Virtual High Level Forum on UN-GGIM
2nd June 2020
The Integrated Geospatial Information Framework
Nine Strategic Pathways for National Leadership in Geospatial Information Management

Strategic Pathways 4, 5 and 6 - The Technology Pillar

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Specialist in Governmental Geospatial Information Policy and Practice
The Strategic Pathway Elements are the most important things to achieve when working towards integrated geospatial information management.
Data - Innovation - Standards

Actions and Tools

- **Elements** are achieved by completing **Actions**
- Actions are identified in the Country Action Plan
- Tools help deliver the Actions
- Principles guide our Actions

**Strategic Pathway 4: Data**

**Data Themes**
- Data Curation and Delivery
- Data Supply Chains

**Data Custodianship, Acquisition and Management**

**Actions**
- Getting Organized
  - Data Framework
  - Data Inventory
  - Dataset Profiles
- Planning for the Future
  - Data Gap Analysis
- Capturing and Acquiring Data
  - Data Capture
  - Data Acquisition Program
- Managing Data Sustainably
  - Data Custodianship Policy and Guidelines
  - Data Governance
  - Data Management Plan
  - Maintained Metadata
  - Data Release
  - Data Storage and Retrieval Systems

**Maintaining Accurate Positioning**
- Maintained Geodetic Infrastructure

**Integrating Data**
- Geospatial and Statistical Integration
- Geocoding and Aggregation
- Data Supply Chains
- Data Interoperability

**Tools**
- Fundamental Geospatial Data Themes
- Data Theme Description Template
- Data Inventory Questionnaire
- Dataset Profile Template
- Gap Analysis Matrix
- Data Theme Road Map Template
- Data Custodianship Policy Principles
- Data Governance Roles and Responsibilities
- Data Management Plan Elements
- Metadata Creation Checklist
- Data Release Guidelines
- Guidance for Improving Geodetic Infrastructure
- Global Statistical Geospatial Framework
- Guidance for Geospatial and Statistical Integration
Positioning geospatial information to address global challenges

Outcomes: access to integrated geospatial data

- Increased range and scope of integrated data
- Data is discoverable and reusable for:
  - national development initiatives
  - innovation
- Productivity improvements through:
  - well-defined data supply chains/no duplication
  - data and technology interoperability

Benefits: reuse and repurpose leading to.....

- Economic growth and improved quality of life for citizens
- Monitor and measure progress towards achieving SDGs and strategic priorities of government
Strategic Pathway 4: Data

Developing the Action Plan

Key Actions for Strengthening Geospatial Information Management

1. Getting Organized
   - Data Collection
   - Data Inventory
   - Data Standards

2. Planning for the Future
   - Data Analysis
   - Data Road Map

3. Capturing and Acquiring
   - Data Acquisitions Program
   - Data Capture

4. Managing Data Sustainably
   - Data Management Policies
   - Data Management Plan
   - Metadata Management
   - Data Storage/Retrieval Systems

5. Maintaining Accurate Positioning
   - Maintaining Geodetic Infrastructure

6. Integrating Data
   - Geospatial Geostatistical Data
   - Geospatial Data Integration
   - Data Sharing Chains
   - Data Interoperability

Tools to Assist in Completing the Actions

- Fundamental Geospatial Data Themes
- Data Theme Description
- Data Inventory Questionnaire
- Dataset Profile Template
- Gap Analysis Matrix
- Data Theme Road Map Template
- Data Custodianship Policy
- Data Governance Roles
- Data Management Plan Elements
- Metadata Creation Checklist
- Data Release Guidelines
- Guidance for Improving Geodetic Infrastructure
- Global Statistical Geospatial Framework
- Geospatial/Statistical Integration

