that this represents the configuration of arrangements that have evolved over the last 30 years.

ANZLIC – the Spatial Information Council - is the peak cross-jurisdictional body for development of policy and strategies for access to and use of Australian and New Zealand geospatial information. Geoscience Australia, which has primary responsibility for the delivery of foundational national geographic information for Australia under the Commonwealth Department of Industry Innovation and Science (DIIS), is the Commonwealth representative on ANZLIC with states and territories governments represented by senior officers from lead spatial agencies within each jurisdiction. Australia has a Federal governmental structure and as such States and territories collect a range of spatial data, which, needs to be aggregated at the national level, holds significant value for Australia.

The Intergovernmental Committee on Surveying and Mapping (ICSM) is a standing committee of ANZLIC that aims to provide leadership through coordination and cooperation in surveying, mapping and charting. Its membership comprises senior representatives of geospatial-related agencies. A number of Permanent Committees and Working Groups carry out projects and research for, and provide advice to, ICSM in their special fields of expertise, including Addressing, Place Names, Cadastre, Geodesy and Topographic Information[66].

Spatial Data Policy section within the Department of Industry Innovation and Science (DIIS) performs a number of functions including: secretariat to ANZLIC, managing the Government's commitment to make PSMA's G-NAF and Administrative Boundaries datasets openly available, and broader spatial data policy development and coordination with key industry government and research sector stakeholders[67].

Philippines: The PGDI Steering Committee is formed to provide executive leadership for PGDI activities. The Department of Environment and Natural Resources, which oversees NAMRIA, is the Chair of the PGDI Steering Committee; while NAMRIA is its assistant Chair, as well as technical and administrative secretariat. Stakeholder agencies are appointed as members which designates at least two representatives to participate in the Steering Committee. These representatives may also be responsible to coordinate and promote their agencies' GIS projects and report updates to the Steering Committee[68].

66 https://www.anzlic.gov.au/anzlic-council

67 http://www.icsm.gov.au/sites/default/files/WG_torsOct14%20%282%29.docx

68 The Philippine Geospatial Data Infrastructure (PGDI) Master Plan 2011-2020, v1.0

3.7 Partnerships

1. Identify focus areas for partnerships in relation to the geospatial information management strategy

Description

Focus areas are identified according to key policy areas and domains.

Implementation Guidelines

Priority areas of national programmes, whether by geography or sector, form the basis of partnerships related to geospatial information management. Within these priority areas, these partnerships aim to meet the implementation needs of the programmes, such as through capacity building, R&D, production of maps, and shared use of facilities and infrastructure. On the other hand, wider trends and innovations may also form the basis of partnerships to solve geospatial information management challenges.

Known Practices

Australia: Significant developments and investments in the digitisation of analogue cadastral, topographic and administrative maps by Government mapping organisations played a significant role in the establishment of the Public Sector Mapping Agency (PSMA Australia). Users began to adopt these innovations in data management to improve operational effectiveness. One example was the Australian Bureau of Statistics (ABS), which saw the benefits of digital mapping techniques for the Census of Population and Housing conducted every 5 years[69].

Indonesia: The One Map Policy, which aims to build a nationally-integrated geo-reference system, geo-database, geo-standard, data custodian, and data version, identifies 19 ministries, 85 thematic maps and 34 provinces as targets. This informs priority areas for partnerships, such as the production of base maps with local governments, improvement of human resources and research and development[70].

Thailand: National initiatives and the NSDI Development and Implementation Action Plan 2011-2015 form the backdrop of partnerships to develop the Space Krenovation Park (SKP) to host THEOS-2, the new Earth Observation satellite system to provide an integrated solution enabler platform leveraging remote sensing and geospatial technology; and function as the Geo-informatics and Space Technology Development Agency (GISTDA)'s mission control and a start-up incubator. These include the "Thailand 4.0" initiative for science and technology policy that aims to transform Thailand into a value-based economy, the National Strategic Action Plan for 2017-2036, and the 12th National Econ and Social Development Plan for 2017-2021. These policies recognise digital innovation, including geospatial information and satellite technology, as their key enablers[71].

69 https://www.psma.com.au/sites/default/files/PSMA-History-1992-2005_0.
70 http://ggim.un.org/meetings/2017-Mexico/documents/Session_4a_Hasanuddin_Abdin.pdf
71 https://www.gistda.or.th/main/en/node/2422

2. Engage key stakeholders to form partnerships

Description

Interests and needs are aligned with potential stakeholders, while the significance and examples of benefits are communicated to decision-makers and stakeholders.

Implementation Guidelines

Target partners are identified and engaged according to the aims of the partnerships. They can be existing stakeholders of national programmes and geospatial information management strategies, such as local governments and universities belonging to a national geospatial information network. National geospatial agencies help coordinate alignment of interests and strengths in this case. Memoranda of Understanding (MOU) commonly act as mechanisms for formalising the partnerships, especially in cases where political landscapes are complex and lines of collaboration might not exist readily across tiers of government.

On the other hand, target partners can be potential stakeholders of emerging programmes and strategies, or use cases, such as private companies or data producers with competencies of potential interest. In this case, collaborative and innovation platforms, or professional associations, can help broker partnerships.

Known Practices

Australia: Numerous meetings among Surveyors-General, led by several champions of the benefits of digital mapping, took place to discuss the potential creation of a national data set that would include the Digital Cadastral Database (DCDB) and selected topographic data. The meeting discussed the needs and interests of such an effort, including the objectives and focus client group, and pitched the ideas and concepts of such an effort to the ABS that was launching a tender for mapping support for its 1996 Census[72].

Indonesia: Potential partners are identified based on their needs or strengths according to the One Map Policy, such as geographic areas with high inconsistencies among geospatial information records or universities with advanced geospatial education programmes. BIG, the Geospatial Information Agency, signs Memoranda of Understanding (MOUs) with ministries, and provincial/regency and municipal governments, to advance priority areas of the One Map Policy accordingly[73].

For example, BIG signed an MOU with Malang State University (UM) to assist with regional mapping activities due to its comprehensive geography education programme. BIG, being the authority for thematic maps in the One Map Policy, also signed MOUs with local governments in the priority area of Kalimantan to conduct detailed mapping for thematic maps at the village level[74][75].

Thailand: Geo-informatics and Space Technology Development Agency (GISTDA) sign MOUs with business partners and universities to set up subsidiary companies or offices, as well as research and training pro-

72 https://www.psma.com.au/sites/default/files/PSMA-History-1992-2005_0.pdf
73 https://www.opengovpartnership.org/sites/default/files/case-study_Indonesia_One-Map-Policy.pdf
74 http://www.big.go.id/berita-surta/show/big-tandatangani-mou-kerjasama-dengan-5-daerah
75 https://um.ac.id/content/page/2/2013/11/mou-um-dengan-badan-informasi-geospasial-big-dan-seminar-nasional

grammes, in the Space Krenovation Park (SKP), which is GISTDA's satellite operation centre as well as an incubator and training centre for young entrepreneurs to establish businesses and acquire skills in space technology and geo-informatics. SKP offers strategic advantages in industry clustering and market connectivity for co-creation of solutions nationally and regionally, and potential partners are identified based on priority industry clusters[76].

