UNGIWG United Nations Geospatial Information Working Group

STRATEGY

for developing and implementing

a

United Nations Spatial Data Infrastructure

in support of

Humanitarian Response
Economic Development
Environmental Protection
Peace and Safety

February 2007

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1 Introduction

High-quality information in a complex world.

Today's world moves at a frenetic pace, paradoxically rendering change a constant. It is also a globalized world, in which the United Nations must meet challenges and growing demands from its member states. Its Secretariat, specialized agencies, funds and programmes in partnership with non-governmental actors, must deliver more services in more places than ever before to those people most in need.

Geospatial information is central to raising efficiency.

From peace-keeping to pandemics, from environment to economic development, the ready availability and cost-effective management of dependable *geospatial information*[1] is central to raising the operational efficiency of the United Nations, in terms of short-term emergency response capacities, long-term risk reduction, development and environmental protection activities - the three pillars of sustainability.

A considerable duplication of effort and lack of coherence.

The production and use of *geospatial information* within the United Nations has been accomplished historically by its component organizations in accordance with their individual needs and expertise. This has resulted in multiple efforts, reduced opportunities for sharing and reuse of data, and an unnecessary cost burden for the United Nations as a whole.

2 A new United Nations for a new millennium

Call for a major overhaul of UN management structures and practices.

While the United Nations believes the principles of its Charter are as relevant today as they were in 1946, it is also aware that the manner in which it delivers on these aims and objectives has to "move with the times". In line with these sentiments, former UN Secretary-General Kofi Annan recently called for a major overhaul of UN management structures and practices. He warned that "years of skimping on investment in staff and operating systems" and "outmoded management policies" had taken their toll, leaving the UN "barely able to conduct its work effectively and efficiently."

Assessment and recommendations for responding to current UN needs.

Following a request from the 2005 World Summit, the Secretary General reported on the conditions and measures necessary for him to carry out his managerial responsibilities more effectively. And, among others, this included an assessment and recommendations to help ensure that the United Nations can respond to current needs and enable the efficient and effective conduct of its work into the future (see Annex III).

[1] The terms in *Italics* are defined in the glossary in Annex I.

3 What is the UNSDI and why is it needed?

3.1 Background

The need to establish greater system coherence for the applications and exchange of geospatial data for UN activities was first highlighted in the UN Geographic Information Strategic Plan (UNGISP) prepared in 2001-2002. The possible future need to develop a spatial data infrastructure to assist in this regard was also raised.

Spatial Data Infrastructure[2], a concept that dates back to the early 1990s, was first introduced by countries to support geographic information exchange, standards adoption and asset sharing across national information networks. The principal objective being to strengthen decision-making for sustainable economic development (see Box 1).

Spatial Data Infrastructure: back to the 1990s.

> ***"… to promote economic development, improve our stewardship of natural resources, and to protect the environment."***
>
> ***(US President Clinton, 1994)***

Box 1: The drivers of Spatial Data Infrastructure (SDI) development

Spatial Information Integration

-Natural resources data

-Environmental data

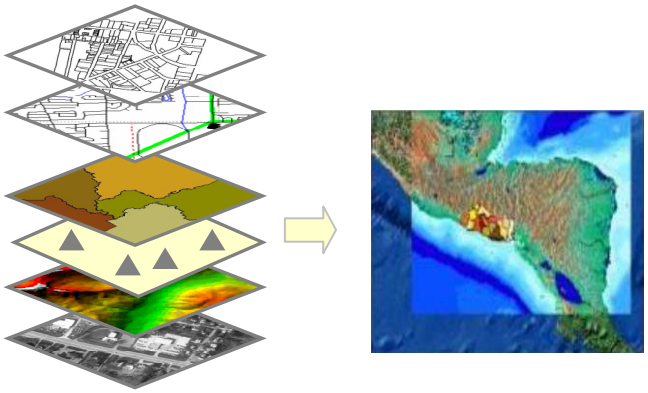
-Economic data

-Natural Hazards data

-Affected population data

-Elevation data

-Satellite imagery



Box2: Geospatial information technologies facilitate the integration of scientific, social and economic data through space and time.

[2] The term infrastructure usefully encapsulates the sense of a reliable foundation for exchange of geospatial information to support national development, somewhat analogous to a conventional 'infrastructure' of rail, road, communications and port links that move goods to support economic activity

Early national initiatives confirmed that the discovery, ready access to, evaluation and dependable utilization of *geospatial information* was greatly facilitated by an underlying infrastructure of policies, technologies, data, common *standards*, practices, protocols and specifications that collectively make up a 'Spatial Data Infrastructure' or SDI.

SDIs: a way to facilitate spatial information sharing.

SDIs are all about re-use; re-use of data, re-use of technical capabilities, re-use of skills developed, and re-use of invested intellectual effort and capital. Re-use minimizes the initial system-wide investment needed from co-operators to benefit fully from spatial data and information, 'sharing not wearing' the costs and helping to realize more rapid returns on investment. Implementing a SDI also means learning from the experience of others' and avoiding pitfalls.

SDIs are all about re-use, sharing not wearing the costs

3.2 UNSDI: an UNGIWG initiative

Formed in 2000, UNGIWG (United Nations Geospatial Information Working Group) comprises a network of UN professionals and others, working in the fields of cartography and *geospatial information* management science to address common geospatial issues - maps, boundaries, data exchange, standards, naming conventions, and location. It also works directly with non-governmental organizations, research institutions and industry to develop and maintain common geographic databases and geospatial technologies to enhance guidance and operational capabilities. UNGIWG has reported periodically to the UN Chief Executive Board (CEB).

UNGIWG:
A network of professionals working in the field of geospatial information management science.

Since its inception, UNGIWG has been laying the foundations for a UNSDI (United Nations Spatial Data Infrastructure). The accomplishments of its Task Groups in particular indicated that refinement and refocusing of current activities and UNGIWG organization could deliver the components for such a system.

The foundations for a UNSDI.

During the 7th UNGIWG Plenary meeting held in Santiago in November 2006, it has been recognized that the development of a common vision and understanding on UNSDI was a priority. In order to build on common interests, the UNGIWG Secretariat consulted the UN agencies on the activities carried out within the agency that could benefit from the UNSDI (see Annex IV).

UNGIWG members consultation:
A participatory approach

Four primary UN business cases drive the need for a UNSDI:

1. Provision of spatial data and information
2. Development of common data services
3. Capacity building
4. Promotion of partnerships and cooperation

In October 2005, UNGIWG proposed to develop a Spatial Data Infrastructure in the UN context to promote and achieve sustainable development, and improve humanitarian and peacekeeping operations.

> "A SDI makes sense at the local, national, regional and global level where the overlap and duplication in the production of geographic information is paralleled by insufficient flows of geographic information among different stakeholders due to a lack of standardisation and harmonisation of spatial data bases".

Box 3: When does a SDI make sense? The SDI Cookbook, GSDI, 2004

A UNSDI, like any other successful SDI initiatives, must revolve around the principle of sharing. Sharing of data, technical capabilities, and skills developed, and invested intellectual effort and capital if it is to deliver the full benefits of geospatial data and information to stakeholders around the globe.

UNSDI is very much about data re-use and sharing.

3.3 UNSDI vision and mission

The UNSDI Vision is for a comprehensive, decentralized geospatial information framework that facilitates decision-making at various levels by enabling access, retrieval and dissemination of geospatial data and information in a rapid and secure way,

UNSDI for enabling access, retrieval and dissemination of geospatial information in a rapid and secure way.

