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Geographic Information for Sustainable Development – Global Trends and Perspectives

Keynote Speech at the 5th Map Asia, 30 August 2006 in Bangkok

Ladies and Gentlemen,

Let me first underline the topicality of the <u>triangle</u> sustainable development – good governance- GeoICT (the overall themes of Map Asia 2006) which I am talking about by some spotlights read and found in Bangkok newspapers this week or in European leading spatial planning magazines:

In his article "Developing countries must set research priorities. Liable research must be relevant <u>locally</u> and collaborative in its approach", Research Vice-president of Asian Institute of Technology (AIT) Bangkok, Professor Sudip K. Rakshit underlines the priority of promoting technological change and sustainable development in the Asia-Pacific region. Through higher education, research and outreach AIT aims at highly qualified and committed professionals who will play leading roles in the sustainable development of the Asia-Pacific region and its integration into the global economy (Bangkok Post, 29 August 2006 GL Learning Post).

That is exactly what FIG is aiming and supporting as well!

In the same edition of Bangkok Post the Malaysian Prime Minister Abdullah Ahmed Badawi is cited, when he delivered a keynote address to the first OIC (Organisation of Islamic Countries) Anticorruption and Enhancing Integrity Forum 2006 in Kuala Lumpur: "I believe that many of such development (i.e. corruption) challenges have their roots in problems of poverty, <u>poor governance</u> and limited education opportunities."

Finally, the third quotation coming from the leading European spatial planning magazine DISP, edited at Swiss Federal Institute of Technology Zurich: It's about the future of sustainability and a new book with the same title. The questions raised in it are of timeless topicality and affect all parts of the world and the whole GEO-Information-Community: "In what direction are we heading against, e.g. the background of an undeniable climate change? How can the world become more just and equitable, and how can future development be sustained to adequately address economic, social, and, perhaps the most important, environmental issues, especially in lots of developing countries and countries in transition." (DISP 165. 2/2006 p. 73)

That is the paramount background and challenge for ICT and Geo-information technologies and - application! Geo-information is no end in itself! It has to contribute solving the problems of the world or like I have formulated the motto of my FIG presidency 2002 – 2006 to contribute to "Shaping the Change" towards sustainable development.

AIT Professor Sudip K. Rakshit requested more integration, interdisciplinarity and cooperation of all responsible experts and communities. I am proud to report to you that nearly all Geo-information societies like FIG, ISPRS, ICA, IAG, IHO, etc. have established

the Joint Board of GIS (JBGIS) which currently I am honoured to chair. Its first decisions show very clearly our priorities: We have started with two working groups, one about education in Africa, one about natural risk and disaster management. Next January JBGIS will join Map World Conference in Hyderabad thus demonstrating its commitment to Asia and Pacific Region.

Ladies and Gentlemen, I hope I could make it very clear that nearly all GeoICT aspects and activities are or should be related to the fore mentioned triangle sustainable development including comprehensive land management – good governance including the increasing civil society and role of NGO's – GeoICT.

In the next minutes I would like to invite you to join me for a short but surely incomplete trip through the global world of geographic information and sustainable development as we see it within FIG and its commissions (see **PowerPoint presentation**).

I would like to point out the
GLOBAL GEO-INFORMATION-TRENDS AND PERSPECTIVES
as they are seen within FIG and its academic members, the Technical University of Munich (TUM) and the University of Natural Resources and Applied Life Sciences (BoKu) Vienna. I thank very much my FIG and university colleagues G. Muggen-huber, R. Mahoney, R. ManSberger, A. Donaubauer and S. Mayr for valuable contributions to these perspectives.

