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Addressing Global Challenges Underwritten By Geospatial Data Management – Joint Board of Geospatial Information Societies *

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ADDRESSING GLOBAL CHALLENGES UNDERWRITTEN BY GEOSPATIAL DATA MANAGEMENT – JOINT BOARD OF GEOSPATIAL INFORMATION SOCIETIES CONTRIBUTIONS

http://www.fig.net/jbgis/

Overview:

Governments and societies around the world are facing increasing and unprecedented challenges, such as earthquakes, tsunamis, floods, and bushfires. These events underscore the need for spatial enablement of government and society. Achieving this will require the contribution of many professionals including the (geo)spatial data community, both directly and indirectly as other professionals utilize and depend on Spatial Data Infrastructure (SDI) as an enabling platform in their efforts. Response to these challenges requires addressing several fundamental issues. These include governance, data sharing, discovery and access, interoperability of systems and data, multi-sourced data integration, standards and capacity building and technology transfer. Many countries can benefit both economically and environmentally from better management of their spatial data assets, by developing spatial enabling platforms at various political and administrative levels.

The Joint Board of Geospatial Information Societies (JB GIS) is committed to supporting society and governments by collaboratively facilitating initiatives and programmes that establish and grow the capacity to deliver timely, comprehensive and useful geographic information. This paper responds to the challenges and issues related to the United Nations Global Geospatial Information Management (UN GGIM) initiative. In considering this response, it is pertinent to note that the member organisations of the Joint Board of Geospatial Information Societies will contribute to this initiative, and will champion the advancement of the UN GGIM initiatives through their various individual and collaborative efforts.

Joint Board of Geospatial Information Societies:

The Joint Board of Geospatial Information Societies is a coalition of leading international geospatial societies that speaks on behalf of the geospatial profession at the international level, especially to the United Nations and other global stakeholders. It coordinates activities within the geospatial society and organizations, internationally.

Membership of the Joint Board comprises the following organizations:

- Global Spatial Data Infrastructure (GSDI) Association
- IEEE Geoscience and Remote Sensing Society (IEEE-GRSS)
- International Association of Geodesy (IAG)
- International Cartographic Association (ICA)
- International Federation of Surveyors (FIG)
- International Geographical Union (IGU)
- International Hydrographic Organization (IHO)
- International Map Trade Association (IMTA)
- International Society of Photogrammetry and Remote Sensing (ISPRS)
- International Steering Committee for Global Mapping (ISCGM)

Structure of paper:

In creating the response to the challenges and issues related to the United Nations Global Geospatial Information Management initiative outlined in this paper, member organizations of JB GIS were canvassed for their opinions about how best to support this United Nations (UN) initiative. The paper was developed from the inputs from the ten member organizations and represents the collective view of the world's geospatial scientists.

The key areas addressed in this paper are:

1. Importance of geographic information
2. Spatially-enabled government and society
3. Connected societies. Challenges are beyond individual organisations.
4. Governance and interactions with society
5. Capacity building (including capacity assessment and capacity development)
    a. Research;
    b. Knowledge transfer;
    c. Education; and
    d. Outreach
6. The importance of a united voice from professional societies, thus aligning strategies and endeavours to collectively present a strong response to global needs. This will facilitate collaboration, engagement and multidisciplinary approaches to supporting the initiative.

1. Importance of geospatial information:

The world is faced with many daunting environmental, security, economic and social issues. The best available data is required to analyze these issues and provide optimal solutions through evidence-based decision making. Having high quality geographic information is a critical component of the data needed to address global, national and local issues. Available and timely access to geographic information (terrestrial and marine related information, underwritten by accurate positioning) - knowing where people and assets are - is essential knowledge for making any informed decisions. Geographic information is an enabling technology/infrastructure for modern society. It can be a unifying medium that links solutions to location.

It has been said that over 80% of all decisions made by humans have a spatial element (Albaredes 1998). And, according to Frank, Raubal and van der Vlugt (2000): *"…geographical information is used in making decisions that have a spatial element and consequently geographical information improves the decision making process."* These data are inter-related and so are their locations (Tobler's First law of Geography (Tobler, 1970)) – *"Everything is related to everything else, but near things are more related than distant things."* Location technologies like Remote Sensing, GPS/GNSS, Geographic Information Systems (GIS) and Cartography are critical to supporting analysis and evidence-based decision making using these location-based data.

