

“Connecting the Earth to the Cloud” – or Possibilities for success in a globally accessible and transparent tool for Water Management

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Key words: Globalisation, SDI, SIM, hydrography, public goods versus market based solutions.

SUMMARY

Much is to be gained from a truthful exchange of data and experiences in development of a functioning water management- for all. We can all agree on buzz words like transparent, accessible and validated information, but when it comes to defining the monitoring and information systems design, agreeing on the terminology to be used and first and foremost: who should be assigned the leadership role? - we turn into petty turf warriors.

We need to look beyond the current problems, the risks and threats outlined as the emerging Water crisis. That is forecasting, predicting the future based on current trend analysis. Probably water is (one of) the most important global issue that need to be solved, so why not focus on a tangible solution within reach? The backcasting method instead starts with defining a desirable future and then works backwards to identify policies and programs that will connect the future to the present. So, if we want to attain a certain goal, what actions must be taken to get there? The future desired conditions needs to be envisioned. Steps can then be defined to attain those conditions, as long as we know and acknowledge the present status.

Access to key information on water use, water supply and water quality are still a limitation to the design of preventive and corrective measures. A collective system where key data is stored in a global SDI would remove the institutional barriers. Several initiatives have recently been taken in this direction, either in the form of CSR efforts, voluntary contributions or through development assistance funding. All these financial sources embrace core principles as transparency, relevance, accessibility, harmonization, sustainability and collaboration. But somewhere there is a missing link in sustaining the efforts and working well together long term. To take the technicalities of out of the experts corner is suddenly possible through intelligently designed web applications and platforms, free of charge. So should we as practitioners instead put our efforts into making the systems logic and understandable for the wider audience? Define the desirable future – within reach?

This paper will address some of the current and recurrent reasons to the eternal backlog of reliable and useful data. But most of all, this paper will point to a vision of surveyors’ professional capacities *connecting the Earth to the Cloud*. Or rather –providing facts and figures for geoinformatics put into practice for keeping an eye on the Earth’s blood circulation – our Waters.

“Connecting the Earth to the Cloud”

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Two things are inevitable prerequisites for international development assistance to succeed in its mission: *Long-term* and *Collaboration*.

This year, 2012, is marked as Rio+20, not to mention that it is the Dragon year following the Chinese astrology. The Dragon is told to have supernatural powers. Its appearance means that big things are to come. The Year of the Dragon is more like a flowing river, not a stagnant lake, so things happen quickly. The Dragon marks progression, perseverance and auspiciousness. It may also bring about unpredictable events. To further qualify the state and conditions, 2012 is the year of the Water Dragon. Last time was in 1952.

Water is said to have a calming effect on the Dragon's fearless temperament. Water allows the Dragon to re-direct its enthusiasm, and makes him more perceptive of others. These Dragons are better equipped to take a step back to re-evaluate a situation because they understand the art of patience and do not desire the spotlight like other Dragons. Therefore, they make smart decisions and are able to see eye-to-eye with other people. However, their actions can go wrong if they do not research or if they do not finish one project before starting another.

It sounds as the right time to attack a severe problem – The emerging Water Crisis.

1. A GLOBALLY ACCESSIBLE AND TRANSPARENT WATER MGMT TOOL

Water administration is basically national in its character, with collaboration forums for river basins and catchment areas. The link to the legislative framework is obvious, and, of course based on the concept of nations. Access to key information on water use, water supply and water quality are still a limitation to the design of preventive and corrective measures in many countries. Global forces in how to consume and protect our water resources more and more override the nation wide concept, and water management administration is lagging behind.

A collective system where key data is stored in a global SDI would remove the institutional barriers. Several initiatives have recently been taken in this direction, either in the form of CSR efforts, voluntary contributions or through development assistance funding. To take the technicalities of out of the experts corner is suddenly possible through intelligently designed web applications and platforms, free of charge. So should we as practitioners instead put our efforts into making the systems logic and understandable for the wider audience? Start with the vision and do a backcasting from a globally efficient integrated water resources management system? As for all collective benefits, you need to work by first defining the total costs and revenues *before* you start the discussion on how to share the burden and the profit.

There are in fact a limited number of actions that could or should be taken to relieve water shortage. A non-exhaustive and very summarized list of these is:

- Risk management. Water harvesting, weather reports, early warning systems...
- Preventive measures. Water storage, land use and management...