3. Develop and implement governance model for partnerships

Description

The Terms of Reference and code of conduct of the partnerships are developed. The implementation modalities, as well as timeline and resources needed are articulated. Champion agencies to drive the partnerships are identified, while roles and responsibilities of relevant stakeholders are defined. Processes and procedures that serve as communication channels for geospatial information provision and sharing are also developed.

Implementation Guidelines

The partnerships may be implemented through existing or new governance models for geospatial information management. The new governance models may be created for the overall partnership, such as through novel approaches of developing government-owned corporations to create and enable access to national geospatial products; or for specific sub-programmes within the partnerships, such as through MOUs and steering committees among partners of specific domains and interests. The champion agencies or organisations may come from the government, industry or academia; with lead ones being national geospatial agencies.

Known Practices

Australia: Through numerous meetings, Surveyors-General articulated institutional considerations for a consortium of private sector parties to create an integrated national digital base-map. Appointing a board of management, a coordinator and secretariat and technical working party was discussed, and the PSMA was established accordingly. Following the success of the integrated national digital base-map, it was made available for commercial use. It was decided that PSMA should become the vehicle to coordinate the assembly of and facilitate access to fundamental national geospatial datasets and in 2001, PSMA became an unlisted public company, limited by shares, owned by the Commonwealth, state and territory governments (single share each). Today, it continues to operate as the hub of relationship management between data custodians, data managers and clients. It produces among other products the Geocoded National Address File (G-NAF).

76 https://www.geospatialworld.net/news/thai-space-agency-launches-space-krenovation-park/

The government geospatial community also has long standing partnership arrangements with the research sector, through its governance and coordination bodies (ANZLIC and ICSM). Government, together with industry organisations have long standing collaboration (14 years) and co-investment in spatial research conducted by academia through FrontierSI (formerly Cooperative Research Centre for Spatial Information (CRC-SI)). In addition, long standing collaboration exists between government organisations and the Australian national science agency (the Commonwealth Science and Industrial Research CSIRO) and its new digital business unit Data61. Annual spatial community conferences are a long standing feature of Australian spatial community landscape. The annual Locate Conferences is an important networking, collaboration and knowledge exchange mechanism[77][78][79].

Indonesia: MOU partnerships leverage on the National Geospatial Information Network, the governance model for the One Map Policy. The Network consists of network nodes in ministries and agencies that are responsible for acquiring, maintaining and updating geospatial data; and a network node connector, BIG. In addition, Centres for SDI Development are also established in universities, which act as centres for innovation and consultation toward local governments, throughout the Network. BIG is able to liaise with the different partners through these existing communication channels and processes[80][81].

Thailand: SKP partnerships are implemented through different programmes, such as the Global Navigation Satellite System (GNSS) Innovation Centre that provided Research and Development (R&D) laboratories and a space for start-ups; and the Sirindhorn Center for Geo-Informatics (SCGI), which was set up as an institute for research and knowledge and technology transfer in space technology and geo-informatics. Formal governance structures may be set up for the partnerships.

For example, the SCGI was set up under an MOU between the Ministry of Science and Technology of Thailand (MOST) by GISTDA, and Wuhan University's State Key Laboratory of Information Engineering Surveying, Mapping and Remote Sensing (LIESMARS). The SCGI would enhance capacity building and awareness raising in space technology and geo-informatics through training courses and workshops, as well as promote collaborative research projects. A Steering Committee, comprising officials and experts from MOST, GISTDA, the National Science and Technology Development Agency (NSTDA) and Wuhan University; and a Scientific Advisory Committee, comprised of experts from Thai and overseas universities including Wuhan University; were formed[82][83].

77 https://www.csiro.au
78 https://frontiersi.com.au/
79 https://www.locateconference.com/2019/
80 https://www.beritasatu.com/sains/364787-big-gandeng-pemda-dan-universitas-dorong-one-map-policy.html
81 https://www.opengovpartnership.org/sites/default/files/case-study_Indonesia_One-Map-Policy.pdf
82 http://www.thairen.net.th/asiconnectlaunch/ppt/Present_looking%20forard%20to%20a%20sccessfull.pdf
83 scgi.gistda.or.th

4. Scale up partnership model across sectors and internationally

Description

Use cases beyond traditional policy areas and domains are identified. Outreach to wider stakeholders, such as donors, private sector, civil society and NGOs is conducted.

Implementation Guidelines

To advance national programmes, partnerships are scaled up internationally and across priority application areas of geospatial information management such as sustainable development. These partnerships can be forged through MOUs; and involve R&D and capacity building, or wider structured programmes that aim to achieve regional impact.

Known Practices

Thailand: International partnerships are forged to advance key application areas of geospatial information management as part of the "Thailand 4.0" initiative for science and technology policy, and the THEOS-2 satellite programme for addressing key priorities in the national strategic action plan (2017-2036). For example, an MOU was signed between the National Research Council of Thailand (NRCT) and the Digital Belt and Road Programme (DBAR) secretariat from the Chinese Academy of Sciences to establish the International Centre of Excellence (ICoE-Bangkok), which would exchange expertise, knowledge and resources in Earth observation science and technology for environment change, water management, agriculture and food security, coastal zone, and disaster risk reduction. This would contribute to regional sustainable development.

Further examples are an MOU signed between the Thai Ministry of Agriculture and Cooperatives and GISTDA, and Hokkaido University, to advance satellite technology for smart agriculture as a key domain under the "Thailand 4.0" initiative; as well as MOUs signed between GISTDA and the Emirates Institution for Advanced Science & Technology (EIAST), and between GISTDA and the National Space Organization (NSPO) of Taiwan, to strengthen cooperation in Research and Development (R&D) and capacity building in satellite technology development and applications[84][85][86].

As of July 2014, GISTDA maintained 23 MOUs, 5 Letters of Intent and 7 agreements that spanned 18 countries in the areas of technology exchange, capacity building, and joint research and project implementation[87].

84 https://www.albawaba.com/eiast-signs-mou-thailand's-gistda-strengthen-cooperation-space-technologies-and-application

85 https://www.global.hokudai.ac.jp/blog/mou-formalized-with-thai-ministry-of-agriculture-and-cooperatives-and-the-geo-informatics-and-space-technology-development-agency/

86 http://journals.sfu.ca/apan/index.php/apan/article/download/34/pdf_10

87 https://www.gistda.or.th/main/sites/default/files/content_file/gistda-brochure/gistda-profile-eng.pdf

3.8 Strategic planning

1. Develop a Geospatial Information Management Strategy

Description

Benchmarking, baseline assessment and gap analysis of current state of activities, including data acquisition and supply chain, technological capabilities, legal and policy frameworks, and capacity levels, are conducted. Stakeholders are engaged through a strategic workshop and consultation process; and the vision, mission and objectives of the geospatial information management initiative are identified in relation to broader policy priorities and strategic needs. The case for change, significance and examples of benefits are communicated to decision-makers and stakeholders.