Geographic information and technologies are key tools in transformation of our relationships with our physical world. The 'spatial enablement' that these tools create can reshape our lives. The effective management and sharing of information across agency boundaries will result in information being used more efficiently and effectively. This will provide significant benefits, including reduced costs of information collection and management through streamlined collection, processing and storage; improved decision making for policy and business processes, resulting in more integrated planning and enhanced government service delivery; improved timeliness, consistency and quality of government responses –information will be easily accessible, relevant, accurate, and complete; improved accountability and transparency for citizens; reducing costs and adding value for government through reusing existing information, sharing infrastructure and designing integrated, collaborative methods of

delivering services; improved national and jurisdictional competitiveness; and improved national jurisdictional security. For example, in different disciplines, accurate and timely geographic information is paramount. There is a need to ensure that terrestrial and hydrographic geographic information is available, usable, and underpinned by accurate positioning. In addition, visualizing and analyzing this information supports evidenced based decision making. Therefore, producing mapping, charting, imagery and other means of representing the Earth, are critical to recognizing the environmental, security, economic and social benefits previously mentioned.

Terrestrial global geographic information

Environmental problems vary by country, region and society. Environmental issues in mountainous areas are also different from those on plains or in coastal regions. Water use techniques in hot and humid areas are different from those in hot and dry areas. Remotely sensed data from airborne and satellite systems can be acquired in a routine and systematic manner in order to enable the contemporary mapping of terrestrial and marine environments to take place. The interrogation of calibrated data sets over time facilitates change in the surface conditions to be detected, monitored and their impact to be evaluated.

Appropriate solutions require geographic information because almost all social and economic human activity depends on location. The provision of accurate and comprehensive global geographic information, via mapping, is an essential tool for understanding regional and global issues. To facilitate such understanding, *Global Map* (ISCGM, 2005) for example was created to help solve the global environmental challenges which were identified in AGENDA21 in 1992 by the cooperative efforts of the official national mapping organizations (NMOs) of all the world's nations.

In November 2010 the Global Earth Observation System of Systems (GEOSS) Data Sharing Action Plan was accepted by the GEO-VII Plenary (GEO, 2010). The plan builds on the crucial concept of full and open exchange of data, metadata and products made available through the GEOSS and follows on from the initiatives of data sharing embedded in the UN Disasters Charter. These are to be made accessible with minimum time delay and with as few restrictions as possible on a non-discriminatory basis at minimum cost for no more than the cost of reproduction and distribution. The plan also recognizes that data are governed by pre-existing laws, policies and practices that may not, at this time, be fully compatible with the concept of full and open exchange.

Global Geospatial Information Management is critical to addressing global issues and JB GIS member organisations, have been involved in this field for many years.

Hydrographic global geographic information

Hydrographic geographic information, being data and information describing the physical nature of the seafloor and its hazards to safe navigation and other activities conducted at sea, is an absolutely fundamental geographic dataset required for any human activity conducted on, under or in the sea. Without hydrography no ship sails safely, no port is built, no coastal infrastructure is developed, no marine environmental plan is implemented, no coast or island can be defended, no submarine cable laid, no marine rescue attempted, no coastal inundation model developed, no tsunami predicted, no maritime boundary delimited, no sea limit enforced. Among many other things, wide access to hydrographic information supports safety at sea, promotes efficient maritime trade and communications and assists in the protection of the marine environment. It must be remembered that over 90% of world trade is still transported by sea (Round Table of international shipping associations, 2011).

While mankind has obtained an impressive level of detail that defines the shape and nature of the surface of both the Moon and Mars this is not true for the world's seas and oceans. While the character of the seabed is reasonably well known for those areas where ships regularly trade, for many parts of the world's coasts and oceans there is little or no data. In the ocean, depth measurements may

be separated by tens or even hundreds of miles, along the coasts there may be no data at all, or a single depth measurement that was obtained by rudimentary means centuries ago.

In order to further facilitate the global coordination of hydrography, the International Hydrographic Organization has encouraged the establishment of Regional Hydrographic Commissions (RHCs). The fifteen RHC's cover the globe and exist to help further the work of the IHO at the regional level. RHCs comprise States in each region together with States that have interests in regions and enable the coordination of nautical information, hydrographic surveys, the production of nautical charts and documents, training, regional cooperation, the development of Marine Spatial Data Infrastructures (MSDI) and hydrographic capacity building projects in those countries that desire to improve their capabilities.