Achieving this vision in the milieu of UN reform, delivering on the MDGs (Millennium Development Goals) and attending to the remits of evolving global governance requires a mechanism to establish system coherence for the applications and exchange of geospatial data for UN activities.

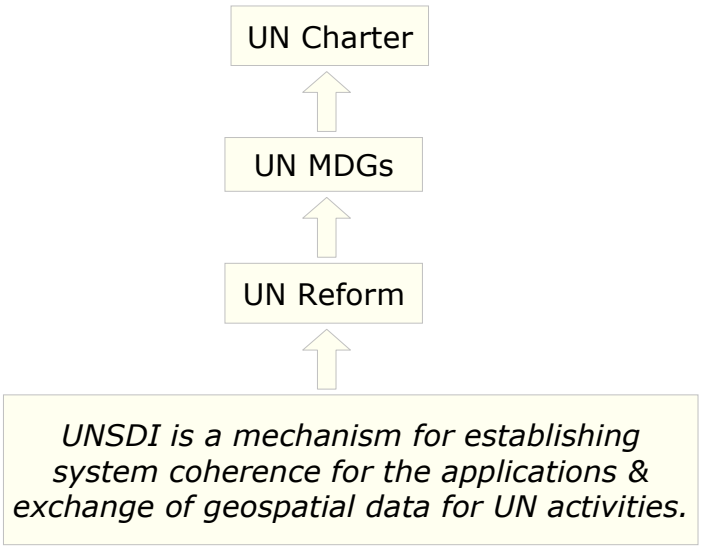


Fig 1: Strategic context for a UNSDI

The UNSDI is such a mechanism. It enables interoperability between spatial data infrastructures developed for specific purposes that operate within UN agencies, among groups of UN agencies sharing common interests, and between the UN, Member States and their regional and thematic groupings, and partners.

UNSDI is a mechanism to establish system coherence for the applications and exchange of geospatial data for UN activities.

To achieve this the UNSDI provides a base collection of technologies, datasets, human resources, policies, institutional arrangements, and partnerships that facilitate the availability, exchange of, access to and use of geographically-related information using standard practices, protocols, and specifications.

Key components of the UNSDI: institutional and technical foundations.

Where SDI's do not yet exist - within or beyond the bounds of the UN - it is in the UN's interest to foster their development as a means of encouraging improved ease of access and re-use of spatial data to support the MDGs, the UN reform agenda and the tenets of the UN Charter.

3.4 Stakeholders

The unique functions of the United Nations mean that UNSDI stakeholders span a spectrum of users and producers of geospatial information, including those dealing with global scale datasets all the way down to users and producers of local and village level spatial data.

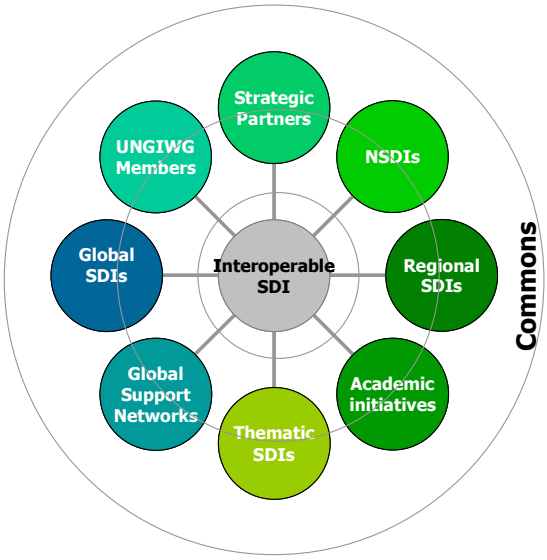


Fig 2: UNSDI stakeholders' linkages

High priority beneficiaries of the UNSDI are UN Member States and their citizens, emphasizing the need to forge interoperable links between national SDI initiatives and the UNSDI from the outset. As well, links between the UNSDI and regional organizations, business, academia, the not-for-profit sector and foundations will form an integral part of the future UNSDI.

A wide range of stakeholders and strategic partnerships.

Strategic partnerships with regional programmes such as INSPIRE - The **IN**frastructure for **SP**atial **I**nfo**R**mation in **E**urope initiative- of the European Commission, the **H**eterogeneous **M**issions **A**ccessibility (HMA) and GEOportal capacities of the European Space Agency (ESA) and with standardisation bodies as the Open Geospatial Consortium (OGC) and the International Organization for Standardization (ISO) (see Annex II) will be actively developed therefore, for the mutual benefit of all parties.

3.5 Expected benefits and beneficiaries

At its core, the UNSDI will contribute substantively to the mission of the United Nations by engaging member states, regional organizations and partners in building consensus, policy and governance mechanisms to ensure that geospatial data and information sharing practices are used widely in social, economic and environmental development.

A substantive contribution to the mission of the United Nations.

Access, retrieval, and dissemination of geospatial data and services will be enabled in an easy and secure way by the UNSDI, avoiding duplication in data collection and management within the United Nations, and with and between its member states and partners.

Avoiding duplication in data collection.

By facilitating efficient global and local access, exchange and utilization of geospatial information to both developed and developing countries, the UNSDI will enhance decision-making on a global basis and at all levels of societies and thus contribute substantively to the achievement of the Millennium Development Goals (MDGs).

Decision-making for social, economic and environmental development enhanced globally and at all levels of societies benefiting MDGs.

The UNSDI will also provide opportunities to increase UN efficiencies and effectiveness in the context of the recent UN reform agenda and by facilitating the demands of increasing global governance.

GeoNetwork

Scope

GeoNetwork *opensource* is an FAO-sponsored software tool that facilitates single point of entry access to geo-referenced databases, cartographic products and related *metadata* located at globally distributed information sources.

Users

GeoNetwork includes so far the cooperative efforts of FAO, WFP, WHO, UNEP and UN-OCHA to develop a more universally applicable ISO and OGC-standards-based (See Annex II) information management tool for United Nations users, member states and UN partners.

Outcomes

- enhances geospatial data access and sharing within and between distributed organizations,
- avoids unnecessary duplication of data assets and results in overall information management efficiencies and cost savings for users,
- increases cooperation and coordination of data collection and description while preserving data and information ownership,
- provides a wide community of spatial information users with easier and timelier access to available digital data including thematic maps,
- spatial visualization using derived cartographic outputs of this kind assists communications between technicians and decision-makers, and provides a basis for more informed decisions in many situations.

Not surprisingly, such outputs increasingly play a key role in the work of the United Nations and its partners.