Implementation Guidelines

Geospatial information management strategies arise due to the need for more coordinated geospatial information sharing, strengthening of institutional frameworks and human resources for geospatial development, or greater innovation and competitiveness. They can be part of the initial development of the NSDI, or part of a next phase of geospatial development that is driven by wider policy priorities such as e-government and national development. Feasibility studies may be conducted to assess benefits of the strategies, while consultation activities such as roundtable discussions and user needs assessment may be engaged to stocktake current strategic needs and identify opportunities, during the development of the geospatial information management strategies.

These strategies may be developed as policy frameworks or master plans by law, executive orders, or policy processes. They can also come in the form of a series of inter-related, regularly-reviewed strategies and their corresponding action plans, which are at scales ranging from whole of government/industry to specific thematic and technical activities.

Subsequently, committees and working groups may be set up to lead development and action planning of the strategies. Promotion and advocacy activities, as well as change management, can be conducted through summits, seminars and conferences too.

Known Practices

Australia: In Australia, national geospatial information activities are guided by a number of strategies. The Spatial Information Council's (ANZLIC) 2016-2019 Strategic Plan articulates the vision that "Spatially referenced information that is current, complete, accurate, affordable and accessible is used to inform decision making for economic, social and environmental outcomes."ANZLIC's Collaboration Framework (2018) supplement the strategic plan, articulating agreed national strategic priorities and identifying key inter-jurisdictional collaborative projects through which strategic priorities are being addressed[88].

88 https://anzlic.gov.au/sites/prod.auzlic/files/ANZLIC%27s%20Collaboration%20Framework%20-%20November%202018.pdf

The intergovernmental Committee on Surveying and Mapping (ICSM), an ANZLIC implementation committee, maintains a five-year Strategic Plan (aligned to the ANZLIC plan) which it reviews every two years when a new Chairman is appointed. The current Strategic Plan 2016-2019 aims to develop and deliver public sector spatial capability through strategic focus areas related to research, communications, spatial data and standards and integrated program management. These plans are supplemented with thematically-oriented strategies and plans that are developing through the Inter-Governmental Committee on Surveying and Mapping, including the Elevation and Depth 2030 Strategy, Cadastre 2034 Strategy, and the Geocentric

Datum of Australia 2020[89].

The 2026 Spatial Industry Transformation and Growth Agenda (2026Agenda) is a whole-of-sector initiative of business, government, research, academia and spatial-user organisations. It is led by the industry with participation of industry, government and research sectors. It sets out the roadmap to drive accelerated growth to transform the Australian spatial sector and location-dependent industries over the next 10 years. The 2026 agenda action plan was crafted through consultation with over 400 individuals through a series of Leadership Forums across Australia together with one-on-one interviews with representatives of priority sectors including agriculture, health, transport and energy. The initiative aims to act as a catalyst to maximise the innovation, productivity and competitiveness of the industry across Australia[90].

Japan: Following Article 9 of NSDI act, or the Basic Act on the Advancement of Utilizing Geospatial Information (AUGI), the government has developed five-yearly Basic Plans for AUGI to achieve the utilisation of geospatial information in a comprehensive and well-planned manner. The Basic Plans provide basic guidelines for the policies for the advancement of utilizing Geospatial Information, as well as for GIS and Satellite Positioning, Navigation and Timing (PNT) Systems. The Geospatial Information Authority of Japan (GSI) leads the development of the Basic Plans and direction toward AUGI by gathering the views of government agencies, industry and academia[91].

Malaysia: The National Infrastructure for Land Information System (NaLIS), led by the Department of Survey and Mapping, was formed in 1997 by an executive order by the Chief Secretary, to promote the efficient sharing and exchange of geospatial information among land-related agencies. The need for geospatial information in the planning and development of land resources had existed since the early 1970s. However, the computerised land information systems that had been developed since existed as standalone systems. In the mid-1990's, Malaysia started an initiative to establish a national land information system. The Central Board for Real Estate Data Sweden was appointed to conduct a feasibility study to determine the initiative's efficiency, before the SDI concept was initiated under the NaLIS framework.

In 2002, NaLIS transitioned to the Malaysian Geospatial Data Infrastructure (MyGDI), led by the Malaysian Centre for Geospatial Data Infrastructure (MaCGDI), to increase efficiency of SDI implementation and account for wider needs of stakeholders, including non land-related agencies and the public. MyGDI was driven by the need to move towards a knowledge-based society and economy[92].

Singapore: The Singapore Geospatial Master Plan was a multi-stakeholder effort amongst numerous data producers and users from the public as well as private sectors and representatives of different sector

89 https://www.icsm.gov.au/sites/default/files/5.1.1-%20ICSM%20Strat%20Plan.pdf
90 https://2026agendacom.files.wordpress.com/2018/07/2026-agenda-report-card-final-for-release-web.pdf
91 http://ggim.un.org/country-reports/documents/Japan-2012-country-report.pdf
92 http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.612.8860&rep=rep1&type=pdf

communities. A concerted stakeholder consultation process occurred over 4 months in 2016 to identify common goals, challenges and opportunities across the sectors. This took the form of a visioning exercise, which articulated broad outcomes and strategies, and roundtable discussions providing more in-depth information about specific topics. In addition, a baseline assessment of progress and achievements of Singapore's NSDI helped identify trends and opportunities for developing the Singapore Geospatial Master Plan[93].

2. Develop Country Action Plan

Description

A road map for the geospatial information management strategy spanning appropriate horizon periods is developed. Objectives, timeframes, required resources, KPIs, deliverables, and operational considerations and risks, are developed for each road map activity.

Implementation Guidelines

Action plans consisting of a set of interconnected outcomes, focus areas, initiatives and timeframes are developed for the geospatial information management strategies. The action plans can be developed at the onset according to planned stages of NSDI development, or in phases according to evolving NSDI business needs and wider policy priorities.

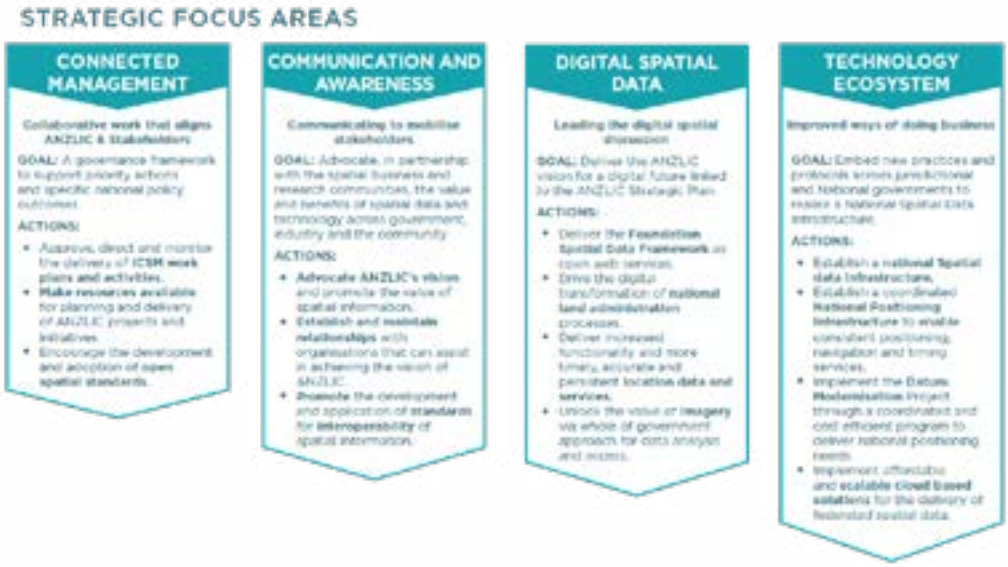
Known Practices

Australia: The ANZLIC and ICSM 2016 – 2019 Strategic Plans have strategic focus areas and goals each, with associated actions at the national level. For example, the ANZLIC Plan's focus areas are connected management, communication and awareness, digital spatial data, and technology ecosystems. Individual states and territories and their respective geospatial agencies have strategic plans to guide activities within their jurisdictions.