UN instruments such as the Convention on the Safety of Life at Sea (SOLAS) and the Convention on the Law of the Sea (UNCLOS) refer to the resolutions and recommendation of the IHO for all matters related to nautical charts and hydrography. The IHO is particularly active in the International Maritime Organization (IMO) and the Intergovernmental Oceanographic Commission (IOC) of UNESCO. As well, the Global Geodetic Observing System (GGOS) is an 'observing system' (of the reference frame, as well as the EO mapping referred to earlier) within the GEOSS. In addition, the IAG is linked with the IHO in the ABLOS (Advisory Board on the Law of the Sea).

Accurate positioning

Geodesy is an earth observation discipline, and the discipline undertakes accurate surface mapping, for example e.g. the sea surface (using satellite altimetry), ice (Lidar and altimetry), and 4-D terrestrial surface (through DInSAR and GNSS points). Geodesy provides a suite of powerful *earth observation* techniques that is making a vital contribution to science and society. The classical definition of geodesy is the science of measuring and mapping the *geometry*, *orientation* and *gravity field* of the earth (these days including their variations with time). Geodetic practice is the foundation for geographic information, and services the disciplines of surveying, geomatics, mapping and navigation.

There are several reasons why geodesy has changed from an 'applied science' that underpins the making of maps to today's cutting edge *geoscience*. First, modern geodesy relies on *space technology*, and enormous strides have been made in accuracy, resolution and coverage due to advances in satellite sensors and an expanding portfolio of satellite missions. Second, geodesy can measure earth parameters that no other remote sensing technique can, such as the position and velocity of points on the surface of the earth, the shape and changes of the earth's ocean, ice and land surfaces, and map the spatial and temporal features of the gravity field. These *geodetic parameters* are in effect the 'fingerprints' of many dynamic earth phenomena, including those that we now associate with *global change* (due to anthropogenic as well as natural causes) as well as responsible for devastating events such as earthquakes, tsunamis and volcanoes. The challenge is to invert the outward expressions of these dynamic earth processes in order to measure and monitor over time the underlying physical causes. Finally what relentlessly drives geodesy into the future is the innovative use of signals transmitted by *Global Navigation Satellite Systems* (GNSS) such as GPS and Glonass (and future systems such as Galileo and BeiDou).

A critical function of modern geodesy is the definition of the *International Terrestrial Reference Frame* (ITRF). In addition high accuracy differential GNSS techniques – which have been refined over several decades – provide the day-to-day means of determining point coordinates in the ITRF. This reference frame is nowadays the basis for most national and regional datums for mapping and science.

In short, geodesy is facing an increasing demand from science, engineering applications, the earth observation community, and society at large for improved accuracy, reliability and access to geodetic services, measurements and products. These demands include the determination of global sea level change at the sub-millimetre per year level; determination of the glacio-isostatic adjustments due to

deglaciation since the last glacial maximum and to modern mass change of the ice sheets, at the millimetre-level accuracy; pre- co- and post-seismic displacement fields associated with large earthquakes at the sub-centimetre accuracy level; early warnings for tsunamis, landslides, earthquakes, and volcanic eruptions; millimetre- to centimetre-level deformation and structural monitoring, and others. In response, JB GIS member association, the International Association of Geodesy (IAG) established in 2007 the Global Geodetic Observing System, to unify all the geometric and gravity services of the IAG so as to support the ambitious goals and the critical demands of modern geodesy.

Importance of comprehensive mapping

Comprehensive mapping and charting is essential for understanding the Earth. Mapping, and the geographic information that 'underwrites' mapping programmes, provide the key elements for ensuring that geographies are understood and that geo-located decisions are supported via access to appropriate geographic information. Comprehensive and timely mapping programmes do not just occur; they need to be planned, implemented, nurtured and grown.

Mapping within nations is complex and demanding. Mapping and charting across international borders is even more complex and demands knowledge of both a neighbour's mapping programme and how it fits into international mapping programmes.

Accessing geographic information

Accessing geographic information once meant physically visiting mapping and charting agencies to acquire paper maps or digital data on tapes, CD-ROMs or DV-Ds. Now, data can be downloaded, efficiently via the Internet, with easy access made possible through interactive Web pages and mobile applications (Apps).