- Value of water. Internalizing costs, pricing policies, allocating financial resources...
- Pollution control

Basically you need to know the amount and quality of the water flows to be able to manage them well. The hydrological models are well known and so are their requirements on data provision. So what you need to know can be monitored, it can be stored and it can be displayed. The means of data capture at hand as well as the desirable frequency of monitoring various parameters are within existing knowledge. It is fully possible to design a cost-efficient system for data capture, while keeping flexibility for forthcoming technological development.

Water, being the single most important factor positively correlated to Human Development Index, needs to be mapped. Visibly displayed, easily accessible and frequently updated.

2. SDI AT A GLOBAL LEVEL

2.1 The need to go global

This is my key argument: The Earth's physical resources are more easily described and understood as such than from a nationally oriented perspective where the complex patchwork of legislation, regulations and agreements at various levels defines the borders.

Water resources are globally used and globally produced. There are concepts like *virtual water* and *ecological/water footprints* aiming at describing this fact of life. Virtual water is a notion for the water used to produce a certain product. The amount needed is one thing, the required water quality and resulting pollution another. Water footprints is the concept used to calculate the real water use of a country, which equals the domestic use plus import minus export of the virtual water. It is meant as a tool for changing production and consumption patterns in a more sustainable direction. These concepts have received substantial attention and interest in conferences and the more ideological debate on how to tackle the water crisis. The value for decision-making can well be discussed, but still it has influenced strategic decisions at a national level. Israel agricultural production for export is one example.

We need to conclude, decisions affecting the world's waters heavily depend on production and consumption patterns. National responsible institutions are less powerful than the "market". Water issues are transboundary, integrated in a complex web of other sectors and decision making structures, a genuine cross cutting public good. But not yet treated as such.

2.2 Something public good

A "public good" should by its economic definition be non-rivalrous and non-excludable. The consumption of the good by one individual should not reduce the availability of the good for consumption by others - that is no rivalry. And no one can be excluded effectively from using the good. Water could to some extent still be considered non-rivalrous and to a large extent non-excludable. Yet we need to realize that due to pollution and changes in land-use it is a locally finite and diminishing resource. Water management expose the tragedy of the

commons, the “situation in which multiple individuals, acting independently and rationally consulting their own self-interest, will ultimately deplete a shared limited resource, even when it is clear that it is not in anyone's long-term interest for this to happen.” The solution to commons’ problems lies within management. Polluter pay principle, privatization – “getting the prizes right” and regulation are possible methods.

Even if water isn't a public good, water management data certainly is. Outside the sphere of economic theorists we easily confuse “public good” with “good for all”. As an economic notion, it does provide us with a framework for analyzing problems connected to its’ production. The slow progress, the technical and institutional barriers, the market failures... nothing is new under the sun...

2.3 SDI percepts and values

The SDI percepts and values may sound self-evident. “Collect once-use many times” and “datasets are more useful when they can be integrated” are underpinning most SDI programs and initiatives. We find them repetitive but they are far from clear to a broader audience. Today we have a massive and widespread use of GPS, and the interactive use of maps, location images and other visual tools are exploding on the web. It both makes it easier to explain what SDI basically is and at the same time makes it less interesting to know the inside of the SDI black box. Just press the right button! Voila - service delivered. The SDI-practitioners need to realize that our own conventional wisdom is questioned from important parts of our society, like the user groups and the ones providing the financial resources.

There are reasons for taking a step back and re-evaluate the situation. The Global Spatial Data Infrastructure Association has done so. And found at least three reasons: 1) Costs of spatial data collection and management are not transparent, but embedded in overall project costs. 2) Data sharing is rarely part of any organizations or institutions mission and 3) The cost of setting up all processes and agreements needed for permitting routine data sharing could well be higher than just revisiting and re-collecting data over and over again.

2.4 Think global – act local

The arguments for a global SDI are there. To us practitioners it becomes mind-boggling, exciting and/or overwhelming. In the world of international assistance projects ambitions and goals are high flying, but milestones and end of project results only loosely connected to this overarching rationale. We get away with being “on our way” and providing selected examples of best practice and early prototypes. We work for a good cause and we do our best. But basically we are only humans or *homo economicus*: purely rationale and also purely selfish.