The 10-year Action Plan for the 2026Agenda is organised around 6 pillars of activity - Public Infrastructure and Analytics; Innovation and Entrepreneurship; Outreach; Research and Development; Education, Training and Capacity Building; and Representation - and underpinned by 34 transformational initiatives. It presents the vision, initiatives and scheduling that collectively will contribute to the accelerated growth of spatial technologies in Australia and to the further development of location-based industries and their impact right across the Australian economy and our broader society[94][95][96].

ANZLIC Strategic Plan 2016-2019

93 https://geospatial.sg/wp-content/uploads/2018/07/Singapore-Geospatial-Master-Plan.pdf
94 https://www.icsm.gov.au/publications/elevation-and-depth-2030-powering-3d-models-our-nation
95 https://www.icsm.gov.au/publications/cadastre-2034-strategy
96 https://www.icsm.gov.au/datum/what-gda2020



Japan: The five-yearly Basic Plans for AUGI are developed in phases according to progressive goals and focus areas of Japan's NSDI, and specify goal implementation approaches and guidelines for AUGI. For example, the first Basic Plan (2008-2012)'s focus was to establish fundamental map information and develop Japan's first quasi-zenith satellite "Michibiki" for GIS and PNT, respectively. In addition, cooperation among relevant entities was promoted through the formation of the Industry-Academia-Government Collaboration Conference. The second Basic Plan (2012-2017) focused on scaling up these efforts, through the creation of the G-spatial Information Center as the hub of geospatial information across sectors, and conduct of demonstration test on positioning by "Michibiki".

The onset of the '4th industrial revolution', and changes in social conditions such as greying of the population and increases in disaster risk, gave rise to the focus on social solutions and creation of new industries and services in the third Basic Plan (2017-2022). The establishment of the four-satellite constellation of the quasi-zenith satellite system, full operationalisation of the G-spatial Information Center, and education and human resource development for geospatial information, are focus areas in this Basic Plan[979899].

Singapore: Based on the stakeholder consultation outcome, the Singapore Geospatial Master Plan was developed to chart the next phase of geospatial development in Singapore through wider partnerships and increased adoption. The Master Plan articulates the vision, strategies and initiatives for geospatial development across various sectors. Thirteen targeted initiatives were drafted to address gaps and promote partnerships. These included a Geospatial Capability Centre to aggregate geospatial expertise while providing a centralized expert service to government agencies; and other initiatives focused on capacity building and industry development[100].

97 http://www.gsi.go.jp/common/000043664.pdf
98 http://www.gsi.go.jp/common/000075948.pdf
99 http://www.gsi.go.jp/common/000194017.pdf
100 https://geospatial.sg/wp-content/uploads/2018/07/Singapore-Geospatial-Master-Plan.pdf

3. Develop a Reporting Framework to monitor the achievement of action plan outcomes

Description

Methodology and procedures for regular monitoring and reporting of progress are established. Incentives and disincentives for enabling successful geospatial information management practices are put in place.

Implementation Guidelines

Monitoring and reporting frameworks are developed to assess and update on progress. In certain cases, the strategies are developed on a continual basis according to evolving business needs and national priorities, such as through periodic benchmarking studies.

Known Practices

Australia: A monitoring framework has been developed to assess and report on the progress of the 2026Agenda action plan. Annual updates on implementation of the 2026 agenda are provided through report card indicating progress on activities within each pillar[101].

Malaysia: MaCGDI conducted a Local Government Benchmarking Study jointly with Esri Malaysia in 2017, which aimed to produce a comprehensive report of the current and future role of geospatial information and technology in the local government, in order to support MyGDI's growth as a key enabler of Transformasi Nasional 2050, the national strategy for economic development, social advancement and innovation. The Study investigated the landscape of local government participation in geospatial-related activities across key sectors, as well as global best practices, in order to assess trends and opportunities for geospatial information management[102].

3.9 Financial management: input-oriented

1. Determine financial and investment needs in relation to geospatial information management strategy and national budget structure

Description

101 https://2026agendacom.files.wordpress.com/2017/10/2026-agenda-action-plan-roadmap-for-release-web.pdf

102 http://esrimalaysia.com.my/u/lib/esrimy/cms/local-government-benchmark-study-malaysia-2018.pdf

A financial strategy, including funding scope and phases, and target funding sources, is developed. Key focus areas and activities for funding are outlined and prioritised. Needed funding is determined.

Implementation Guidelines

Financial strategies can be developed as part of geospatial information management strategies, in which funding scopes and phases are aligned with the strategies' timelines and focus activities. Funding requirements, including cost estimates, are identified for major projects according to the scopes and phases based on users' requirements. Target funding sources such as those for wider ICT programmes or national government budgets are inventorised.

Known Practices

Philippines: The Philippine Geospatial Data Infrastructure (PGDI)'s financial strategy is aligned with its three stages of institutionalisation, expansion and sustainability, as part of the PGDI Master Plan. The first stage was focused on the development of the Geoportal, while the next two focused on adoption and capability development. Ballpark figures for major activities such as data collection, management and digitisation, and geoportal development were derived across the stages[103].

2. Develop financial framework

Description

Specific funding sources are identified and secured. The financial plan, including objectives, key budget items and timeframes, is developed; and budgetary guidelines based on processes and instruments of budgeting, accounting and auditing are established. A governance model that defines roles and responsibilities of key institutions, such as expenditure review committees, and processes and procedures of funding programmes, is developed.

Implementation Guidelines

Key budget items and timeframes may be developed in financial plans based on existing geospatial information management plans and strategies, and budgetary guidelines such as proposal submission timeline and criteria developed according to annual expenditure programmes and other national funding programmes for specific agendas. Geospatial agencies may prepare financial plans with stakeholders collaboratively, and review them regularly to ensure evolving funding requirements are met.

103 The Philippine Geospatial Data Infrastructure (PGDI) Master Plan 2011-2020, v1.0

Known Practices

Philippines: Annually, the National Mapping and Resource Information Authority (NAMRIA) and the stakeholder agencies will review and prepare key budget items according to the PGDI Master Plan's major projects and activities, and submit proposal for funding from the regular appropriations of the national government. Depending on the Master Plan's project development and implementation strategies, the regular appropriations may be released to individual agencies or to NAMRIA centrally. NAMRIA and stakeholder agencies may also review available government funds that may be strategic to specific stages of the Master Plan, and develop the PGDI's financial plan accordingly. For example, the eGovernment Fund for cross-agency computerization or systems development projects, financed the Philippine Geoportal System in the institutionalisation stage of the PGDI. Funding requirements are also evaluated at every stage of the Master Plan[104].

