Surveying and Mapping: Today and Tomorrow

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This perspective looks at the current global agenda in terms of the UN Millennium Development Goals and their relevance to the global geospatial community. Issues such as tenure security, pro-poor land management, and good governance in land administration are all key issues to be advocated in the process of reaching the goals.

The MDGs represent a wider concept or a vision for the future, where the contribution of the geospatial community is central and vital. This relates to the areas of providing the relevant geographic information in terms of mapping and databases of the built and natural environment, providing secure tenure systems, and systems for land valuation, land use management and land development. The work of the surveyors and geospatial experts is about infrastructure investment both in physical and technical terms, which make other decisions better and more reliable.

The perspective also looks at the future especially in terms of technology development and the strategic direction for developing the Geospatial Reference Systems (GRS) and the Spatial Data Infrastructure. These future directions are highly relevant since GRS underpins all geospatial data including fundamental geospatial data sets for the cadastre, topography, geophysics, environment, natural resources, transport, utilities and emergency management.

FACING THE GLOBAL AGENDA

The areas of surveying and land administration are basically about people, politics and places. It is about human right, engagement and dignity, policies and good government, and places in term of shelter, land and natural resources. By taking this approach FIG, as the overall organization of land professionals, pursue sustainable development in both an economic, social, governmental, and environmental sense. The areas of surveying and mapping, spatial information management, cadastre and land management provide a basic platform for poverty eradication and development. This is why FIG is deeply committed to achieving the Millennium Development Goals (MDGs).

The MDGs form a blueprint agreed to by all the world's countries and all the world's leading development institutions. The United Nations Millennium Summit, September 2000, established a time bound (2015) and measurable goals and targets for combating poverty, hunger, disease, illiteracy, environmental degradation and discrimination of women. These goals are now placed at the heart of the global agenda.

The MDGs is a powerful concept towards development, security and human rights for all. Land professionals such as surveyors play a key role in this regard in terms of providing some of the fundamental preconditions for development. These preconditions are also embedded in the Millennium Declaration and spelled out in the targets and indicators for achieving the MDGs.

Goal 1: Eradicate extreme poverty and hunger
Goal 2: Achieve universal primary education
Goal 3: Promote gender equality and empower women
Goal 4: Reduce child mortality
Goal 5: Improve maternal health
Goal 6: Combat HIV/AIDS, malaria and other diseases
Goal 7: Ensure environmental sustainability
Goal 8: Develop a Global Partnership for Development

The Eight Millennium Development Goals

It is obvious that the MDGs address some of the most fundamental issues of our times. It is also obvious that only a few of these issues relate to the work and the world of the surveying community. But in any case, as stated by Kofi Annan (UN, 2005c) "We will not enjoy development without security, we will not enjoy security without development, and we will not enjoy either without respect for human rights. Unless all these causes are advanced, none will succeed."

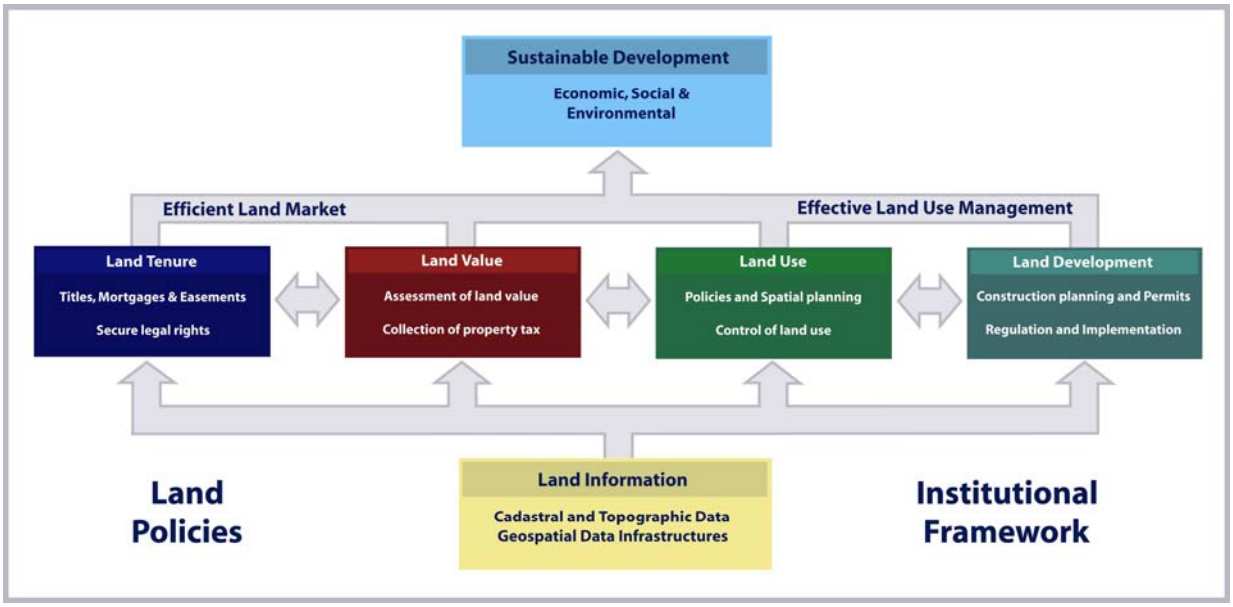
FIG – as an international NGO recognized by the UN – should make the world understand the important contribution of surveyors in this regard and cooperate with the UN agencies such as UNDP, UN-HABITAT, FAO, and the World Bank to optimize the outcome of our common efforts. FIG should identify their role in this process and spell out the areas where the global surveying and geospatial profession can make a significant contribution. Issues such as tenure security, pro-poor land management, and good governance in land administration are all key issues to be advocated in the process of reaching the goals. Measures such as capacity assessment, institutional development and human resource development are all key tools in this regard.