We have a tendency to start afresh; we like to see a green-field project. Nevertheless we tend to believe that a small pilot project limited by existing resources will be replicated, scaled up and turned into a national, or even global model. The only condition for such a prospect is that it has to be *our* project. And each one has their own set of terms, named by abbreviations adding further to the confusion. We can find frightful examples of numerous projects in

parallel based on various standards and concepts, all well equipped with external consultants and technical fixings, and supporting a weak governmental institution. In practice, such projects absorb the existing capacity instead of developing it further. Truth is that we face the same basic problem over and over again, there might be a strong ruler, but there is a weak state. The nation wide concept, on which the majority of international funding is based, does simply not work in an organizational structure where under-equipped institutions primarily work in silos.

We all know that water management administration is lagging behind. Possibly it is also true that lateral thinking is not sufficiently practiced or encouraged and therefore simply not enough. Capacity is scarce and scattered compared to the imminent problems that need to be solved. We need to improve our efficiency. For long we have worked with coordination and standardization. Much of the international work is financed by ODA through various projects and programs. There are inherited mechanisms in such an approach depending on external budgets, leading to an eternal backlog of reliable and useful data. Tendering procedures work toward a market with few actors and basically create an oligopoly structure. Imbalance between the public sector procurers' and private sector consultants' working conditions lead to most individuals being either or, while shifting would improve skills on both sides. Data collection absorbs most of the project resources, maintenance, sharing and storage postponed to next phase. While the time lag between phases often is substantial, people within the administration switch jobs. Early prototypes become obsolete, only the consultants remain and need to do the work all over again. It builds further on the CV for similar assignments.

“Act local”, shall we start with our individual management? Maybe not the data on our own water consumption or water pollution, but our possible professional contribution to a functioning and efficient resource management.

3. SDI EXPERIENCES TO BE TAPPED

We are facing the fact that SDI nowadays has a history, not only a prosperous future. Spatial Data Infrastructures emerged two decades ago in many countries all over the world. Naturally have assessments been made to motivate their funding and steer further development. The major example of a large scale SDI, the INSPIRE initiative and EU Directive was launched ten years ago.

ee&sd has looked into a few of the many ongoing initiatives aiming at increased transparency and improved data management. The UNSDI at a global and structural level, the IWMI Water Data portal, the GEMS/Water global freshwater quality information system and the Victorian Water Resources Data Warehouse for an Australian state river. We have also followed the strategic discussion on global, national and thematic SDIs for the last year. There is much more experience to be tapped, but at this stage some key design features can already be postulated. Much can be learned from earlier mistakes, when you do the research and actually finish one project before starting another.

3.1 The UNSDI initiative

The United Nations Spatial Data Infrastructure (UNSDI) has as its' vision 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. The initiative was taken to coordinate and make available geographic data from all linked UN organizations and national information suppliers. The Netherlands has provided a coordination office to be the national link between the UN organizations and the national partners. The scope is wide and aims to contribute to the whole range of global issues like food security, agricultural development, water management, economic development, peace and safety, tropical forest monitoring, humanitarian response, environmental protection, realization of the MDG¹s and combating climate change impact. The coordination office also manages the national UNSDI - GeoNetwork portal.

UN has formed a special working group for geographic information, the UNGIWG². The UN Environment Programme, UNEP has engaged in the issue, for example by convening consultations with potential stakeholders on roles and functions for a possible UNSDI.

3.1.1 Reflecting on results

Taking the example of the regional East African meeting themed “Better Data Sooner”, held in October 2007, it is clear that shifting the focus from capturing data to the use of data still is a matter of awareness. Data storage legitimizes a role for the respective organization in the wider and complex context. It is hard to abandon, and the wording on aiming for a common and shared storage is very careful. A gathering like this results in many attendants; many are in fact also concerned. “All in all a very mixed bag of perspectives, opinions, requirements and expectations.” With the SDI vision: A truly functional SDI should promote production of better data - not just more of it – through feedback and quality improvement, and the philosophy that it is only when data are used that they can be critically assessed and improved, any data provider will feel exposed.

The appropriate role for UN was reiterated as a “broker for encouraging open data policies and to present best practices, guidelines and recommendation to governments in the interest of promoting spatial data infrastructures.” A very hard role to execute without substantial professional capacity aligned with the forefront of ICT and sensor developments. UNEP concluded its' job now to be “distil the spirit of the attendants richly textured discourse into specific observations and recommendations that can be communicated back to UNGIWG to help guide the design a complex UN-wide SDI towards practical service to member states and society.” A bit of eventually landing where they started, wanting to “articulate the governance requirements and expectations of any UNSDI”.