3.10 Financial management: performance-oriented

1. Determine financial and investment needs in relation to geospatial information management strategy and action plan.

Description

The objectives of the geospatial information management initiative in relation to broader policy priorities and strategic needs, e.g. data sharing, capacity and adoption, etc., are identified, along with key geospatial information management activities for performance monitoring.

2. Develop reporting framework to monitor performance

Description

Performance assessment tools and models are created, and benchmark performance levels and KPIs are identified. A governance model that defines roles and responsibilities of key institutions, such as contact points for data acquisition and reporting, as well as processes and procedures to submit performance reports and analyse results, is developed. Monetary and non-monetary incentives and disincentives for enabling performance are put in place.

104 The Philippine Geospatial Data Infrastructure (PGDI) Master Plan 2011-2020, v1.0

3.11 Financial management fostering joined up working and cooperation

1. Determine financial and investment needs in relation to geospatial information management strategy and national budget structure

Description

Key programmes and activities for funding are outlined and prioritised, and potential stakeholders and partners for joined up working and cooperation are identified.

Implementation Guidelines

Joint financing may be used in collaborative programmes that involves multiple parties across different levels of administration to make available accurate, harmonised geospatial data for national goals such as environmental management and sustainable development. Stakeholders and priority activities for funding are identified based on the needs and stages of the collaborative programmes.

Known Practices

Philippines: Key programmes and activities for joint funding were identified according to the stages of the Philippine Geospatial Data Infrastructure (PGDI) Master Plan, which were institutionalization, expansion and sustainability. The Philippine Geoportal System was the focus of the first stage, while adoption and capability development were the focus of the next two. Accordingly, stakeholders were identified based on data producers and users participating in the Geoportal[105].

2. Engage stakeholders to formulate scope and approach

Description

Horizontal policies and cross-cutting objectives, e.g. collaborative research, joint data production, etc., are defined, and financial partnerships and funding pools are developed. A financial strategy, including funding scope and phases, target outcomes, and budget formats and requirements is formulated.

Implementation Guidelines

Objectives for financial partnerships are defined according to key activities and timelines of existing geospatial information management plans and strategies. Potential investors for the partnerships are identified and engaged to develop financial strategies, according to the objectives and timelines.

105 The Philippine Geospatial Data Infrastructure (PGDI) Master Plan 2011-2020, v1.0

Known Practices

Philippines: The Philippine Geospatial Data Infrastructure (PGDI)'s cross-cutting objectives are aligned with its three stages of institutionalization, expansion and sustainability, as part of the PGDI Master Plan. The first stage was focused on the development of the Geoportal, and the development of Fundamental Datasets and data management policies, while the next two focused on adoption and capability development. Ballpark figures for major activities such as data collection, management and digitization, and geoportal development were derived across the stages. Accordingly, potential investors are identified for each stage according to their financing capabilities, and the financial strategy developed across the stages with PGDI stakeholder agencies and investors[106].

3. Develop financial framework

Description

Joined-up funding programmes, such as grant schemes and co-financing mechanisms, are set up. A governance model that defines roles and responsibilities of key institutions, guidelines and code of conduct, and processes and procedures of joined up working and cooperation, is developed.

Implementation Guidelines

Joined-up funding programmes could leverage upon investment schemes with the private sector. Governance models for the joined-up funding programmes could leverage those of the geospatial information management plans and strategies, with geospatial-related agencies overseeing the programs.

Known Practices

Philippines: Strategies were made to leverage public-private sector investments and taxes collected by local governments in the financing of the development of national and agency geoportals, and acquisition of fundamental datasets, during the institutionalization stage of the PGDI Master Plan[107].

106 The Philippine Geospatial Data Infrastructure (PGDI) Master Plan 2011-2020, v1.0
107 The Philippine Geospatial Data Infrastructure (PGDI) Master Plan 2011-2020, v1.0

3.12 Inter-organizational culture and knowledge management

1. Identify focus areas for inter-organizational culture and knowledge management in relation to the geospatial information management strategy

Description

Needed shared visions, values, norms and knowledge are determined through benchmarking, baseline assessment of culture, and gap analysis.

Implementation Guidelines

Broad common needs can be identified based on developments in legislation or goals and strategies for geospatial information management, or as part of regional programmes. The needs for visions, values and knowledge might become more evident as goals and policy directions of geospatial information management programmes and strategies get more refined.

Known Practices

Australia and New Zealand: The Spatial Information Industry Action Agenda consisted of goals, strategies and actions to identify opportunities and challenges to the progress of the spatial information industry and develop a framework that would promote growth in the spatial information industry. One of the goals of the Agenda was to develop a joint policy framework that encouraged a mutually beneficial relationship between business and government. A key strategy of this goal was to develop formal linkages between both sectors for the joint development of industry policy recommendations, such as to define the roles of public and private sector activities in the geospatial information supply chain, and strengthen the private sector through industry development initiatives[108].

Indonesia: Capacity building in GIS and NSDI activities was needed during the initial stages of geospatial information management, due to Indonesia's vast, complex geography and political landscape. This need evolved with the development of geospatial information management regulations and policies. Dialogue on strategies for policy implementation among stakeholders, and establishing synergy for coordination and collaboration among geospatial information providers in Indonesia became a focus[109].

Thailand: Thailand aimed to contribute to regional sustainable development by promoting scientific innovations and professional linkages in Big Earth Data for integrated research on climate change, environmental protection, disaster risk reduction and natural resources management.

108 http://www.crcsi.com.au/assets/Resources/33dbc19a-4938-4f46-9a43-d9ff07f5209c.pdf

109 http://www.fig.net/resources/proceedings/fig_proceedings/fig2014/papers/ts08h/TS08H_darmawan-sutanta_et_al_7288.pdf

This was aligned with its THEOS-2 satellite programme that aimed to create a space-GIS integrated platform for addressing key priorities in the national strategic action plan (2017-2036), as well as the Digital Belt and Road Programme (DBAR) led by the Chinese Academy of Sciences to share expertise, knowledge and resources in Earth observation science and technology for large-scale development. DBAR's extensive geographical coverage warranted increase in research and monitoring capacity for diverse projects in the Sustainable Development Goals[110][111].

2. Engage key stakeholders to form inter-organizational networks

Description

Interests and needs with potential stakeholders are aligned, and the case for change, significance and examples of benefits are communicated to decision-makers and stakeholders.

Implementation Guidelines

An MOU may be signed among stakeholders to seal gentlemen's agreement among the stakeholders, as well as attain needed political support. Geospatial, or science and technology, agencies may lead the engagement process. Other key government agencies, and academic institutions with relevant expertise may also be involved.

Known Practices

Thailand: A Memorandum of Understanding (MoU) was signed between the National Research Council of Thailand (NRCT) and the DBAR secretariat from the Chinese Academy of Sciences to establish the International Centre of Excellence (ICoE-Bangkok), which would exchange expertise, knowledge and resources in Earth observation science and technology for environment change, water management, agriculture and food security, coastal zone, and disaster risk reduction.