SURVEYING AND LAND ADMINISTRATION

Land administration systems (LAS) provide a country's infrastructure for implementation of its land-related policies and land management strategies. The term Land Administration refers to the processes of recording and disseminating information about the ownership, value and use of land and its associated resources. Such processes include the determination of property rights and other attributes of the land that relate to its value and use, the survey

and general description of these, their detailed documentation and the provision of relevant information in support of land markets.

The importance of capacity development in surveying and land administration at the organizational level has been usefully quantified in Great Britain (1999) by research that found that approximately £100 billion of Great Britain's GDP (12.5% of total national GDP, and one thousand times the turnover of OSGB) relied on the activity of the Ordnance Survey of Great Britain. Less exhaustive studies in other European countries have pointed to similar figures. The importance of geographic information continues to grow, with a range of SDI initiatives at local, national, regional and global level, so there is reason to believe that the figures would be increased rather than reduced if the GB study were to be repeated today. With these very significant numbers, as well as the central importance of sound land management, the importance of solid, sustainable organizations in the field of surveying and land administration is clear.



A Global Land Management Perspective.

FACING TECHNOLOGY DEVELOPMENT

Technology development is the major driving force in changing the face of the spatial information world. The GPS technologies for measuring have revolutionised the traditional surveying discipline and the high resolution satellite imagery tends to revolutionise the mapping discipline. The database technologies for storage of large data sets and the GIS technologies for data management, analysis and manipulation arguably have had the greatest impact on the spatial information environment. And in the future the

communication technologies such as the WWW and the Internet will become the focus of attention for viewing and using spatial data. This technological development is considered further below with a special focus on the Geospatial Reference System.

The Geospatial Reference System (GRS) defines how latitudes, longitudes and heights are measured and enables accurate location of features anywhere on earth. Traditionally, a national GRS has been realized through the geodetic network, which involves placement of Permanent Survey Marks and carrying out surveys to generate accurate latitudes, longitudes and heights for those marks. A global trend during the last decade has seen Continuously Operating Reference Stations (CORS) using Global Satellite Navigation Systems (GNSS) technology complementing and/or replacing Permanent Survey Marks as a means of realizing and delivering the GRS. This point at some strategic directions for the development of GRS:

GRS will be more widely used.
The growth in the use of Global Satellite Navigation Systems (GNSS) in many applications and increasing requirement for accuracy means that future users of the Geospatial Reference System will be much more diverse than the traditional users in Surveying and Mapping applications. The use of GNSS in asset management applications is also growing. These new classes of users will require new and innovative approaches to the delivery of the Geospatial Reference System.

GRS will be more collaborative.
Such a collaborative approach with include more attention to standards development, institutional framework and capacity building issues. This will require more collaboration with manufacturers, suppliers, users and researchers. There will also be a continued and growing need for intrastate, interstate and international collaboration on standards, best practice and compatible infrastructure.