¹ Millennium Development Goals

² UN Geographic Information Working Group

The benefit lies in pinpointing the core issues, which was part of the thorough preparations. We find these issues as the most important ones:

- how to ensure data warehousing and longevity after the end of projects
- avoiding the overwhelming complexity of bi-lateral data exchange agreements
- confronting the reality that most agencies have no mandate to share data but all desire that other agencies share first
- avoiding building another generation of 'silos' - how many data repositories do we really need?
- best methods for engaging the senior decision makers who are needed to make SDI "go"

3.1.2 Results from the user groups

One source of information on the status and need for SDI is the Global Spatial Data Information Association. The GSDI Association is an inclusive organization of organizations, agencies, firms, and individuals from around the world. The purpose 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.”

GSDI has produced an extensive “cookbook” which is used and quoted in the development of many NSDIs. From the 2009 update of this SDI Cookbook you find the following “status report” on user needs³:

Thousands of organisations spend billions of dollars each year producing and using geographic data. Yet, they still do not have the information they need to solve critical problems. There are several aspects to this problem:

- Most organisations need more data than they can afford. Frequently, large amounts of money are spent on basic geographic data, leaving little for applications data and development.
- Some organisations cannot afford to collect base information at all. Organisations often need data outside their jurisdictions or operational areas. They do not collect these data themselves, but other organisations do.
- Data collected by different organisations are often incompatible. The data may cover the same geographic area but use different geographic bases and standards. Information needed to solve cross-jurisdictional problems is often unavailable.
- Many of the resources organisations spend on geographic information systems (GIS) go toward duplicating other organisations’ data collection efforts. The same geographic data themes for an area are collected again and again, at great expense. Most organisations cannot afford to continue to operate this way.

³ SDI_Cookbook_PDF_2009, p 11

3.2 INSPIRE and European SDIs

The status of implementation of the EU INSPIRE⁴- directive is regularly assessed. In the latest report, June 2011, the following conclusions and recommendations are of specific relevance here:

- All European countries are developing a NSDI following the directive, but there seem to be an increasing gap between countries in the pace of progress.
- Increasing involvement from the environment Ministries (and their agencies) while the central operational role lies with the mapping and cadaster agencies.
- The users and user communities of INSPIRE and the NSDIs are not always very clear. Only starting to emerge, if they emerge at all. Very modest and fragile user involvement.
- Open data, policies and emerging open source software development play a more prominent role. Open standards are applied.
- Rapid technological developments, e.g cloud computing.

A major recommendation is the need for SDIs to seek cooperation with all the data custodians and (major) users in order to integrate and streamline the activities. There is also a shift in who is taking the lead from the mapping and cadastral agencies to the role of the major SDI users (e.g. Ministries). There are several examples during the last few years to improve sharing data, mostly by measures like simplifying the licensing mechanisms between public authorities.

Even if it is not part of the legal obligations, many geoportals emerge, thematic or even for single organizations or projects.

EuroGeographics' activities focus on underpinning the European Spatial Data Infrastructure with the definitive reference data collected, maintained and provided by its members. Half of the members are the mapping and cadastral agencies in the European countries and the activities concern interaction with the European decision makers in the field, exchange of best practice, harmonising national spatial datasets into a portfolio of integrated pan-European products and related services, and an ongoing programme of spatial data infrastructure projects. The organisations' vision is to *achieve 'interoperability' of our Members' national land and geographic information assets* to enable Europe to become the most competitive and sustainable economy in the world, following the Lisbon agenda.

The real property market and related financial markets play a very important role in EU economy, and open real property markets are vital to developing the single European market. To highlight the importance of cadastre and land registration, EuroGeographics established the Cadastre and Land Registry Group. The group is one of currently five Knowledge Exchange Networks. None of these are specifically on environment. In 2002, the INSPIRE Environmental Thematic Coordination Group wrote a Position paper on Environmental Thematic user Needs. The content of reference data in the infrastructure is here recommended

⁴ Infrastructure for SPatial InfoRmation in Europe

and at quite an ambitious level. The selection was made from the existing and planned environmental legislation, and used the experience of EEA. EEA and EIONET⁵ have been working since 1993 on streamlining the data flow for environmental monitoring, assessment and reporting in Europe.

The list of needs are massive, much of it at regional and local level, and many examples of benefits from a common and shared infrastructure are provided in the position paper.