Other than the NRCT, which served as the ICoE-Bangkok's administrative office, other strategic partners of the ICoE-Bangkok - Asian Institute of Technology (AIT), Ramkhamkaeng University (RU), and Geo-informatics and Space Technology Development Agency (GISTDA) - were engaged based on their core strengths. For example, the AIT and RU Centre of Regional Climate Change and Renewable Energy's focus on education and research make them suitable candidates for developing regional capacity development activities and life learning resources for professionals[112].

110 http://ggim.un.org/unwgic/presentations/6.1_Monthip_Sriratana.pdf
111 https://www.gistda.or.th/main/en/node/2422
112 http://ggim.un.org/unwgic/presentations/6.1_Monthip_Sriratana.pdf

3. Develop inter-organisational frameworks that foster common knowledge and culture

Description

Cooperation mechanisms for fostering shared visions, values, norms and knowledge, such as consultative forums and joint meetings, are formulated. A road map of key activities outlining objectives, timeframes and required resources is created. A governance model that defines roles and responsibilities of key institutions, guidelines and code of conduct, and processes and procedures for fostering common knowledge and culture, e.g. forums, communities of practice, etc., is developed.

Implementation Guidelines

Cooperative mechanisms for fostering common knowledge and culture may range from semi-formal meetings, conferences and forums with more dynamic agendas; to peak industry associations; and organised centres of excellence with formal reporting structures comprising secretariats, programme offices and coordinator agencies leading various work streams. These mechanisms might evolve in focus and approach with wider developments in policies and regulations, nationally and regionally. The private sector and academia may also be involved as core members.

Known Practices

Australia and New Zealand: A key initiative to develop a joint policy framework that encouraged a mutually beneficial relationship between business and government was the formation of a peak industry association to represent private business interests within the spatial information industry, to be known as the Spatial Industries Business Association (SIBA) (formerly ASIBA, the Australian Spatial Information Business Association), which eventually became the Spatial Industries Business Association and Geospatial Information & Technology Association ANZ (SIBA|GITA).

Along with the Surveying and Spatial Sciences Institute (SSSI), SIBA|GITA build capacity and set guidelines for geospatial industry practice. They perform a range of member professional development and certification, knowledge sharing and networking and spatial industry representation and advocacy functions. For example, SSSI administers general and specialised certification programmes for surveying and spatial professions, while SIBA-GITA administers the Asia-Pacific Spatial Excellence Awards (APSEA) which recognises the achievements of top spatial information enterprises and individuals[113][114].

In addition, the government and industry organisations have long standing collaboration and co-investment in geospatial research conducted by academia through FrontierSI (formerly Cooperative Research Centre for Spatial Information (CRC-SI)). Longstanding collaboration also exists between government organisations and the Australian national science agency (the Commonwealth Science and Industrial Research CSIRO) and its new digital business unit Data61. Annual spatial community conferences are a long standing feature of Australian spatial community. The annual Locate Conferences are also key to supporting networking and

113 https://sssi.org.au/get-certified

114 https://www.spatialbusiness.org/asia-pacific-spatial-excellence-awards

collaboration[115][116][117].

Indonesia: The National Coordination Meeting (Rakornas) has been held annually since 1991, initially under the name of Rakornas National Geographic Information System, then Rakornas National Spatial Data Infrastructure in 2000 to reflect change in policy and focus, and finally Rakornas Geospatial Information Infrastructure in 2011 to be in line with State Law No. 4/2011 on Geospatial Information. Led by the Geospatial Information Agency, the forum aims to deliberate strategies, share best practices and identify priorities among central government agencies, local government agencies, universities and private sector firms. This can be in the form of presentations and panel discussions in ballroom settings[118][119].

Thailand: NRCT, AIT, GISTDA and RU act as coordinators of the ICoE-Bangkok's various programmes, namely Networking and Policy Implementation, Education and Capacity Building, Research and Development and Social Service and Consultancy, based on their respective expertise. They work with Partner Institutes in project implementation and provision of supporting facilities and infrastructure for projects, and report to the ICoE-Bangkok Director in NRCT, which conduct regular committee meetings among the coordinators and programme teams. The Director in turn reports to the DBAR Secretariat, which prepares annual work plans and leads DBAR work meetings and conferences. A dedicated seminar was held to have an in-depth discussion on ICOE-Bangkok objectives, such as a regional consultation and networking workshop for Big Earth Data in Southeast Asia[120].

4. Evaluate inter-organizational culture and knowledge management

Description

Methodology and procedures for regular monitoring and reporting of progress are established.

Implementation Guidelines

Inter-organizational culture and knowledge management may be monitored and reviewed according to evolving industry needs and wider policy priorities, or as part of growth agendas and road maps for the geospatial industry.

115 https://www.csiro.au
116 https://frontiersi.com.au/
117 https://www.locateconference.com/2019/
118 http://www.fig.net/resources/proceedings/fig_proceedings/fig2014/papers/ts08h/TS08H_damawan_sutanta_et_al_7288.pdf
119 http://big.go.id/rakornas-2014/
120 http://ggim.un.org/unwgic/presentations/6.1_Monthip_Sriratana.pdf

Known Practices

Australia and New Zealand: The progress of SIBA|GITA and its antecedents is monitored in relation to wider industry needs and trends. ASIBA, the first form in which SIBA|GITA existed, was renamed to the Spatial Industries Business Association (SIBA) in 2009 to position the Association more globally in response to its increasingly international membership that ranged from small-scale consultancies to multinational corporations. In 2016, SIBA and Spatial Queensland joined forces in order to represent the interests and needs of the wider geospatial community more effectively. Thereafter, SIBA and the Geospatial Information Technology Association Australia and New Zealand (GITA ANZ) merged to form SIBA|GITA, in order to increase capacity to respond to the geospatial industry's needs and drive growth and innovation effectively. Additionally, as part of the 2026 Spatial Industry Transformation and Growth Agenda, plans are in place to consolidate SIBA|GITA and SSSI as a high-priority initiative aiming to provide effective leadership and advocacy for the geospatial community[121][122].

3.13 Capacity building

1. Assess capacity needs in relation to the geospatial information management strategy

Description

Key stakeholders to determine capacity needs and focus areas are identified and engaged. Capacity assessment is conducted to identify target competencies and KPIs, such as through a competency framework, as well as establish the baseline of capacity assets and levels. Gap analysis is performed to identify areas where skills fall short of requirements, and gaps in training and knowledge exchange.

Implementation Guidelines

Assessing capacity needs can be done through various approaches, such as methodological surveys to address research questions about availability and needs of capacity, and focus group discussions and workshops among local government agencies. These activities can be done as part of structured exercises to develop capacity building strategies and competency frameworks, or as part of engagement sessions for NSDI implementation according to master plan objectives and timelines. They may involve the government, industry and academia.

121 https://www.directionsmag.com/article/2367

122 https://2026agendacom.files.wordpress.com/2017/10/2026-agenda-action-plan-roadmap-for-release-web.pdf

Known Practices

Indonesia: After State Law No. 4/2011 on Geospatial Information was passed, seminars, workshops and focus group discussions were held in 2013 to assess the Law's effect on growth of demand for geospatial information personnel, the landscape of availability and distribution of such personnel in terms of educational background and expertise, as well as how the education sector should respond to these developments. These events were held among representatives from universities, businesses, government and community[123].