GRS will be increasingly more accurate.
There is a strong and continuing trend for users to demand more and more accuracy from the Spatial Data Infrastructure in general (e.g. a more accurate Digital Cadastral Data Base or higher resolution imagery). This trend is unlikely to slow in the next decade. As the fundamental underlying framework for all spatial data, the Geospatial Reference System needs to be at least one order of magnitude more accurate than the requirements of the most demanding users. These high expectations of the Geospatial Reference System are especially true for users with so-called *safety of life critical* or *liability critical* applications, who expect accuracy with very high levels of reliability. High levels of accuracy and reliability are also critical in applications with high levels of automation. All of these demands will require a commitment to continuous accuracy improvement in the Geospatial Reference System to meet the changing requirements of the most demanding users.

GRS will be more digital.
The Geospatial Reference System will move from being delivered in an analogue way (based on Permanent Survey Marks in the ground) to more digital delivery mechanisms e.g.

in real time via mobile phones. This technology is in its early stages of evolution and over time a better understanding of orbits and atmospheric effects, along with many more satellites will allow more reliable, more accurate and more efficient positioning. In any case, future strategies for the Geospatial Reference System will need to balance this ongoing issue of an *analogue* approach of marks in the ground compared to a *digital* approach.

GRS will be more multi-dimensional

In the past the Vertical (1-Dimensional) and Horizontal (2-Dimensional) parts of the Geospatial Reference System have been considered as quite separate. This 1D+2D approach needs to give way to a truly 3D approach. Dealing with change in the time dimension will require further evolution from a 3D to 4D Geospatial Reference System.

Trends and directions in Spatial Data Infrastructure (SDI)

The directions in the context of the GRS could also be usefully applied to discussion of the Spatial Data Infrastructure (SDI) more generally. The above trends could be expanded upon in the context of the SDI to also include, for example:

- SDI will be more m*obile;*
- SDI will be more l*ive;*
- SDI will be more *intelligent;*
- SDI will be more *potentially intrusive*

Governments worldwide are moving forward in relation to creating policies and initiatives which open up some of their information to the public. However, what is lacking is the ability for industry to engage directly with these whole-of-government/cross-agency initiatives. There is a need to create an infrastructure or enabling platform that provides the link between government and private industry and from which applications and services can be leveraged and value added, and thereby providing the ability to grow the private sector and spatial information industry as a whole. This is in line with the vision of spatially enabling government and requires designers to appreciate the difference between data and information.

FACING THE FUTURE

FIG is committed to both flying high and keeping the feet on the ground. By “flying high” I mean that we need to have a big vision e.g. in contributing to solving the global challenges especially with regard to poverty reduction and in responding e.g. to the Millennium Development Goals. As the leading international NGO on land issues this is our core global responsibility. At the same time we need to keep our “feet on the ground”: we must serve the needs of our members associations and the individual surveyors and make sure that they get benefits from our global activities and from the work of our technical commissions. We

can promote this through providing an international forum for professional development and innovation in all aspects of surveying, and by terms of capacity building, events and publications, and standards and guidelines. The overall aim is to strengthen the links between the global agenda and the surveying grass roots.

The future belongs to our children

Biography:

Professor **Stig Enemark** was born 1943 in Copenhagen. He studied at the Royal Academy of Agriculture in Copenhagen and 1966 he obtained the degree of M.Sc. in Surveying, Planning and Land Management. In 1970 he was licensed for cadastral surveying. Since 1980 he has been employed at Aalborg University, as Associate Professor and Reader in Land Management. He is currently a full Professor in Problem Based Learning and Land Management. He was Head of the School of Surveying Planning (1991-2005) and President of Danish Association of Chartered Surveyors (2003-2006).
Since 1994 he has been the Danish delegate to the Council of European Geodetic Surveyors, and he is an invited Fellow of the Royal Institution of Chartered Surveyors, UK.

He has consulted widely to the Danish National Survey and Cadastre and he played a key role in implementing the Danish Cadastral Reform. He has also worked as a consultant for the EU and the World Bank.
He has been active in FIG since 1984 as the Danish national delegate. He served as chairman of Commission 2 (1994-1998) and he was chair of FIG task force on Mutual Recognition of Professional Qualifications. In 1999 he was appointed an Honorary Member of FIG, in 2004 he was elected Vice-President of FIG and in 2006 as President.
He has more than 250 publications to his credit in the areas of cadastre, land administration, land management and spatial planning, and in the areas of professional education and capacity building.