How best to market, sell and deliver geographic information via the Internet and how to build efficient Web portals are questions that need to be addressed. And, if security and privacy are issues of concern, appropriate systems must be established to ensure that users are confident of the integrity of the data and security when accessing and downloading data or contributing to collaboratively-built datasets.

JB GIS member associations can assist in the response to establishing accurate positioning, data collection, management, representations and dissemination and services. They can also assist through the promotion and coordination of meetings, workshops and symposia that bring-together all stakeholders in international mapping and charting programmes.

2. Spatially-enabled government and society:

A spatially enabled society – including its government – is one that makes use and benefits from a wide array of spatial data, information, and services as a means to organize its land related activities. Spatial enablement is a concept that adds location to existing information and thereby unlocks the wealth of existing knowledge about the land, its legal and economical situation, its resources, potential use and hazards. Information on landownership is a basic and crucial component to allow for correct decision-making. Such data and information must be available in a free, efficient, and comprehensive way in order to support the sustainable development of society. It therefore needs to be organized in such a way that it can easily be shared, integrated, and analysed to provide the basis for value-added services.

Governments striving for 'Good Governance' are making better informed decisions with geographic information and reducing costs associated with data duplication, including the following examples. In Australia the APS200-Location Project (Australian Public Service Commission, 2011), approved in July of 2011 by the Secretaries Board, is being used to support government reform and location enable all of government. Beginning with fiscal year 2011, the United States White House Office of Management and Budget requires geographic information to support any budget requests. The Geospatial Platform was identified in 2011 by US agencies as critical to the US National Spatial Data Infrastructure (NSDI). Indonesia's NSDI was put into law in 2011 with parliamentary and presidential support, to enable better governance in areas such as environment management and land administration.

NGOs are improving their responsiveness to situations such as disasters by sharing data resources to increase efficiency and to facilitate consistent decision making and planning. The United Nations response to natural disasters, like the earthquake in Haiti and flooding in Pakistan, required geographic information.

Businesses, have long recognized the importance of location, and are now expanding data mining and geographic analysis to be more competitive in a shrinking global economy. For example, natural resource companies use location analysis to be economically viable and environmentally conscientious. Businesses across many sectors use location information analysis to improve decision making and provide sustainable economic development.

People from all walks of life are coming to expect geographic information from their governments, NGOs and businesses partners. They are leveraging this information in their social media location based communication and collaboration. Geographic information and analysis provide infinite benefits to society when access issues are solved. The UN GGIM will play a critical role in facilitating collaboration on these issues. UN GGIM has the ability to make high quality geographic information available to Governments, NGOs and businesses to support better decision making as they address environmental, security, economic and social issues.

This requires data and services to be accessible and accurate, well-maintained and managed and sufficiently reliable for use by the majority of society which is not yet spatially aware. This includes the role of efficient communication of geographic information through modern cartography for the planned spatial enablement of government and societies. Cartographic visualisation and cartographic communication play key roles for geographic information representation, dissemination and use. This is in line with the objectives of the UN GGIM and also it is in line with the current Joint Board vision.

However, with increased understanding and expectation of geographic information our society is still not fully realizing the potential benefits of shared location data. Millions of dollars continue to be wasted on data redundancy in every country, and this lack of data sharing increases our lost opportunity costs exponentially. There is a need for international coordination on global geographic information management which will need to address issues such as:

- Data sharing enabled by policy agreements and technology;
- Adoption of the highly stable International Terrestrial Reference Frame (ITRF) as the datum for all geographic information;
- Integration of location data in solutions for environmental, security, economic and social issues;
- Utilization of location GIS analysis in evidence-based decision making;
- Use of visualization and cartographic representation to clearly communicate issues and solutions; and
- Access to data and answers via web and mobile Apps

Collaborating on these issues will promote the sharing of information that is critical to finding solutions to global problems. The value of access to location data is already realized by millions of users in hundreds of thousands of governments, NGOs and businesses around the world.

In terms of spatially enabling a society, there are further issues that need to be considered, namely:

- the educational framework;
- the technical and institutional development of spatial data management;
- the development of awareness at all levels of society (citizens institutions and decision-makers); and
- the development and applicability of land management tools in order to make best use of spatial data.

In support of this, the role of JB GIS member organisations, in essence, is to facilitate better global outcomes through utilisation of SDIs and delivery of spatially enabled societies. This role directly complements the objectives of UN GGIM initiative. The JB GIS's view of the changes now taking place in the geographic information world and these changes exemplify convergence of technologies and disciplines. These changes need to be influenced where appropriate, and leveraged, by the global geographic information community.