Box 4: GeoNetwork: a standards-based Spatial Data and Information Management System for the Web

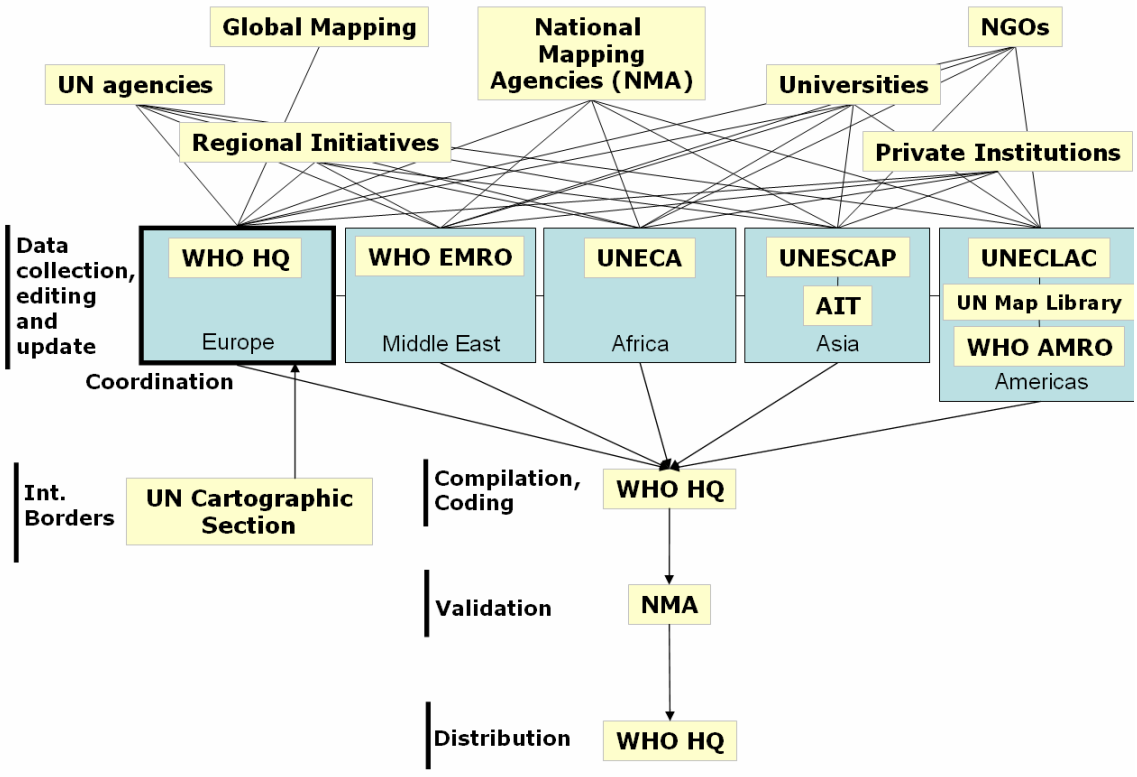
SALB: Second Administrative Level Boundaries

Scope

SALB is a UN project, coordinated by WHO, which has been launched in the context of the activities of the United Nations Geographic Information Working Group (UNGIWG). The objective of the project is to improve the availability of information about administrative boundaries down to the second sub-national level.

The SALB data set consists of National Mapping Agencies (NMA) contact information, coded historic changes and digital maps that can be downloaded at no cost on a country by country basis.

The SALB project is a good illustration of the potentiality that exists when the UN and non-UN community do collaborate together and share their data and technical skills.



Box 5: The SALB network: Institutions/projects/committee/networks participating in the SALB project at each of its steps (represented by the lines in bold).

4 Next steps

4.1 Implementation strategy

Applications dependent upon geospatial data and related technologies are rapidly assuming mission critical status in today's United Nations. The ever increasing convergence of geospatial and web technologies in particular has opened up exciting new prospects for the Organization to revolutionize its global business integration while at the same time strengthening its decision support, planning and operational capacities. By more effectively integrating, managing and utilizing these technologies to serve its geographic information needs, the UN enterprise stands to reap substantial political, social and economic returns on investment in these sectors.

To ensure a successful and sustainable UNSDI, the implementation strategy builds upon existing UNGIWG geospatial data development efforts, provides for highly visible results in the near-term, and sets an appropriate framework for medium and long-term UNSDI development and maintenance.

Additionally, the UNSDI needs to build upon the original UN Geographic Information Strategic Plan prepared in 2001-2002, taking account of subsequent user requirements and the experiences of organizations both within the U.N system and those of its partners. In particular, the UNSDI needs to take account of developments pioneered by organizations such as the GSDI (**G**lobal **S**patial **D**ata **I**nfrastructure association), the **O**pen **G**eospatial **C**onsortium (OGC), the GIST (**G**eographic **I**nformation **S**upport **T**eam) and partners in academia and industry, as well as those in national governments, and regional organizations that complement the advances made by the UN Secretariat, and its programmes, agencies, and funds.

National Coordination Offices (NCO) role in the UNSDI Development Process

Netherlands, Czech Republic, Hungary (Spain under development)

Scope

The United Nations Spatial Data Infrastructure (UNSDI) aims to improve accessibility and exchange of geospatial data and information between UN bodies and between the different UN bodies and their Member States.

The role of NCO's in UNSDI as outlined below can help to facilitate the "Delivering as One" recommendations of the Secretary-General's High-level Panel on UN System-wide Coherence by linking directly with the "One UN" Country Programme under the Resident Coordinator.

NCO's role in UNSDI:

- provide the National UNSDI portal/node,
- fulfilling national government's policies with respect to issues relying on the use of geo-information,
- coordination and execution of geo-information disclosure activities for large enterprises, companies or multi-nationals in order to fulfil their Corporate Governance goals,
- capacity building at national and regional level.

Box 6: UNSDI Coordination offices in Netherlands, Czech Republic and Hungary

This participatory process will be essential to delivering an effective UNSDI, building upon consensus, good governance, and best enterprise management and information sharing practices that maximize the benefits of geospatial information worldwide in terms of social, economic and environmental development (see Box 6).

4.2 Implementation stages and outcomes.

The indicative five-year plan for the UNSDI that follows is envisaged to take place in four overlapping stages:

- Stage 1: Building UNSDI foundations - short-term (0-12 months),
- Stage 2: Building the Infrastructure - medium-term (12-24 months)
- Stage 3: Institutionalizing the Infrastructure - long-term (>24 months).
- Stage 4: Continuous Improvement of UNSDI Processes beyond the completion of Stage 3 – i.e. the UNSDI is assumed to have reached full functionality for the presently available levels of technology and resources (see Figure 3 below).

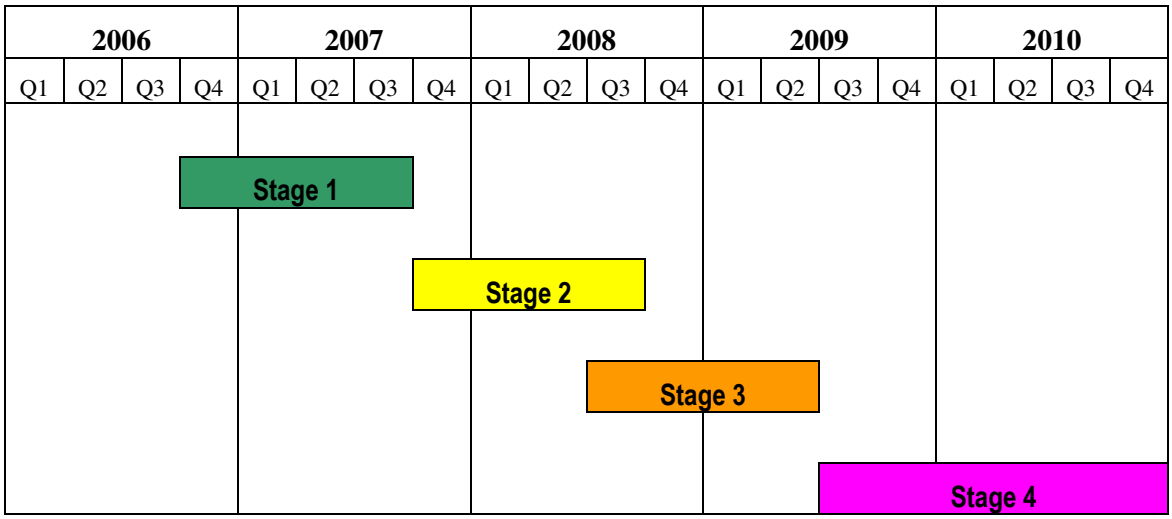


Figure 3: Major implementation stages of first, indicative five-year implementation plan

Each of these implementation stages has outcomes defined by the strategic 'Goals' and the 'Specific Actions' or tasks outlined to achieve them (see chapter 4.3 and Annex V). Related tasks need to be implemented in a coordinated, integrated manner within each Stage and according to the programme components that address UNSDI issues, linkages and partnerships, and sustainable funding.