Suggested Road Map

SP4: Structure
Strategic Pathway 4: Data
Getting Organised

UN-GGIM Working Group on Global Fundamental Geospatial Data Themes

Data Themes
- Global Geodetic Reference Frame
- Geographical Names
- Addresses
- Functional Areas
- Buildings and Settlements
- Land Parcels
- Transport Networks
- Elevation and Depth
- Population Distribution
- Land Cover and Land Use
- Geology and Soils
- Physical Infrastructure
- Water
- Orthoimagery

Dataset Profiles

<table>
<thead>
<tr>
<th>Dataset</th>
<th>Description</th>
<th>Data Characteristics</th>
<th>Data Governance</th>
<th>Access, Usage and Licensing Arrangements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadastre</td>
<td>Land parcel boundaries, polygons and/or lines with dimensioning; It contains all crown land and freetood</td>
<td>Vector, Daily</td>
<td>Whole of State</td>
<td>Lands Department, ICT Department, Lands Department</td>
</tr>
<tr>
<td>Conservation Area and Estates</td>
<td>Legislated lands and waters, e.g. national parks, nature reserves, conservation parks, etc.</td>
<td>Vector, Ad hoc,</td>
<td>Whole of State</td>
<td>Environment and Heritage Department, ICT Department, Environment and Heritage Department</td>
</tr>
<tr>
<td>Contaminated Sites</td>
<td>Confirmed contaminated sites</td>
<td>Vector, Ad hoc</td>
<td>Whole of State</td>
<td>Mines Department, ICT Department, Mines Department</td>
</tr>
</tbody>
</table>

Data Inventory Questionnaire

- Dataset Name
- Name of Custodian
- What is the data used for?
- What other organizations use/have this dataset?
- Point of Contact Name
- Point of Contact Position/Title
- Point of Contact Details (Email, Phone)
- What is the resolution of the data in g scale?
- What is the accuracy of the data?
- What is the horizontal accuracy of the data?
- What is the vertical accuracy of the data?
- Data Linkage
- Data Attribute Accuracy
- Data Logical Consistency
- How is data logical consistency managed (e.g., topology/rules)
Positioning geospatial information to address global challenges

Strategic Pathway 4: Data
Planning for the Future

SP4: Actions

Gap Analysis Matrix

<table>
<thead>
<tr>
<th>Current Situation</th>
<th>Desired Future State</th>
<th>Gaps in Capability (Challenges)</th>
<th>List of Actionable Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example: The nation has significant data holdings that are adequately maintained but there is lack of information on urban infrastructures, particularly dwellings.</td>
<td>Example: A high-quality representation of the landscape.</td>
<td>Example: A building footprints dataset that can be used to understand potential economic loss from exposure to natural hazards.</td>
<td>Example: Investigate cost effective automated image interpretation and change detection methods to capture the location of existing buildings and identify new buildings as they are constructed.</td>
</tr>
</tbody>
</table>

Road Map

Courtesy Australian Government
Strategic Pathway 4: Data
Capturing and Managing Data

Data Governance
- Custodianship
- Governance Model
- Knowledge
- Processes
- Security
- Accessibility
- Technologies
- Quality
- Geospatial Data Management Plan

Data Lifecycle

Custodianship Guidelines

Data Release Guidelines

Supply Chains
- National
  - Aggregation
  - Jurisdiction Data
  - National/Institutional Data
  - Community Data
  - Private Sector Partner Data
- Local Business
  - Local Government Inputs
  - Supplier Operations
  - Internal Business Teams
  - Supplier/Service Inputs

United Nations Secretariat
Global Geospatial Information Management

Positioning geospatial information to address global challenges

ggim.un.org
Strategic Pathway 4: Data

Improving the Positioning Infrastructure

- Instruments
- Datums
- Geodetic Services
- Physical Infrastructure
  - Survey Marks
  - CORS Networks
  - Geodetic/survey databases
  - Qualified staff

Global Geodetic Reference Frame

- Geodetic Infrastructure
- Policies, Standards and conventions
- Education, Training and Capacity Building
- Sustainable and Enhanced GGRF
- Appropriate Governance
- Outreach and Communication