In addition, in facilitating this and to improve access, sharing and integration of geographic data and services, SDIs have emerged as enabling platforms. An SDI is a dynamic, hierarchic and multi-disciplinary concept that includes people, data, access networks, institutional policy, technical standards and human resource dimensions. Spatial enablement will assist both developed and developing countries to pursue sustainable development objectives and it will ensure better productivity and efficiency. To achieve this, the geographic information community must embrace the challenges of location, innovation, and collaboration.

3. Connected societies.

The keys to being connected are interoperability and integration of systems and data, as well as sourcing data and services from multiple sites.

Interoperability

Interoperability is the capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units. In the spatial context, spatial interoperability is "the ability of a spatial system or components of a spatial system, to provide geographic information portability and inter-applications cooperative process control". Having a common, and well-defined datum/reference frame, assists in interoperability, especially in the use of geographic information for disaster response/situation awareness (e.g. sea level), where we need time-series of coordinate data (i.e. we need to consider 4-D not just 3-D geographic information). In general, there are different interoperability perspectives - information, technology and processes.

An example of this, in order to facilitate data sharing and integration to assist government business processes, is the fact that the Australian Government has developed an interoperability framework which contains the three perspectives: the Information Interoperability Framework; the Technical Interoperability Framework; and the Business Process Interoperability Framework. In this environment, an essential feature of a successful SDI is the interoperability of systems and information. The SDI shares reliance on interoperability with other information platforms. In this context, and in the context of data integration as part of the SDI platform, there are also different technical and nontechnical issues such as legal, policy, institutional, and social factors that affect interoperability. Legal interoperability is particularly challenging and has recently been addressed by the GEOSS Data Sharing Task Force.

Multi-sourced spatial data integration

Most data providers use their own approaches to coordinate spatial data, especially for data integration purposes with focus on a limited number of areas/disciplines. One of the aims of an SDI initiative is to integrate multisource spatial datasets. Many reports highlight the heterogeneity and inconsistency of these initiatives and activities and attempt to address these impediments by documenting the technical inconsistencies. Technical inconsistencies tend to arise from nontechnical aspects and fragmentation of the social, institutional, legal, and political arrangements affecting individual data custodians and organizations (Mohammadi and Rajabifard 2010).

With this in mind, the development of integrated datasets for a nation or a jurisdiction is a cultural and institutional challenge more than a scientific one. Therefore, there is a need to develop a data model,

framework and strategy to facilitate organizations to better tackle this challenge and be more proactive in developing relationships at all levels of government. This includes a critical examination of philosophies, structures and processes and is significant to both industry and governments alike. The design of an integration platform requires development of a set of concepts and principles that facilitate interoperability.

Technical issues related to multisource data integration can be addressed by appropriate standards and compliances. However, non-technical issues and interaction between people and data can be achieved only through the development of effective policy mechanisms which is often much more challenging.

4. Governance and interactions with society:

Geographic Information management

The effective management of geographic information requires good governance. Organizational arrangements have long been recognized as a critical enabler and fundamental component of any initiatives and platforms such as UN GGIM. The UN GGIM envisages a global and multi-level governance structure, a system of negotiation between members at several territorial levels with tiers of member states and international organizations involved in policy networks that transcend territorial boundaries. Both vertical interactions and horizontal interaction occur at each level. Furthermore, Governance which deals with collective decision-making is clearly a function or aspect of organizational arrangements.

Visualising and representing geographic information

When one considers the massive amounts of geographic information stored in national repositories, how best to understand the meaning of this information comes to mind. The area of geographic visualisation, built on computer visualisation techniques, can provide the vehicle to gain an understanding of what geographic information databases contain.

For example, the ICA has championed the development of geographic visualisation through its Commission on Geographic Visualization, more recently named the Commission on GeoVisualization. The ICA, through its Commission can contribute tools that allow for data in large repositories to be interrogated, visualised and understood.

Understanding geographic information representations

To be understandable, data from repositories needs to be presented in such a way that a representation of geography is presented so as to be understood by both professional and laypersons. These representations are the very core of what cartography offers.