Philippines: In the first stage of the Philippine Geospatial Data Infrastructure (PGDI) master plan, roundtable discussions were conducted to understand stakeholder agencies' strategic GIS use and concerns, and formulate their Agency Geospatial Data Infrastructure (AGDI) Plans that would provide basic guidelines and procedures for linking agency node portals to the Philippine Geoportal seamlessly. This involved identification of requirements for data, ICT resources and capacity building[124].

2. Formulate and implement a capacity building programme

Description

An action plan is developed, such as a Strategic Workforce Plan, which builds on existing capacity assets to address gaps. A governance model is developed to identify champion agencies to drive capacity building, and define roles and responsibilities of key stakeholders. Objectives, timeframes, required resources and deliverables for capacity building activities are defined. The capacity building programme is integrated with national budget structures to ensure funding.

Implementation Guidelines

Capacity building programmes can be implemented based on competency frameworks for geospatial information management, or based on NSDI master plans. Competency frameworks consist of competency standards and guidelines as well as accreditation systems. They are used to structure educational curriculum, training and workforce strategies for the management and development of human resources for geospatial information; and this may involve competency-based training, competency certification, and human resource management systems such as talent recruitment and selection. On the other hand, NSDI master plans can provide frameworks for carrying out capacity building activities. These activities can be tailored to support NSDI implementation, such as training for geoportal setup and operations during geoportal engagement workshops, and can be scaled up progressively with achievement of master plan objectives and KPIs. In certain cases, capacity building activities can be scaled up through partnerships with overseas institutions.

Coordination structures in the national geospatial information management networks are leveraged on for governing capacity building programmes. The national geospatial agency leads capacity building

123 http://www.fig.net/resources/proceedings/fig_proceedings/fig2015/papers/ts02f/TS02F_amhar_narieswari_et_al_7448.pdf

124 http://www.namria.gov.ph/Downloads/Publications/NewsScoop/2013novNo55.pdf

programmes nationally, while government officials, experts and academics in network nodes participate in such programmes at the local level. This can include policy and research in technical and human resource aspects of geospatial information management. Additionally, working groups can be set up to implement capacity building and monitor compliance with competency standards, which are overseen either by steering committees or national geospatial agencies. In more complex national capacity building initiatives, committees for specific sub-programmes can be established within the umbrella of those national initiatives too.

Known Practices

Indonesia: The Indonesian National Competence Standard of Geospatial Information sector (SKKNI-IG) was developed in 2013 as a basis for the management and development of human resources in geospatial information, such as the competency-based training and certification of competency. SKKNI-IG covers surveying, photogrammetry, hydrography, remote sensing, GIS and cartography. The Geospatial Information Conformity Assessment Working Group (KKPK IG), led by BIG, also conducts accreditation and certification based on SKKNI-IG, by granting formal recognition of the competencies of professionals, service providers, and training institutions; as well as certifying their products, processes and management systems, respectively[125].

SKKNI-IG is implemented through Centres for SDI Development (PPIDS) established at local universities, to address the challenges associated with Indonesia's vastness and high number of local governments that need capacity building. PPIDS act as regional centres for innovation and consultation by assisting local governments in human resources development through meetings and Focus Group Discussions, training of staff in basic and new technologies for SDI implementation, as well as Research & Development[126].

Thailand: As part of the NSDI Development and Implementation Action Plan 2011-2015, the Space Krenovation Park (SKP) was developed as the Geo-informatics and Space Technology Development Agency (GISTDA)'s satellite operation centre, incubator and training centre for space technology and geo-informatics. It organises capacity building activities regionally and globally through subsidiary programmes and governance structures.

These include the Global Navigation Satellite System (GNSS) Innovation Centre that provided Research and Development (R&D) laboratories and a space for start-ups; and the Sirindhorn Center for Geo-Informatics (SCGI), which was set up as an institute for research and knowledge and technology transfer in space technology and geo-informatics. The SCGI is run by a Steering Committee and Scientific Advisory Committee, which comprise officials and experts from GISTDA, local agencies and overseas universities. In addition, the SKP's ASEAN Research and Training Centre for Space Technology and Applications (ARTSA) advances education and training, knowledge sharing and research collaborations in geo-informatics for the region and globally. GISTDA also partners with the International Society for Photogrammetry and Remote Sensing to build capabilities of students and young professionals in remote sensing and geospatial information scienc-

125 http://www.fig.net/resources/proceedings/fig_proceedings/fig2015/papers/ts02f/TS02F_amhar_narieswari_et_al_7448.pdf

126 http://www.big.go.id/berita-surta/show/big-lakukan-pembinaan-simpul-jaringan-melalui-rapat-koordinasi-ppids-2014

es through summer schools, hackathons and exchange programmes[127][128].

Further capacity building programmes are advanced through partnerships with overseas agencies and institutions. For example, GISTDA partners with the Thai Ministry of Agriculture and Cooperatives and Hokkaido University to advance satellite technology for smart agriculture; as well as with the Emirates Institution for Advanced Science & Technology (EIAST), and the National Space Organization (NSPO) of Taiwan, to strengthen cooperation in Research and Development (R&D) and capacity building in satellite technology development and applications[129][130][131].

Singapore: Singapore's geospatial information capacity building programme consists of a number of initiatives targeting different demographic groups, from students to working adults. For example, in order to build geospatial information interest for youngsters, the government set up the Singapore Geospatial Challenge, a national competition to encourage students apply basic geospatial skills to solve thematic challenges. At a more advanced level, universities and polytechnics provide a range of education opportunities ranging from running professional training courses, executing specific certified courses, to applying a GIS master programme. Hackathons were also organized to expose the use of geospatial information in multiple domains such as in the social sector for voluntary welfare organizations (VWOs) and NGOs.

In addition, a competency framework is being developed to assist in curriculum development and to help to equip geospatial specialists with the relevant skillsets. Geospatial information has also been identified as a strategic asset to be built within the Public Service. To this end, a Geospatial Capability Centre is being set up to enlarge and enhance the geospatial information expertise, to provide a central consultancy and professional technical service to government agencies to implement geospatial projects, to undertake strategic workforce planning and talent development, as well as to conduct R&D[132][133].

127 http://oldweb.most.go.th/eng/index.php?option=com_content&view=article&id=173:ministry-of-science-and-technology-gets-ready-to-launch-sirindhorn-center-for-geo-informatics-aiming-at-strengthening-researchers-in-geo-informatics-with-international-capacities&catid=88:the-news&Itemid=491

128 http://www.thairen.net.th/asiconnectlaunch/ppt/Present_looking%20forard%20to%20a%20sccessfull.pdf

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131 http://www.un-ggim-ap.org/meetings/pm/5th/201607/W020161026584902554813.pdf

132 https://geospatial.sg/wp-content/uploads/2018/07/Singapore-Geospatial-Master-Plan.pdf

133 http://ggim.un.org/2nd%20session/country%20reportss/Country_Report_Singapore.pdf

3. Evaluate capacity building

Description

Methodology and procedures for regular monitoring and reporting of progress are established.