In the field of spatial or (geo)graphic information management the changes that are occurring can best be observed by considering **four** interrelated areas:

1. Geo-Tools (GIS-Technology)
2. Geo-Data (Spatial Data)
3. Geo-Processes / Geo-Businesses / e-Government
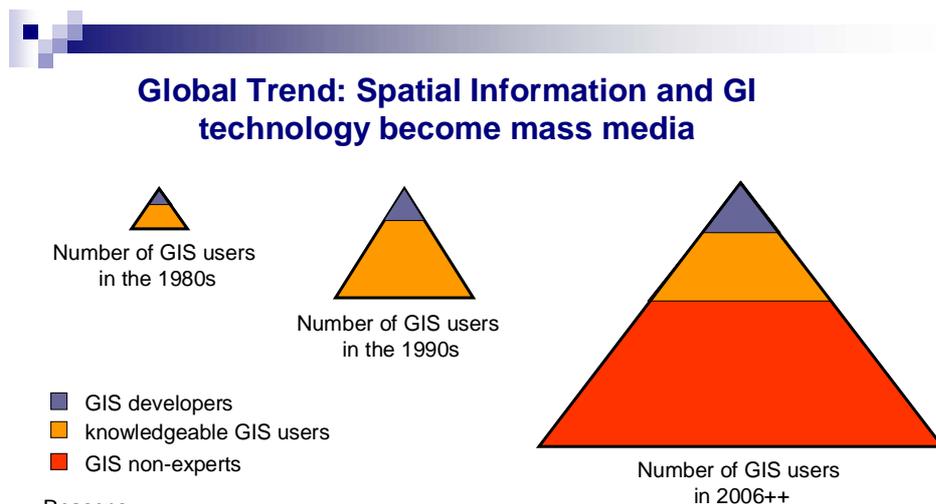4. Geo-Cooperation – Human Interactions

1. Geo-Tools

- **Improved Systems** (everybody can use positioning service like GPS, combined with mobile phones, PDAs and mobile GIS systems:
  - increased interoperability
  - increased performance
  - increased functionality
  - decreased size (handhelds)
  - decreased prize
- **New Developments**
  - Web-Mapping / Web Services / Web-GIS
  - e-Commerce / e-Government
  - Location-based Services / mobile GIS solutions
  - High Resolution Satellite images and digital photogrammetric sensors
  - Low cost navigation systems (e.g. car-navigation)
  - Improvements in GNSS
- **Improved Network-Services**
  - Improved rate of internet penetration in the world
  - New web access tools (AJAX, XML)
  - Modern image tiling techniques for Web-based 3D-visualisation

- Online access to – also cost-free – spatial viewers (Google Earth and Microsoft Virtual Earth) for a broad mass as drivers for spatial data infrastructure services
- Future research activities to improve web searching (semantic web, topic maps)

- **International Standards**
  - Interoperability standards are required to allow the merging of different / heterogeneous data sets and to combine geo-date services (e.g. formats, exchange and interoperability; gateways and protocols; communication equipment, software)
  - Open Geospatial Consortium (OGC) and the official standardisation organisations (ISO, CEN) address the interoperability issue

2. Geo-Data

- **Background**
  - "Data are going public" (e-Government, e-Citizen) (s. below diagramme Global Trend)
  - Data are referring to rather different reference frames - a challenge for experts
- **Extension of database-contents**
  - Natural resources
  - Economic and development oriented data

Global Trend: Spatial Information and GI technology become mass media

Number of GIS users in the 1980s

Number of GIS users in the 1990s

■ GIS developers
■ knowledgeable GIS users
■ GIS non-experts

Number of GIS users in 2006++

Reasons:
- technical advancements:
- web technology / interoperability
- data aquisition techniques: high resolution remote sensing sensors, high resolution airborne laser scanning
- SDI initiatives (not really yet)
- investment in data and technology from outside the traditional GIS segment: MICROSOFT VIRTUAL EARTH, GOOGLE EARTH ...

- **Ensuring the Integrity and Validity** of Databases (make available accurate, detailed and reliable geo-information)
- **Need of Query Shells** as a front-end decision support tool for GIS databases to fulfil the various needs of decisions making.
- Filtering data streams to extract meaningful information is needed for environmental monitoring, security, infrastructure operations and transportation applications.
- **Metadata**
  - Metadata describe the data model, the thematic content, quality, geometric accuracy, spatial reference system, quality and administration.

- Development of Metadata standards as part of a National Spatial Information Infrastructure (NSII)
- Open access to users for metadata (e.g. INSPIRE)
- The research on Metadata Management of Resource and Environment Spatial Database Metadata is of high priority.