3.3 The Water Data portals, some examples

The *IWMI⁶ Water Data portal* is an integrated portal providing a one stop access to all data stored in IWMI's archive. A large amount of water and agriculture related data is accessible and the system also supports data management in the organization's research projects. Access to data is provided in compliance with copyrights, intellectual property rights and data agreements. At present the portal has 856 members. IWMI is the 2012 Stockholm Water Prize Laureate. Part of the motivation for the prize was IWMI's mapping of the world's water resources. These advancements in the application of remote sensing and geographic information systems (GIS) analysis have dramatically improved its' ability to measure the availability and efficiency of water use. The data portal holds global maps on water scarcity, irrigation use, environmental flows, and drought patterns. Over 100,000 publications are downloaded from the IWMI website every month, and are widely read on leading digital repositories worldwide. A water accounting system tool has been developed that can determine the amount of potentially usable water in a basin, assess where the water is going and calculate the actual cost per cubic meter. The tool is widely used by planners to identify where water can be saved, and how it can be used most effectively.

The United Nations Global Environment Monitoring System (*GEMS*) *Water Programme* aims at providing environmental water quality data and information of the highest integrity, accessibility and interoperability. The data are used in water assessments and capacity building initiatives around the world. The global freshwater quality information system GEMStat is designed to share surface and ground water quality data sets collected from its global network, including more than 3,000 stations, close to four million records, and over 100 parameters. Information could be displayed on-the-fly as maps or graphs. Data tables and downloading the data in different formats are planned to be available in the future.

UNEP has been driving this monitoring programme for the past 20 years. A design document at national level was produced for South Africa in 2004. It contained recommended sample sites, monitoring variables, sampling frequencies, operational requirements, data and a QA strategy. It was found that various assessments having their own specific reasons nevertheless tend to produce a very limited number of information parameters.

⁵ European Environment Agency and its partnership network European Environment Information and Observation Network

⁶ International Water Management Institute

The *Victorian Water Resources Data Warehouse* is a site for up-to-date information on the Australian state Victoria's water resources. It gives access to both raw and summary data on both water quality and quantity throughout Victoria, and is a central repository for published documents produced from this data. It is an interactive mapping application⁷ that integrates water-related data from a range of sources; including the State Hydrographic network, Victorian Water Quality Monitoring Network, Index of Stream Condition, Waterwatch Victoria, Groundwater Management System and Department of Primary Industries, Primary Industries Research Victoria (PIRVic) salinity bores. The water data that can be accessed through the map includes water monitoring points, groundwater bores, index of stream condition reaches, marine monitoring sites, water related management boundaries and base topographic data. The site is owned by the Victorian State department of Sustainability and Environment and is an attractive example of easily accessible information on water.

Users can choose which layers they want to see, zoom in and out, pan around the map view, query and/or select features, access layer metadata, download specific layers and print customised maps. The interactive map also allows users to query water sites and retrieve the relevant water quality and/or quantity data from the data warehouse.

3.3.1 Possibilities for accessible water data

A number of examples exist, on various levels and with various degrees of progress, use and interaction. With a more comprehensive examination, it will be found that a functioning structure, appropriate selection of data, costs for capture and storage, usefulness for various purposes and other key elements of a global SDI for water management is already out there to be investigated.

4. THE MISSING LINK

Someone,⁸ somewhere has concluded: "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 systemwide 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."

The problems we face have to do with designing and implementing the initial structure and content of datasets, and allocating the financial resources for such a systemwide investment.

We have to consider something we often neglect - the human element. Information systems and IT infrastructures should simply facilitate communication. The key questions relate to how people communicate naturally. Who asks the questions? In what way?

⁷ <http://nremap-sc.nre.vic.gov.au/MapShare.v2/imf.jsp?site=water>

⁸ Unfortunately this reference got lost while writing this paper

Why should people share data? Where are the incentives or motivation to do so?
And - What are the disincentives or barriers to sharing data?

Data quality arises as an area. People are unwilling to release or share data because those data may be perceived as being of poor quality. The human motivational factors are still the underlying reason for not sharing, irrespective of high or low quality levels. The UNSDI meeting - “Better Data Sooner” – aimed at changing this attitude. “Data holders keeping products under wraps while they attempt to perfect them are missing out on the chance of having many more eyes and brains contribute to improving their data.”