Geostatistical Data Integration

- Establish a Working Group
- Develop a Strategy
- Identify Stakeholders
- Identify Available Resources
- Specify policy, standards, guidelines and norms
- Make Data Accessible
- Develop the methodology

Prepared by UN-GGIM Subcommittee on Geodesy and adopted by UN-GGIM

GSGF Adopted Framework

Expert Group on the Integration of Statistical and Geospatial Information

UN-GGIM
United Nations Secretariat
Global Geospatial Information Management

Positioning geospatial information to address global challenges

ggim.un.org
Strategic Pathway 5: Innovation

- Countries have different ‘innovation’ starting points
- Innovation is ‘context’ dependent
Strategic Pathway 5: Innovation

Bridging the geospatial digital divide

Digital Access Gap
- Poor Internet access
- Power outages
- Lack of computing infrastructure

Digital Adoption Gap
- Skills and knowledge
- Low levels of investment
- Lack of awareness

Digital Value Gap
- Insufficient ‘usable’ data
- Unable to harness emerging technologies/realise benefits
Strategic Pathway 4: Innovation

Actions and Tools

Process of innovation
- Gather information
- Understand needs
- Leap frogging to modern technology
- Incremental innovation
- Build capacity to innovate
- Innovation Framework
Strategic Pathway 5: Innovation

Actions and Tools

Direction Setting

Strategic Priorities

Data/Technology Maturity

IGIF Generational Bracket

Level 1

Analog Mapping

Level 2

Digital Cartography

Level 3

Geographic Information Systems

Level 4

Spatial Data Infrastructure

Level 5

Integrated Geospatial Information Management

IGIF Maturity Index

<table>
<thead>
<tr>
<th>IGIF Generational Bracket</th>
<th>Analogue Mapping</th>
<th>Digital Cartography</th>
<th>Geographic Information Systems</th>
<th>Spatial Data Infrastructure</th>
<th>Integrated Geospatial Information Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peggy</td>
<td>Map Production</td>
<td>Product-based</td>
<td>Process-based</td>
<td>User Centric</td>
<td>Knowledge On-demand</td>
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<tr>
<td>Operational Level</td>
<td>National, Subnational, Private Sector</td>
<td>National</td>
<td>National, Subnational, Private Sector</td>
<td>Cross-Sector Integration</td>
<td>Global Network</td>
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<tr>
<td>Data Supply Patterns</td>
<td>Siloed Production</td>
<td>Siloed Production and Delivery</td>
<td>Informal Individualised Supply Chains</td>
<td>Formalised Hierarchical Supply Chains</td>
<td>Published direct to the Web</td>
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<tr>
<td>Storage</td>
<td>Main Press</td>
<td>Computer hard drive</td>
<td>Optical disk/ Cloud Storage</td>
<td>Cloud Storage</td>
<td>Cloud/Edge Computing</td>
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<tr>
<td>Acquisition</td>
<td>Photogrammetry</td>
<td>Digitisation/ Imaging</td>
<td>Digitisation/ Image Interpretation</td>
<td>Automated Data Integration, Social Media, Crowdsourcing</td>
<td>IoT sensors, Machine-learning, Artificial Intelligence</td>
</tr>
<tr>
<td>Access</td>
<td>Central Sites</td>
<td>FTP Sites</td>
<td>Web Portal</td>
<td>Centralised</td>
<td>Cloud/Portal</td>
</tr>
<tr>
<td>Data Formats</td>
<td>Paper Maps</td>
<td>CAD (2D)</td>
<td>GIS (3D)</td>
<td>GIS (Discontinuous, 2D, 3D)</td>
<td>Linked Data (Seamless 2D, 3D, 4D)</td>
</tr>
<tr>
<td>Users Services</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>Data catalogue/ security</td>
<td>Brokering Services</td>
</tr>
<tr>
<td>Knowledge Representation</td>
<td>Map Legend and Production Notes</td>
<td>Analogue Metadata</td>
<td>Digital Metadata</td>
<td>Digital Metadata and Provenance</td>
<td>Metadata, Provenance, Domain and Process Ontologies</td>
</tr>
<tr>
<td>User Domain</td>
<td>Government</td>
<td>Government, Private Sector, Academia</td>
<td>Government, Private Sector, Academia, Community Groups and Individuals</td>
<td>Government, Private Sector, Academia, Community Groups and Individuals</td>
<td>Everyone</td>
</tr>
<tr>
<td>Analytics</td>
<td>NIL</td>
<td>Predominantly Analogue Analysis</td>
<td>Digital Analysis, Manually Executed Algorithms</td>
<td>Automated Algorithm</td>
<td>Real-time query responses</td>
</tr>
<tr>
<td>Reference Frame</td>
<td>Map Projection</td>
<td>Various Map Projections/ Datums</td>
<td>National Geodetic Datums</td>
<td>Global Reference Frame Static</td>
<td>Global Reference Frame (Dynamic)</td>
</tr>
</tbody>
</table>
Strategic Pathway 5: Innovation