At the completion of the first five-year planning period a thorough programme evaluation needs to be undertaken in addition to the annual performance evaluations embedded in the plan itself. A new five-year plan will then need to be developed since establishing a truly effective UNSDI may take over 15 years.

Because the UNSDI will by and large follow an evolutionary path, influenced by the availability of resources (people, technology and infrastructure), deadlines set for completion of some tasks will remain tentative until resources are secured along the way for their development. With focused leadership however, much can already be

achieved in the early stages of UNSDI development by building upon the achievements of UNGIWG and its Task Groups, enhancing system-wide cooperation and organization, and the more effective utilization of existing assets. Only nominal incremental expenditures are therefore anticipated early in the UNSDI implementation process, while the benefits should be nonetheless visible and substantive.

4.2.1 Stage 1: Building UNSDI foundations.

Main actions: Stage 1 of the UNSDI implementation addresses the establishment of an effective organizational architecture and refinement of underlying policy and standards frameworks. Building system-wide consensus for the adoption and refinement of best practices will be essential for developing and formalizing agreed policies and standards.

4.2.2 Stage 2: Building the Infrastructure.

Main actions:

- The second stage of the UNSDI implementation focuses on further development of core data layers. Standardized *Metadata* population and the development of *catalogue services* will remain priorities throughout Stage 2 of UNSDI implementation, aided by the adoption of relevant policies, standards and tools by both internal and external partners. Numerous of these 'projects' can be expected to continue well into Stage 3 of the UNSDI planning period as well.

- The design, development, and testing of site interoperability, data access and maintenance procedures will be important at this stage of infrastructure development. Nominated data *custodians* for example, should already be maintaining and updating data and publishing metadata associated with the data archives for which they have accepted responsibility.

- Remedial action needs to be initiated during Stage 2 if any concerns are highlighted during the testing of the infrastructure.

Expected outcomes:

- It is anticipated during Stage 2 that resource mobilization efforts and capacity building negotiations initiated in Stage 1 will have begun to yield serious possibilities for extending the infrastructure to more developing nations and increasing the suite of services available to stakeholders.

- Partnerships are also anticipated to yield consolidated improvement in service delivery during this stage of UNSDI development, as standards adopted by the UNSDI increase interoperability and data agreements that enhance accessibility are negotiated incrementally over time.

4.2.3 Stage 3: Institutionalizing the Infrastructure

Main actions:

- UNSDI portals therefore need to be adequately equipped, staffed, and maintained to assume operational responsibilities.

- Data custodians also need to be in a position to provide operational levels of data maintenance early in Stage 3 of implementation to ensure currency of archives.

Expected outcomes:

- Stage 3 will see the institutionalizing of the information infrastructure and the dawning of operational geospatial data services across the distributed matrix of data resources that comprise the UNSDI.

- By the time Stage 3 implementation begins, UNGIWG agencies and partners will have significantly increased the number and capability of geospatial data portals and other data resources linked within the UNSDI.

- Improved access to data and distributed processing resources that leverage value from new data sharing agreements should result, but this will 'come at price'.

- As the number of documented and interoperable geospatial data layers increases and access to the information infrastructure becomes more widespread, the visibility of UNSDI service levels and their responsiveness or otherwise to the user community's needs will increase.

4.2.4 Stage 4: Continuous Improvement of UNSDI Processes

The final implementation stage involves UNSDI configuration management whereby the information architecture and technical infrastructure built up over the previous Stages is extended and refined over time, as demand for stakeholder services and finances dictate.

4.3 Issues, goals and proposed actions

The outcome of recent UNGIWG consultations has enabled reassessment of issues that impact upon the development of a future UNSDI. When coupled with the original findings and recommendations of the "Geographic Information Strategic Plan" of 2001- 2002, opportunities to reaffirm and/or set new goals for the UNSDI and to prioritize the specific objectives and recommended actions needed to address these issues have emerged. The results are presented and categorized below for further consideration.

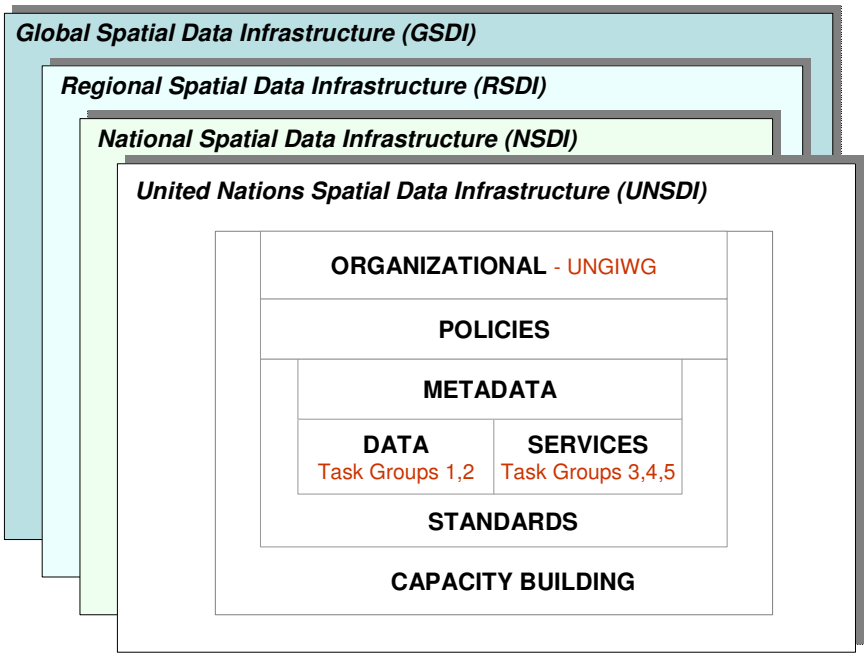


Figure 4: Proposed UNSDI framework

4.3.1 Policy and organization

Issue: The paucity of clear policies and organization framework on geospatial information management reduces the use and effectiveness of geospatial data and information both within and outside UN system.

Goal 1: to create a coordinated, consensus-based, and inclusive UNSDI based on strategic/business principles that provides a high level coordination framework for UNGIWG, building upon what has already been achieved. Implicit in the UNSDI development is the need for a decentralized matrix approach, connected through agreed upon, open data exchange standards and interoperability with NSDIs and major regional SDIs.

Proposed actions:

g1T1[3]. Establish a sustainable governance mechanism. This mechanism should take the form of a UNSDI Implementation Committee.

g1T2. Define, approve and adopt key policies that specify the "rules of engagement" for stakeholders formalized in a Letter of Agreement.

g1T3. Form small multi-agency Special Interest Groups to define a strategic/business purpose for the UNSDI.

g1T4. Classify and document all geospatial initiatives in UN agencies to facilitate future interoperability of legacy data, systems and applications.