Research into use and usability of mapping products in their widest context can provide information about how best to produce and use visualisations of geographic information and representations of the Earth. Professional associations can contribute knowledge, training and 'best practice' examples to assist in this.

5. Capacity building (including capacity assessment and capacity development):

Capacity building and technology transfer is a key issue for designers of any spatial and geographic information management. There is a need for a global agenda for capacity building and technology transfer for countries in the context of geographic information and this can be developed and managed by UN GGIM. This element is also central to the objectives of the JB GIS member organisations in support of local, national and international spatial data management and infrastructure developments that will allow nations and their citizens to better address social, economic, and environmental issues of pressing importance. . Summaries of these capacity building activities can be found at http://www.fig.net/jbgis/adhoc/index.htm. The JB GIS also promotes the informed and responsible use of geographic information and spatial technologies for the benefit of society

Research

Research into the many facets of the provision, use and exploitation of geographic information and services is essential for ensuring quality, timeliness and appropriateness. Professional Associations that are represented on the JB GIS, jointly or independently, offer to undertake research into areas that support development related to the GGIM initiatives.

Knowledge transfer

Knowledge transfer, conducted by JB GIS member associations, in many instances conducted in collaboration with national member organisations, affiliates and industry, are provided to contribute to the provision of new knowledge and to foster the advancement of the discipline. In order for students to have access to relevant courses and for industry to keep abreast with developments in technology and contemporary geographic information thinking, it is important for relevant educational courses be offered.

Knowledge transfer can be achieved through face-to-face courses or via on-line delivery. The member associations also promote the generation of extensive publications, including books, journals and Newsletters.

JB GIS is committed to supporting existing educational courses and providing specialist courses where needed. In addition, in order to enhance communications and sharing among geospatial specialists and organizations from all nations, and through the effort of GSDI Association, a platform called the Geographic Information Knowledge Network (GIK Network (http://giknetwork.org) has been designed and is available for use. What began as an initiative to better serve the needs of National Mapping Agencies has expanded to become a much larger and more complex project to serve the global geographic information community at large. The platform is ready to be used by all members of UN GGIM.

Education

Sister organisations that form the JB GIS champion education and training. This can be in the form of traditional university and training college programmes, short courses for professional and technical members of mapping agencies and as outreach initiatives to transfer knowledge about the discipline and its contemporary practices.

These programmes can be supported by JB GIS member associations offering programmes independently, or in partnership with sister associations. As well, access to associations' publications, paper or Web-delivered, can be used to support such activities.

Outreach

An important contribution that the JB GIS makes through its member associations, and the international community is outreach and technology transfer. Member associations undertake the transfer of knowledge about geographic information by publishing books and special editions of journals and running workshops. Colleagues from the JB GIS community conduct these workshops on a volunteer basis, generally with the support of the national member organisation of a member association or the national mapping body. Outreach starts early to students of all ages through the internationally celebrated GIS day. Resources can be found at: http://gisday.com/.

Outreach activities are especially pertinent to enhancing the skills of colleagues from developing countries. Specialist programmes can be offered for professional and 'everyday' map users (from adults to children). The JB GIS, through its member organisations can assist with its current programmes, designed to embrace professional and non-professional geospatial scientists alike. As organised citizen mapping undertaken (globally) by the organisations like *OpenStreetMap*, where individuals and groups– everyday citizens - use GPS enabled consumer electronics to undertake mapping, there is a need to make links with these non-traditional mapmakers.

6. The importance of one voice, aligning strategies and endeavours to collectively make a strong response to global needs:

The collective 'voice' and actions of the JB GIS can be used to foster collaboration and engagement in the provision and management of geographic information. The multidisciplinary skills and knowledge that the combined associations bring to support growing the UN GGIM can be delivered via coordinated JB GIS activities.

Summary

This paper has provided information regarding the membership, alignment, collaboration and joint activities by JB GIS member associations to support the UN initiatives regarding growing the UN GGIM. We see this support assisting the elements outlined in this paper:

1. Importance of geographic information
2. Spatially-enabled government and society
3. Connected societies. Challenges are beyond individual organisations.
4. Governance and interactions with society
5. Capacity building (capacity assessment and capacity development)
    a. Research
    b. Knowledge transfer
    c. Education
    d. Outreach
6. The importance of one voice, aligning strategises and endeavours to collectively make a strong response to global needs including multi-disciplinary collaboration and engagement.