Actions and Tools

Identification of Needs → Data / Technology / Skills

Capability Framework

Desired Situation → Gaps in Capability → Enablers → Priorities

Supporting Tools

ICT and Software Inventory

Needs Assessment and Gap Analysis Template
Strategic Pathway 5: Innovation

Actions and Tools
The innovation system is the flow of technology and information among people, businesses and institutions. It establishes an innovation culture through developing capacity to innovate.

![Australian Innovation System](image)
Strategic Pathway 5: Innovation

Actions and Tools

The innovation system is the flow of technology and information among people, businesses and institutions. It establishes an innovation culture through developing capacity to innovate.

**Innovation System**

- Trade and market forces
- Addressing national challenges
- Public procurement
- Tax, regulation and standards

**Decision-making**

- Innovation Programs
- Data Analytics
- Products and Services

*Australian Innovation System*
Strategic Pathway 5: Innovation

Actions and Tools

Innovation does not occur with one big action, but rather through a series of many coordinated forward-looking steps.

Technologies and Methods
- Primary Data Acquisition
- Community Mapping
- Data Harvesting
- Secondary Data Capture
- Data Storage
- Data Access
- Data Sharing
- Data Integration

Digital Transformation Strategy
- Interoperability
- Communication Strategies
- Policy and Regulatory Needs
- Economies of Scale
- Capacity Needs
- Procurement Efficiency
- Monitoring and Evaluation
Strategic Pathway 6: Standards

Introduction

- Key enabler for:
  - Data integration
  - System interoperability
  - Innovation
- Standards Development Organisations
  - ISO/TC 211 Geographic information/Geomatics
  - Open Geospatial Consortium
  - International Hydrographic Organization
- Strategic Pathway 4 complemented by:
  - A Guide to the Role of Standards in Geospatial Information Management
  - Companion Document on Standards, recommendation by Tier

The Standards Guide

The Companion Document
Strategic Pathway 6: Standards

Barriers

Survey by ISO, OGC and IHO
Strategic Pathway 6: Standards

Actions and Tools

Standards Framework
- Governance
- Raising awareness and setting strategic goals
- Gathering evidence
  - Needs
  - Identify gaps
- Action Plan
- Management
  - Review Program
  - Capacity Building
  - Compliance
Technology Pillar
Data - Innovation - Standards

Outcomes
• Increased range and scope of integrated data
• Data and technology interoperability
• Information discoverable and reusable
• Enabling Innovation
• Productivity improvements
• Robust data governance

Benefits
• Decision-making for national development imperatives
• New products and services
• Economic growth and improved quality of life for citizens
• Monitor and measuring progress towards SDGs

Thank you