[3] g1T1: to be read goal 1, Task 1

g1T5. Develop a UNSDI Communication Plan to enable clear communications with, and obtain feedback from, all UNSDI stakeholders.

g1T6. Encourage bodies carrying out actions under the UNSDI activities to "brand" the products or services derived from these actions to acknowledge them as part of UNSDI implementation.

g1T7. Maintain or formalize relevant membership and active participation in bodies such as the GSDI, OGC, ISO, and work closely with major SDI-related activities of INSPIRE, GMES, GEOSS and NATO.

g1T8. A key activity for UNSDI implementation will be the convening of Workshops for member states and regional organizations to solicit feedback and engender and maintain a sense of ownership of the UNSDI process among participants.

4.3.2 People and resources

Issue: The variable maturity of geospatial data management and usage between UN agencies, coupled with the reality of today's limited resources for expanding these activities, pinpoints a gap in the internal availability of systems and trained personnel to maximize the use of geospatial data and information across the breadth of the UN.

Goal 2: to ensure sufficient access for UN organizations to the systems and trained personnel required to take full advantage of available geospatial technologies, data and information in meeting their organizational responsibilities and to maximize their potential contributions to UN reform, the Millennium Development Goals and UN Charter.

Proposed actions:

g2T1. Seek the voluntary participation of its members to self-assess their current, in development and planned organizational, technical, and policy-related capabilities for sharing and integrating geospatial information.

g2T2. Investigate opportunities for limited-term, in-service training for technical staff of the agencies identified as not yet being in a position to take full advantage of geospatial technologies in more advanced geospatial management environments operated by other member organizations.

g2T3. Document and circulate a compendium of 'geospatial success stories' suitable for the consumption of senior managers and budget planners not yet convinced of the advantages of introducing or strengthening their agencies' geospatial capacities.

Goal 3: to identify and address external capacity building needs of member countries to accelerate the development of open and interoperable NSDIs in countries presently disadvantaged in this regard.

Proposed actions:

g3T1. Seek the assistance of UN training resources, regional bodies and UNGIWG members and partners to realize this goal.

g3T2. Capacity building activities should to be aligned with those of partners and member states as all ultimately need to form part of the same UNSDI framework.

Goal 4: to ensure adequate funding and partnership agreements are in place that support the sustainable staffing and systems required by agencies and UNGIWG to deliver programs underpinned by, or underpinning, geospatial data generation, documentation, access, and analysis.

Proposed actions:

g4T1. to increase awareness of the benefits to be derived from establishing and sustaining an adequate spatial data infrastructure for the United Nations by maintaining elevated levels of advocacy in its communications with high level decision-making and advisory bodies.

g4T2. Investigate opportunities for securing, at least in part, core funds to help build and sustain the UNSDI from the substantial budget pool set aside for ICT in the United Nations.

g4T3. Link development of open and interoperable NSDI capabilities of member states in need by aligning the capacity building objectives of the UNSDI with those of the international donor community.

g4T4. Stimulate reliable partners in industry, academia and elsewhere to jointly fund and participate in critical aspects of the UNSDI by 'franchising the logo'.

g4T5. Investigate opportunities for shared funding between UNGIWG members and partners, and innovative funding opportunities with the private sector.

g4T6. Broker public-private partnerships (PPPs) with 'one face' of UNGIWG.

4.3.3 Geospatial data and information sharing

Issue: Ease of data discovery, evaluation, access and dissemination are critical to the future success of a UNSDI.

Goal 5: to ensure that current, *quality assured geospatial data* and information can be easily discovered, and are immediately and openly available via the Internet from within a distributed matrix of interoperable data resources resident in UN bodies, regional organizations, national governments, academia, industry, the NGO network and the community at large.

Proposed actions:

g5T1. Formalize data sharing agreements with internal and external partners, using standard geospatial terminology and incorporating the best practices trialled with success by advanced national and regional SDI operators.

g5T2. Identify data custodians associated with developing and maintaining essential geospatial datasets, especially framework datasets and specify the authority, responsibilities and mandate of the nominated ones.

g5T3. Formalize new agreements with data custodians as and when necessary, to guarantee data are current and quality assured.

g5T4. Encourage adoption of international standards to facilitate the sharing and use of geospatial data and information within the UNSDI.

g5T5. Promote adoption of an open standards-based approach in the design of new web services systems by UNGIWG members.

g5T6. Continue to identify, acquire and refine core datasets and other framework data for the use of all UNSDI participants.

g5T7. Negotiate with member states, regional organizations, partners and other relevant organizations to establish open access to additional, widely applicable framework datasets.

g5T8. Develop and promote policies and coordination processes for the common and consistent collection of metadata based on the use of interoperable, international metadata standards.

g5T9. Designate responsibility for the creation and maintenance of geospatial metadata at an agency level across the UN system.

g5T10. Work toward a UN spatial data catalogue and interconnectivity with other data catalogues, portals, clearinghouses or repositories of accessible, quality geospatial data by deploying UN-sponsored tools such as GeoNetwork opensource and other relevant applications.

g5T11. Investigate and ultimately implement on a system-wide basis, geospatial data visualization tools such as those being trialled by UN-OCHA in collaboration with external partners.

g5T12. Establish a small, multi-agency Special Interest Group to identify priority legacy datasets of importance to the wider audience of UNSDI participants so that they can be 'unlocked', documented and rendered accessible with manageable and affordable levels of technical intervention.

g5T13. Encourage geo-coding of statistical data by UN agencies, member states and partners during primary data collection.

g5T14. Give consideration to long-term preservation of critical geospatial data archives.

4.3.4 Technology

Issue: Implementation of a system-wide UN architecture for distributed data access and geoprocessing will require hitherto unattained levels of cooperation and resources from among UNGIWG members. But with the rapid evolution of computer technology and access to suitable communications bandwidth growing similarly, global Web-based access to, dissemination of, and applications using geospatial data is fast becoming a reality across suitable technology infrastructures.

Goal 6: to build a UN Spatial Data Infrastructure framework around a shared enterprise architecture and technology infrastructure that is vendor-neutral, modular, and uses OpenGIS standards and Web Services. The framework should provide interoperable, open and cost-effective data and information services to users inside and outside the UN, with users linked via the Internet using conventional communications channels.

Proposed actions:

g6T1. Understand the breadth of geo-processing systems and technology available to its members and partners through surveys and consultation as a prerequisite to designing the information architecture and infrastructure for the UNSDI.

g6T2. Convene a small, multi-agency Special Interest Group selected from its relevant Task Group participants and partners to scope-out the architecture and technology requirements for the UNSDI in detail, working with technology providers as required.

g6T3. Encourage adoption and use of the Special Interest Group recommendations by UNGIWG members when upgrading or developing their internal geospatial data management systems.

g6T4. Continue to support and develop successful and promising UNSDI-related technology initiatives such as GeoNetwork opensource and Maps-on-Demand.

4.3.5 Linkages and partnerships

4.3.5.1 Increasing dialogue and shared understanding

Issue: The need for increased dialogue and shared understanding of the UNSDI is not only restricted to least developed nations. UNGIWG members and their partners in industry, academia and elsewhere can also benefit by raising the bar in this regard, as there remains a considerable disparity in the capabilities of members system-wide to generate, share and utilize geospatial data and information effectively.

Goal 7: to ensure that adequate communication, advocacy, and outreach regarding the UNSDI are extended to all UNGIWG members, member states, regional organizations, partners and the wider community of geospatial data custodians, suitably raising their awareness concerning the UNSDI and encouraging their full participation.

Proposed actions:

g7T1. Increase awareness among national and regional organizations concerning the needs, possible design and benefits of the UNSDI.

g7T2. Stimulate the sharing of expertise and experience of and between member states regarding NSDIs and their possible integration with the UNSDI.

g7T3. Continue to engage in a dialogue with those implementing national and regional SDIs.

g7T4. Utilize the support of UNGIWG members with offices 'resident' in developing regions and countries to extend communications and information exchange.