The JB GIS, through its member associations offers to contribute actively to the work of the UN GGIM and to take action as necessary as a result of the Committee's deliberations.

Joint Board of Geospatial Information Societies
September 2011

Appendix:

Joint Board of Geospatial Information Societies

Global Spatial Data Infrastructure (GSDI) Association
The GSDI Association is an inclusive organization of organizations, agencies, firms, and individuals from around the world. The purpose of the organization is to promote international cooperation and collaboration in support of local, national and international spatial data infrastructure developments that will allow nations to better address social, economic, and environmental issues of pressing importance.
(www.gsdi.org/)

IEEE Geoscience and Remote Sensing Society (IEEE-GRSS)
The Geoscience and Remote Sensing Society seeks to advance science and technology in geoscience, remote sensing and related fields using conferences, education, and other resources. The fields of interest of the Society are the theory, concepts, and techniques of science and engineering as they apply to the remote sensing of the earth, oceans, atmosphere, and space, as well as the processing, interpretation and dissemination of this information.
(www.grss-ieee.org/)

International Association of Geodesy (IAG)
The International Association of Geodesy (IAG) is a scientific organization in the field of geodesy. It promotes scientific cooperation and research in geodesy on a global scale and contributes to it through its various research bodies. It is an active member of the International Union of Geodesy and Geophysics (IUGG) which itself is a member of the International Council for Science (ICSU). The Mission of the Association is the advancement of geodesy, an Earth science that includes the study of the planets and their satellites.
(www.iag-aig.org/)

International Cartographic Association (ICA)
The International Cartographic Association (ICA) is the world authoritative body for cartography, the discipline dealing with the conception, production, dissemination and study of maps. Its mission is to promote the discipline and profession of Cartography and GIScience in an international context. The activities of the ICA are important for promoting and advancing the theory and praxis of cartography.
(www.icaci.org)

International Federation of Surveyors (FIG)
FIG is the premier international organization representing the interests of surveyors worldwide. It is a federation of the national member associations and covers the whole range of professional fields within the global surveying community. It provides an international forum for discussion and development aiming to promote professional practice and standards.
(www.fig.net/)

International Geographic Union (IGU)
The International Geographical Union was established in Brussels in 1922. Its core functions are convening meetings, coordinating and promoting research at international and global scales, placing geographers in key international positions, and recognizing outstanding achievement with its awards.
(www.igu-online.org/site/)

International Hydrographic Organization (IHO)

The International Hydrographic Organization (IHO) was established in 1921 to support safety of navigation and the protection of the marine environment. It is an intergovernmental consultative and technical organisation, comprising 80 Member States, all of which are UN Member States. IHO Member States are normally represented by the national Hydrographer of each State. The IHO has observer status at the UN and is recognized by the UN as the competent authority regarding hydrography and nautical charting.
(www.iho.int)

International Map Trade Association (IMTA)

The IMTA promotes the interests of all companies involved in the mapping industry, from retailers of atlases and manufacturers of globes, to developers of geographic information systems. IMTA facilitates the exchange of information between companies to keep up-to-date on new technologies, cartography techniques and mapping products as they are emerging. The association is made of up of three regions: IMTA (EAME), IMTA (Americas), and IMTA (Asia Pacific).
(www.imtamaps.org/)

International Society of Photogrammetry and Remote Sensing (ISPRS)

The International Society for Photogrammetry and Remote Sensing is a non-governmental organization devoted to the development of international cooperation for the advancement of photogrammetry and remote sensing and their applications. The Society's scientific interests include photogrammetry, remote sensing, spatial information systems and related disciplines, as well as applications in cartography, geodesy, surveying, natural, Earth and engineering sciences, and environmental monitoring and protection. Further applications include industrial design and manufacturing, architecture and monument preservation, medicine and others.
(www.isprs.org/)

International Steering Committee for Global Mapping (ISCGM)

The International Steering Committee for Global Mapping (ISCGM) examines measures that concern national, regional and international organizations can take to foster the development of Global Mapping in order to facilitate the implementation of global agreements and conventions for environmental protection as well as the mitigation of natural disasters and to encourage economic growth within the context of sustainable development. The Committee advocates the importance of Global Mapping, exchanges views, facilitates coordination and gives recommendations on a periodic basis. The Committee also conducts various studies and research, when necessary, and makes public the results of its activities.
(www.iscgm.org/cgi-bin/fswiki/wiki.cgi)

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