3. Geo-Processes / Geo-Businesses / e-Government

- **Background**
    - National Mapping Agencies were the main producers for GI/Geo-data and public bodies were the main customers
    - Now Geo-information/Geo-data is often produced and maintained by companies who want to make a profit
    - Sensors are penetrating our world widely with new possibilities of applications (monitoring and controlling)
- **Integration of GIS in mainstream IT:** GIS is now accepted as a mainstream technology within government
- **GIS became a key tool for Sustainable Development** (environmental and natural resource management agencies)
    - GIS is not any longer an end in itself
- **GI as fundamental for security issue** (risk management, emergency management)
- **GI as a market product**
    Development of an electronic market place on GI products (e-market, e-commerce)
    - Pricing is critical issue in the delivery process of geo-data
- **Paradigm Shift:** Geospatial industry is moving from a technology-driven niche to a customer-orientated service. "Solutions" on demand instead of "Data in the stock"
- **GIS as business tool:** GI is not just a technology – it is increasingly part of the way in which commerce, government and academia operate. Approximately 80 % of administrative and economic decisions are based on spatial information.
- **Promoting GI:**
    - GIS is in order to protect our homes, our friends, and our own lives and to organise remedial measures.
    - GIS teaches us how to respect nature and how to understand her actions.
    - GI distributes spatial information to hundreds of millions people almost immediately via Internet GIS/standardised Web-services.
    - Promotion activities are required to raise awareness among potential users about the benefits of using geo-information products.

4. Geo-Cooperation – Human Interactions

- **Background**
    - NSDI institutional cooperation is still a weakness – it requires cultural change/mental shift
- **Cooperation to get added value:** The collection of information often was done isolated by specific institutions without scrutinising the existing demand of merged data to get added value. This often led to a shortfall in the return on investment
- **New Public Management:** National Mapping Agencies (NMA) introduce(d) business models of the private sector, like project management, management by objectives, cost accounting, and quality management, to achieve a more efficient administration. The

concept provides the transition of NMA from a position of power and authority to business-, and customer-orientated service institutions.

- **Competition:** Public Authorities are now in competition with other geo-data providers, like the organisations, which produce high resolution satellite imagery or those who produce high-resolution digital elevation models, often collected with advanced data acquisition techniques, like laser altimetry and mobile GIS.
- **PPP (Public-Private-Partnership)** is required: Co-ordination is a major problem of GI: huge number of players and stakeholders, e.g. data collectors, software vendors, data brokers, citizens and end users. Even within government, multiple departments are inevitably involved, all with their own agendas set by different Ministers.
- **Acquisition of Customer Needs:** Before value-added services can be created, it is necessary that the targeted end-users have been identified, that the requirements they put on the data products and services are known, and that their experience, skills and system configurations have been recognised.
- **Promoting GI to key leaders:** Consequently, actively influencing the key and leading decision makers about the benefit from the introduction of a GI.
- **GI as tool for citizen Empowerment:** GI will be accepted as a means towards more public participation, supporting the empowerment of citizens. Citizens watch (instead of being watched!) and participate in planning and decisions affecting their lives and interests. That is an important contribution to building up a Civil Society and local democracy!

From Vision to Reality?

I come to the end and would like to formulate **my conclusion** as follows:

There are currently three big innovations promoting the technical progress in the field of Geo-information: Web-services, mobile GIS linked to satellite positioning systems (GPS; GLONNASS, GALILEO) and the so-called Earth-Viewer like Google Earth or Microsoft Virtual Earth.

My colleague, Professor Schilcher, chair of the Round Table GIS e.V. at TUM, has said in his greetings on "Geobasis Information – Strategies, Implementation, Trends" in Stuttgart, July 2006: "The opening-up of the Geo-information market of Google, Microsoft, Yahoo and other companies will vitalise the development and particularly modify the profitable geo-data market. I expect for this year – perhaps even before the INTERGEO 2006 – the first contracts will be entered between land surveying offices and Google or Microsoft about the use of Geo-data."

That is a good reason to participate the "World Cup of Surveyors 2006", the joint XXIII FIG Congress / INTERGEO 2006 in Munich, 8 – 13 October, to prove if the contracts have been entered or not.

See you in Munich!