4.3.5.2 Capacity building

Issue: The least developed countries have much to gain from the establishment of spatial data infrastructures that foster sustainable development and address prevailing socioeconomic challenges. The United Nations' ability to leverage capacity building in association with its partners in the donor community is of particular importance in this regard, as it has the potential to accelerate development of interoperable NSDIs in countries where the need is most evident.

Goal 8: to significantly raise capacities of least developed countries to implement and sustain open and interoperable NSDIs that are compatible with the overall design and development of the UNSDI.

Proposed actions:

g8T1. Strengthen SDI capacities in developing nations and regional organizations and work to leverage donor support for strengthening national and regional SDI capacities and encouraging their integration with the UNSDI.

g8T2. Incorporate responsible business plans and risk management strategies into all NSDI capacity building projects to assist rigorous monitoring and evaluation during project implementation.

g8T3. Encourage donor funding of NSDI capacity building projects contingent upon data sharing agreements (see Goal 5).

g8T4. Offer or generate in league with donors and partners, training possibilities for member states in need and that are designed to accelerate consolidation of national and UN data infrastructures.

Goal 9: to ensure currency of UNSDI information infrastructure and the policies, organization, technology and resources that underlies it in the light of ongoing international advances and refinement of SDIs.

Proposed action:

g9T1. Engage continuously with international partners working in SDI-related fields such as the OGC, ISO and other strategic partners.

Goal 10: to sustain and deepen involvement of those contributing and critical to the UNSDI such as identified strategic partnership organizations.

Proposed action:

g10T1. Maintain and strengthen existing strategic partnerships such as those with the GISD, GIST, OGC, ISO and others to capitalize on the available goodwill and knowledge concerning development of the UNSDI.

g10T2. Foster and support global, regional and country level partnerships that potentially impact upon the UNSDI including linkages between and among civil society, private sector, philanthropy, media, and academia.

g10T3. Support UN agencies, regional organizations, and governments in developing partnerships with non-state entities.

g10T4. Move beyond the organizations already involved in the UNSDI and reach out to optimally engage the broadest range of potential sectors/actors as is practicable.

g10T5. Engage the broadest range of potential sectors/actors as is practicable.

4.3.6 Monitoring and evaluation

Issue: Monitoring and evaluation will be essential for maintaining stakeholder and investor/donor confidence in the UNSDI development and operations. UN agencies have inbuilt systems or services that deal with maintaining efficiencies, program evaluation and audit. Both UN agencies and external partners need to maintain a strong sense that UNSDI is going to be accountable and that its performance needs to be assessed on a regular basis. An IT enterprise architecture maturity model can be used as a self-assessment tool, as well as an IT investment maturity model. Existing tools and methodologies can and should be adapted to UNSDI to enable the necessary monitoring and reporting processes to be put in place from the outset of implementation.

Goal 11: to establish credible levels of UNSDI accountability, through regular monitoring of enterprise performance and the reporting of outcomes to the UNSDI constituency.

Proposed actions:

g11T1. Utilize UN programme evaluation and audit systems to regularly monitor UNSDI performance.

g11T2. Adapt industry tools and methodologies for performance monitoring and reporting

4.4 Risks and obstacles

Both tangible and the intangible factors drive the successful implementation and operation of a SDI. The technology encompassing the tangible components of a SDI is just part of the challenge. For example, field data are often collected during specific missions but are lost to potential future users. The result is inefficient use of resources and potential duplication.

Experience with operational SDIs indicates that intangible factors such as people, procedures and work cultures carry 80% of the responsibility for SDI success. In contrast, the technological factors, including the hardware and software, carry only 20% of the total influence over operational effectiveness.

These factors are illustrated by the "SDI Iceberg" (Figure 5). The implication is clear; institutions must work together for a common vision if an effective spatial data infrastructure is to be realized. This is an important reality to keep in mind given the size, diversity and complexity of the UN distributed global structure, its mandates, and its multi-cultural origins and management systems.

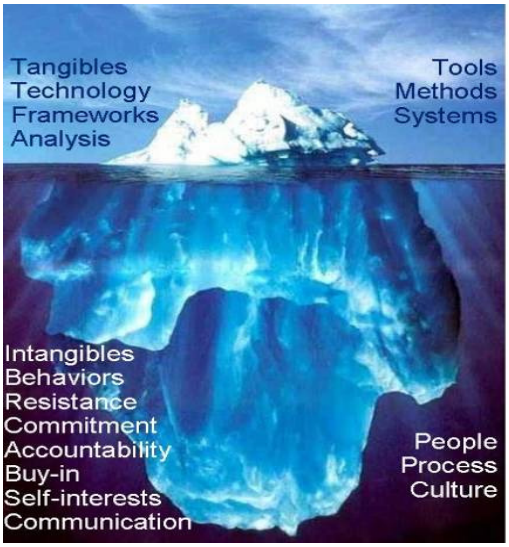


Figure 5: The influence of people and procedures relative to technology in successful SDI's. (Source: Knodel, 2004. Journal of Change Management 4(1): 53).

ANNEXES

I. Glossary
II. Partner descriptions
III. UNSDI and the UN reform
IV. UNGIWG members' consultation on UNSDI
V. Planned activities
VI. Acronyms

Annex I. Glossary

Catalogue services	Services designed to help users of application software to find information that exists anywhere in a distributed computing environment. Also called Clearinghouse.
Custodian	Individual or group with a specific guardianship responsibility for a dataset.
Geospatial information	Information that is referenced to the earth's surface, whether by coordinates or by identifiers such as addresses.
Metadata	Summary information or a description of the characteristics of a set of data. Often referred to as "data about data", metadata is the information and documentation which makes data understandable and sharable for users over time (ISO 11179 Annex B).
Opensource software	Software that is shipped with its source code, and that is subject to the nine policies of the Open Source Organization.
Quality assured data	Standard terminology for describing reliable data, conforming to standards, tested and authenticated.
Standard	Documented agreements containing technical specifications or other precise criteria to be used consistently as rules, guidelines or definitions of characteristics to ensure that materials, products, processes and services are fit for their purpose.

Annex II. Partner descriptions

INSPIRE - The **IN**frastructure for **SP**atial Info**R**mation in **E**urope initiative

The INSPIRE Concept

The European Commission INSPIRE initiative, formally agreed on by the European Parliament and Council in November 2006 and approved on 12 February 2007, is intended to establish a legally compulsory a European spatial information infrastructure that delivers integrated spatial information services to users. These services, as from 2009 required by law, should allow the users to identify and access spatial or geographical information from a wide range of sources, from the local level to the global level, in an interoperable way for a wide variety of uses. The target users of INSPIRE include policy-makers, planners, managers and the scientific community at European, national and local level and the citizens and their organizations. Possible services are the visualization of information layers, overlay of information from different sources, and spatial and temporal analysis of natural resources.

INSPIRE Principles

- Data should be collected once and maintained at the level where this can be done most effectively,
- It should be possible to combine seamlessly spatial data from different sources and share it between many users and applications,
- Spatial data should be collected at one level of government and shared between all levels,
- Spatial data needed for good governance should be available on conditions that are not restricting its extensive use,
- It should be easy to discover which spatial data is available, to evaluate its fitness for purpose and to know which conditions apply for its use.