Implementation Guidelines

Capacity building programmes can be evaluated according to processes of performance monitoring and reporting in NSDI master plans, or as part of the revision of competency frameworks and standards.

Known Practices

Indonesia: SKKNI-IG is reviewed and revised according to the needs of the geospatial sector and the Regional Model Competency Standards developed by the International Labour Organisation for countries to develop national skills standards across industries. For example, in 2017, BIG increased SKKNI-IG's number of unit codes from 102 to 260, added a new scope competency in Regional Survey, and added the new key functions of supervision and innovation, after evaluating SKKNI-IG since its formulation in 2013[134].

Philippines: Assessment of capacity building outcomes will occur after every stage of the PGDI Master Plan as part of an evaluation process to determine performance and implementation gaps. This involves a stock-take of the levels of GIS appreciation and technical capability attained in relation to the PGDI's present and future demands, and assessment of the need for additional capability development interventions[135].

4. CONCLUSION

This 'Foundational Guide to National Institutional Arrangements Instruments for Geospatial Information Management (Asia-Pacific)' builds upon the UN-GGIM NIA-WG's previous work in developing an overarching framework as an integrated process for implementing NIA in geospatial information management, which included 13 structural and managerial NIA instruments and their principles, guidelines and good practices. It refines and deepens the overarching framework through implementation steps and guidelines for the NIA instruments, which takes into account the Asia-Pacific geographical context based on supporting known practices. The resulting step-by-step recommendations aim to facilitate adoption and implementation of the NIA instruments by Member States. A self-assessment framework complements the recommendations by guiding users to consider and monitor current and future implementation needs holistically. It is the aim that the Guide will provide a basis for future NIA work, as well as alignment and integration with related UN-GGIM efforts such as the Integrated Geospatial Information Framework (IGIF).

134 https://www.fig.net/resources/proceedings/fig_proceedings/fig2016/papers/ts01f/TS01F_narieswari_8172.pdf

135 The Philippine Geospatial Data Infrastructure (PGDI) Master Plan 2011-2020, v1.0

ACKNOWLEDGMENTS

The following individuals provided input into and participated in the development of this document:

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Paul Box	Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia
François Chirié	Institut National de L'information Géographique et Forestière, France
Andrew Coote	ConsultingWhere
Joep Crompvoet	Katholieke Universiteit Leuven
Mark Cygan	Environmental Systems Research Institute (Esri) USA
Clare Hadley	Ordnance Survey, UK
Siau Yong Ng	Singapore Land Authority
Liyang Lim	Singapore Land Authority
Mou Jian Lee	Singapore Land Authority
Simone Lloyd	Ministry of Economic Growth and Job Creation, Jamaica
Faatasi Malologa	Department of Lands and Survey, Tuvalu
Xavier Molina	Military Geographic Institute, Ecuador
Saeid Pirasteh	University of Waterloo
Anders Sandin	Lantmäteriet, Sweden
Gerda Schennach	Federal Office of Metrology and Surveying, Austria
Taro Ubukawa	Geospatial Information Authority of Japan
Ingrid Vanden Berghe	National Geographic Institute, Belgium
Yaneke Watson	Ministry of Economic Growth and Job Creation, Jamaica

We wish to express our thanks to all of the volunteers for their time and contributions to this document.

APPENDIX

Glossary

Geospatial Information Coordination Unit

An independent body or office representing whole-of-government needs that coordinates and takes accountability for all activities related to the geospatial information management initiative or National Spatial Data Infrastructure. The Coordination Unit is responsible for formulating strategies and policies for geospatial data management and access, preparing institutional arrangement guidelines and recommendations, and building networks among data producers and users across sectors.

Refer to Page 12 of Part 2: Implementation Guide of the Integrated Geospatial Information Framework [Consultation draft: Work-in-progress] (as presented to the 8th session of UN-GGIM)

Geospatial Information Management Strategy

A plan to achieve the long term and overall aim of the geospatial information management initiative or National Spatial Data Infrastructure, and provides the overall direction for defining the institutional arrangements. It identifies the vision, mission, and objectives of the geospatial information management initiative in relation to broader policy priorities of government; as well as articulates the case for change, significance and examples of benefits of the initiative.

Refer to Page 14 of Part 2: Implementation Guide of the Integrated Geospatial Information Framework [Consultation draft: Work-in-progress] (as presented to the 8th session of UN-GGIM)

Geospatial Information Management Strategy Action Plan

A road map or guide to operationalise the geospatial information management initiative in a national and sub-national context. It is usually spread across appropriate horizon periods (e.g., 1-3 years, 3-5 years, 5+ years as relevant); and includes the economic impact and value of geospatial information systems, investment needs, priorities, analysis of socio-economic benefits and potential funding sources. In addition, it identifies key elements of each road map activity, such as the agencies involved, objectives, deliverables, timeframe, and budget.

Refer to Pages 4 and 16 of Part 2: Implementation Guide of the Integrated Geospatial Information Framework [Consultation draft: Work-in-progress] (as presented to the 8th session of UN-GGIM)

Governance Model

A diagram showing the interrelationships between the proposed institutions, committees and the Coordinating Unit in the geospatial information management initiative or National Spatial Data Infrastructure, which are designed to bring national and municipal agencies together to share geospatial information, reform cross-agency business processes and adopt latest ICT standards and systems. The Governance Model provides guidelines for promoting collaboration; identifying key institutions and their roles and responsibilities; as well as developing processes, procedures and regulations for geospatial information management and sharing.

Refer to Page 15 of Part 2: Implementation Guide of the Integrated Geospatial Information Framework [Consultation draft: Work-in-progress] (as presented to the 8th session of UN-GGIM)

National Institutional Arrangements

Formal and informal cooperation structures that supports and links public and private institutions and/or organisations, and which are used to establish the legal, organisational and productive frameworks to allow for sustainable management of geospatial information, inclusive of its creation, updating and dissemination, thereby providing an authoritative, reliable and sustainable geospatial information base for all users.

Refer to http://ggim.un.org/meetings/GGIM-committee/documents/GGIM4/140807UN-GGIM%204th%20session%20NIA%20Chair%20Arozarena%20CB.pdf

Steering Committee

A governing body made up of members from across government to provide leadership and direction for implementing the geospatial information management initiative or National Spatial Data Infrastructure. Organizations that collect, manage and are significant users of geospatial information are represented in the committee structure.

Refer to Page 12 of Part 2: Implementation Guide of the Integrated Geospatial Information Framework [Consultation draft: Work-in-progress] (as presented to the 8th session of UN-GGIM)

Technical Working Groups

Working groups or committees that advise the Coordination Unit and Steering Committee on technical or specialised aspects associated with geospatial data sharing and interoperability across institutions. These include data management, access and standards; operation of data exchange systems; the formulation, implementation and review of legal and policy frameworks; and methods of financing and investment.

Refer to Page 13 of Part 2: Implementation Guide of the Integrated Geospatial Information Framework [Consultation draft: Work-in-progress] (as presented to the 8th session of UN-GGIM)