OGC - The **O**pen **G**eospatial **C**onsortium, Inc

The OGC is a non-profit, international, voluntary, consensus standards organization that is leading the development of standards for geospatial and location based services. Through its member-driven consensus programs, OGC works with governments, private industry, and academia to create open and extensible software application programming interfaces for geographic information systems (GIS) and other mainstream technologies. Adopted specifications are available for the public's use at no cost.

The OGC sees its mission as serving as a global forum for the collaboration of developers and users of spatial data products and services, and to advance the development of international standards for geospatial interoperability.

At a strategic level the OGC aims to:

- Provide free and openly available standards to the market, tangible value to its Members, and measurable benefits to users,
- Lead worldwide in the creation and establishment of standards that allow geospatial content and services to be seamlessly integrated into business and civic processes, the spatial web and enterprise computing,

- Facilitate the adoption of open, spatially enabled reference architectures in enterprise environments worldwide,
- Advance standards in support of the formation of new and innovative markets and applications for geospatial technologies,
- Accelerate market assimilation of interoperability research through collaborative consortium processes."

ISO – The **I**nternational **O**rganization for Standardization

ISO is the world's largest developer of standards. Although ISO's principal activity is the development of technical standards, ISO standards also have important economic and social repercussions. ISO comprises a network of the national standards institutes of 156 countries, on the basis of one member per country, with a Central Secretariat in Geneva, Switzerland, that coordinates the system. Within ISO there is a technical committee for geographical information, ISO/TC211, setting a wide range of (more than 20) standards.

ISO is a non-governmental organization: its members are not, as is the case in the United Nations system, delegations of national governments. No commercial vendors are involved. As such, ISO is able to act as a bridging organization in which a consensus can be reached on solutions that meet both the requirements of business and the broader needs of society, such as the needs of stakeholder groups like consumers and users.

Annex III. UNSDI and the UN reform

The potential contribution of the UNSDI from the on-going UN reform viewpoint is underscored by the following statements:

- The report: "Investing in the UN: For A Stronger Organization Worldwide" (UN, 2006), deals specifically with the management of the Secretariat and confirms the need for significant investment to match its overall pursuit of efficiency and results. Proposals focus on seven areas of expertise, of which "information and communications technology" and "cost reduction and increase of efficiency" are of particular relevance in defining the future role and management of geographic information in the Organization and the related need to establish a UNSDI.

- The report: "Business Unusual: Facilitating United Nations Reform Through partnerships" (UN, 2005) provides an overview of recent partnership activities in the United Nations and the progressive opening of the organization to non-state actors, including business and civil society, as indispensable partners in our work To better understand the diversity of the partnerships that have developed during the past decade, the authors pertinently group them under four functions: advocacy, developing norms and standards, sharing and coordinating resources and expertise and harnessing markets for development. The UNSDI, as an infrastructure strengthening UN internal cohesion while integrating external capabilities, will consider these four functions as keystones.

- The Report of the High-level Panel on UN System-wide Coherence in the areas of Development, Humanitarian Assistance and the Environment, entitled "Delivering as One" (UN, November 2006) puts forward a series of recommendations to overcome the fragmentation of the United Nations so that the system can deliver as one, in true partnership with and serving the needs of all countries in their efforts to achieve the Millennium Development Goals and other internationally agreed development goals. By facilitating the availability, exchange of, access to and use of geographically-related information in an unified and integrated way, the UNSDI initiative falls clearly within the scope of these recommendations

Annex IV. UNGIWG members' consultation on UNSDI

The UNGIWG Secretariat is currently consulting the UN agencies on the activities carried out within the agency that could benefit from the UNSDI. Both technical and non-technical issues, ranging from technical standards and protocols, institutional and organizational issues, including data access policy were assessed.

You will find below a summary of the main issues raised by UNGIWG members on Geospatial Information access and their main expectations of the UNSDI initiative.

Mains issues raised by UNGIWG members on Geospatial Information access

Organizational

- Geospatial information discovery and retrieval based on individual contact
- General hesitancy to share data partly due to competition for funds, confidentiality, liability concerns and restrictions put in place with the original data sources, i.e. member states or external partners
- Lack of resources for efficient information management
- Lack of resources to homogenize and post information
- Data exchange for emergencies and for joint operations not institutionalized

Policies

- Complexities of wildly-different and inconsistent data access policies
- Lack of a consistent mechanism for Geospatial data exchange
- Duplication of procedures
- Data confidentiality on personal information of refugees, internally displaced persons or people receiving ARV (AntiRetroViral) treatment
- No mechanisms to channel back integrated information to field or global partners which had inputs in databases

Capacity building

- Lack of awareness and perceived relevance on GIS capabilities
- Varying degrees of expertise and capacity in geo-information serving
- GIS tools not widespread in organization
- Capabilities receive sporadic use

Standards

- General lack of standards
- Geospatial data and service providers are not adhering to interoperability standards

Metadata

- Lack of extensive and reliable metadata Catalogues
- Absence of a good search capacity based on metadata

Services & Data

- No platform exists for periodic and automatic data sharing and co-development of common datasets
- GPS data collection not yet streamlined in all operations

- Data repositories not populated enough and publicly access weak
- Internet bandwidth limitations
- Necessity to exploit Internet technologies to extend services to non-specialist communities
- Need to bring web map services more closely with corporate web presence
- Lack of integration of Geospatial information services with the rest of the programmes
- Services are locked in stacks (or silos) meaning that data or products have to be customized, duplicated and shipped, with all the costs that that entails.

UNGIWG members' main UNSDI expectations

Organizational

- Establish policies for data sharing.
- Build partnerships.
- Encourage donors to report projects that have a geospatial component, to invest in infrastructural projects and to foster the development of a community of practice.
- Engage in the activities of standards setting bodies to voice the requirements of the UN.
- Ensure that all related coordination activities the UN engages in is aware of and takes advantage of UNSDI products and services.
- Facilitate platforms where data exchange becomes central to inter-agency coordination.
- Globally reduce duplication, identify gaps and support synergies.
- Support national GIS groups for datasets consolidation and increase their visibility in the UN System.
- Create a platform for project news (in implementation or in design) to create partnerships.

Capacity building

- Engage in capacity building programs.
- Provide training materials and standards/guidelines on data exchange protocols.
- Develop a best practices database on data management partnerships.
- Provide technical materials for awareness raising and capacity building (multilingual).

Standards

- Encourage proprietary systems to adhere to interoperability standards.
- Promote use of standards and common protocols guidelines.
- Promote simple, standardized boilerplate data access policy templates.

Services & Data

- Provide enterprise spatial data infrastructure implementation models.
- Promote modular system implementation (i.e. break down the stacks) use
- Promote re-use.
- Facilitate metadata creation, discover, retrieval and visualization.
- Provide geospatial services and data reliable/relevant repositories.

Annex V. Planned activities

UNSDI implementation					
Goals	**Proposed actions**	**Stage 1**	**Stage 2**	**Stage 3**	**Stage 4**
Policy and organization					
Goal 1: to create a coordinated, consensus-based, and inclusive UNSDI based on strategic/business principles that provides a high level coordination framework for UNGIWG, building upon what has already been achieved. Implicit in the UNSDI development is the need for a decentralized matrix approach, connected through agreed upon, open data exchange standards and interoperability with NSDIs and major regional SDIs.	Establish UNSDI implementation committee				
	Define Letter of Agreement on "rules of engagement"				
	Form Special Interest Groups on strategic/business purpose				
	Classify and document geospatial initiatives in UN				
	Develop a UNSDI Communication Plan				
	Encourage bodies to "brand" actions under UNSDI activities				
	Formalize relevant membership with OGC, ISO, INSPIRE, etc.				
	Convene Workshops for member states and regional organizations.				
People and resources					
Goal 2: to ensure sufficient access for UN organizations to the systems and trained personnel required to take full advantage of available geospatial technologies, data and information in meeting their organizational responsibilities and to maximize their potential contributions to UN reform, the Millennium Development Goals and UN Charter.	Self-assess current, in development and planned capabilities for sharing geospatial info.				
	Investigate opportunities for limited-term, in-service training				
	Document a compendium of "geospatial success stories"				
Goal 3: to identify and address external capacity building needs of member countries to accelerate the development of open and interoperable NSDIs in countries presently disadvantaged in this regard	Seek the assistance of UN training resources for capacity building				
	Align capacity building activities with those of partners and member states (Link esp. with Goal 8)				
Goal 4: to ensure adequate funding and partnership agreements are in place that support the sustainable staffing and systems required by agencies and UNGIWG to deliver programs underpinned by, or underpinning, geospatial data generation,	Increase awareness and endorsement of UNSDI benefits through CEB				
	Investigate opportunities for securing core funds from the budget pool set aside for ICT in the UN				
	Link capacity building objectives with those of the international donor community				

UNSDI implementation					
Goals	**Proposed actions**	**Stage 1**	**Stage 2**	**Stage 3**	**Stage 4**
documentation, access, and analysis.	Stimulate partners to jointly fund and participate in critical aspects of the UNSDI by "Franchising the logo"				
	Investigate opportunities for shared funding between UNGIWG members.				
	Broker public-private partnerships (PPPs) with 'one face' of UNGIWG				
Geospatial data and information sharing					
***Goal 5*:** to ensure that current, quality assured[4] geospatial data and information can be easily discovered, and are immediately and openly available via the Internet from within a distributed matrix of interoperable data resources resident in UN bodies, regional organizations, national governments, academia, industry, the NGO network and the community at large, in support of the UN MDGs.	Formalize data sharing agreements with int./ext. partners				
	Identify data custodians				
	Formalize agreements with data custodians				
	Encourage adoption of international standards				
	Promote adoption of an open standards-based approach				
	Continue to identify, acquire and refine core datasets				
	Negotiate with member states to establish open access to framework datasets.				
	Develop and promote policies for consistent collection of metadata				
	Designate responsibility for the creation and maintenance of metadata				
	Work toward a UN spatial data catalogue				
	Investigate and implement geospatial data visualization tools				
	Establish a Special Interest Group to identify legacy datasets of importance to the wider audience				
	Encourage geo-coding of statistical data during primary data collection				
	Give consideration to long-term preservation of critical geospatial data archives				
Technology					
***Goal 6*:** to build a UN Spatial Data Infrastructure framework around a shared enterprise architecture and technology infrastructure that is vendor-neutral, modular, and uses OpenGIS standards and Web Services. The framework should provide interoperable, open and cost-effective data and information services to users inside and outside the UN, with users	Understand the breadth of geo-processing systems and technology				
	Convene a Special Interest Group to scope out the architecture and technology requirements				
	Encourage adoption and use of related S.I.G recommendations				
	Continue to develop UNSDI-related technology initiatives				

[4] Of verifiable origin, scale, date, accuracy etc

UNSDI implementation					
Goals	**Proposed actions**	**Stage 1**	**Stage 2**	**Stage 3**	**Stage 4**
linked via the Internet using conventional communications channels.					
Linkages and partnerships					
Goal 7: to ensure that adequate communication, advocacy, and outreach regarding the UNSDI are extended to all UNGIWG members, member states, regional organizations, partners and the wider community of geospatial data custodians, suitably raising their awareness concerning the UNSDI and encouraging their full participation.	Increase awareness among national and regional organizations concerning the needs and benefits of the UNSDI.				
	Stimulate the sharing of expertise and experience of and between member states regarding NSDIs and their integration with the UNSDI				
	Continue to engage in a dialogue with those implementing national and regional SDIs				
	Utilize the support of UNGIWG members with offices "resident" in developing regions and countries to extend communications and information exchange.				
Goal 8: to significantly raise capacities of least developed countries to implement and sustain open and interoperable NSDIs that are compatible with the overall design and development of the UNSDI.	Strengthen SDI capacities in developing nations and regional organizations				
	Incorporate responsible business plans and risk management strategies into all NSDI capacity building projects				
	Encourage donor funding of NSDI capacity building projects contingent upon data sharing agreements (see Goal 5)				
	Offer or generate in league with donors and partners, training possibilities for member states				
Goal 9: to ensure currency of UNSDI information infrastructure and the policies, organization, technology and resources that underlies it in the light of ongoing international advances and refinement of SDIs.	Engage continuously with international partners working in SDI-related fields such as the OGC, ISO and other strategic partners.				
Goal 10: to sustain and deepen involvement of those contributing and critical to the UNSDI such as identified strategic partnership organizations	Maintain and strengthen existing strategic partnerships such as those with the GISD, GIST, OGC, ISO etc.				
	Foster and support global, regional and country level partnerships including linkages between and among civil society, private sector, philanthropy, media, and academia.				
	Support UN agencies, regional organizations, and governments in developing partnerships with non-state entities.				
	Engage the broadest range of potential sectors/actors as is practicable				

UNSDI implementation					
Goals	**Proposed actions**	**Stage 1**	**Stage 2**	**Stage 3**	**Stage 4**
Monitoring and evaluation					
Goal 11: to establish credible levels of UNSDI accountability, through regular monitoring of enterprise performance and the reporting of outcomes to the UNSDI constituency.	Utilize UN programme evaluation and audit systems to regularly monitor UNSDI performance				
	Adapt industry tools and methodologies for performance monitoring and reporting				

Annex VI. Acronyms

AIT	Asian Institute of Technology
CEB	UN Chief Executive Board
DPKO	UN Department of Peacekeeping Operations
ESA	European Space Agency
FAO	Food and Agriculture Organization of the UN
GEOSS	Global Earth Observation System of Systems
GIS	Geographical Information System
GISD	Geographic Information for Sustainable Development
GIST	Geographic Information Support Team
GMES	Global Monitoring for Environment and Security
GSDI	Global Spatial Data Infrastructure
HMA	Heterogeneous Missions Accessibility
INSPIRE	INfrastructure for SPatial InfoRmation in Europe
ISO	International Organization for Standardization
MDGs	Millennium Development Goals
NATO	North Atlantic Treaty Organization
NCOs	National Coordination Offices
NGO	Non Governmental Organization
NMA	National Mapping Agencies
NSDI	National Spatial Data Infrastructure
OGC	Open Geospatial Consortium
PPPs	Public-private partnerships
RSDI	Regional Spatial Data Infrastructure
SDI	Spatial Data Infrastructure
UN	United Nations
UNECA	United Nations Economic Commission for Africa
UNECLAC	United Nations Economic Commission for Latin America and the Caribbean
UNEP	United Nations Environment Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNGISP	United Nations Geographic Information Strategic Plan
UNGIWG	United Nations Geographic Information Working Group
UNHCR	United Nations High Commission for Refugees
UNJLC	United Nations Joint Logistics Centre
UNOCHA	Office for Coordination of Humanitarian Affairs
UNOSAT	United Nations
UNSDI	United Nations Spatial Data Infrastructure
WFP	United Nations World Food Programme
WHO	World Health Organization
WHO AMRO	WHO Regional Office for the Americas
WHO EMRO	WHO Regional Office for the Eastern Mediterranean