Public-sector accounting practices also need to be revisited to properly account for the benefits accrued across government as a result of formalized data sharing practices. Who reaps the benefits of data sharing and who bears the associated costs? Senior executive-level support is critical to the success of data sharing initiatives in a SDI. A senior champion is necessary to keep everyone’s eyes focused on the larger prize.

Self interest and governance structures may be the key impediment to sufficiently rapid progress.

4.1 The political background to global interaction

The Earth Summit 2012, Rio+20, will assess progress towards the internationally agreed commitments. These commitments that have defined the pathway for sustainable development began in Stockholm 1972. So it is not only Rio+20, it is also Stockholm+40. The ground-breaking Swedish proposal to convene a UN conference on the human environment has landed in a long and unique multilateral process- how to integrate economy, environment and social aspects into something sustainable- for all. It is time to take a step back and re-evaluate.

The obstacles were there in 1972 and they still remain. “The existing international system, strongly anchored through the UN charter in the overriding principle of national sovereignty, was not equipped to respond to the demands of the now rapidly changing world.”⁹ The Swedish diplomat, Sverker Åström, initiator of the conference wrote in an article some months prior to the meeting: *“it is one of the ironies of history that the principle of national sovereignty and equality received its triumphal confirmation in the Charter of the United Nations at the time when the introduction of atomic weapons, the development of communications and the awakening consciousness of the environmental risks made it unmistakably clear that all of humanity is interdependent and that the old concept of sovereignty is inadequate.”*

Åström pointed to the fragmented structure of the UN system as a key concern. *“...carefully defined functional areas in a way that corresponds approximately to the administrative divisions within most member nations. Without strong new initiatives from their respective principals they cannot be expected to achieve the effective interdisciplinary coordination of*

⁹ From Stockholm to Johannesburg and beyond p 303

environmental endeavours that is now needed and the governments themselves have a long way to go before they accomplish such coordination within their own administration.” He was terribly right, and this critical dilemma for the international system of sustainable development governance still persists.

The Rio (and following CSD) process yielded a massive development in national level environmental legislation, foras, groups, initiatives, interaction and advancement of the environment-development agenda. Public awareness, private sector engagement are tangible results. A booming “market” for greening paired with a weak structure for locally anchored genuine capacity has resulted in an overgrown flora of innovative concepts for affirmative action. Still the key data on the existing situation and monitoring of the result of our endeavours are missing, especially at regional and local level. Available international finance through ODA and private foundations has been generous in technical assistance and capacity building support. Despite all good intentions we have failed in building a strong foundation, long term sustainability and organic growth.

4.2 The professional capacities and interaction

The role of the professionals might be larger than we ourselves tend to think. In fact, technical experts and the international community are the ones that have got the most of actual capacity development on environment development and sustainability the last two decades. Many of us have an extensive worldwide network. Most of us work on a project by project basis and rarely on sustained efforts where we genuinely collaborate long-term.

The experts’ corner is a safe haven. A results based management of our own efforts where we actually strive for the overall objective of our project plan activities could however be much more energizing. Working together is stimulating but also very challenging! Can we agree? Without bias examine crosscutting disciplines and learn from each other instead of just dividing resources and responsibilities within the team. Lean back or take a leap forward depending on the actual situation instead of on our traditional roles in our respective professions. Bear in mind the Water Dragon – be more perceptive of others, understand the art of patience and do not desire the spotlight... like other Dragons.

The ability to select *key* data and *effective* methods within SDI is far more important than the ability to produce exhausting and all encompassing overviews of a system, structure or concept. We suffer from information overflow. So we need the courage to choose and select.

Open source, cloud services instead of individual data repositories, new interfaces... ICT development is strongly connected with the famous X-factor, sudden unexpected and drastic changes. We are part of the global world where re-use of technical capabilities, re-use of skills developed, and re-use of invested intellectual effort are the real assets on which we can rely.

Surveyors core business has in fact narrowed down when we focus on Cadastre: A register of property showing the extent, value, and ownership of land for taxation. Behind the few words: “extent, value and ownership” there should be a wealth of experience to underpin the

decisions on land use, market conditions and valuing of a limited resource like 'land'. And 'land' is also waters, in addition something dynamic, moving and vulnerable. The function of a cadastre is therefore crucial to society at large. Surveyors have over years and borders gained experience in the area that are essential for SDI in general. From a recent discussion on LinkedIn regarding the situation in Greece, Dimitris Rokos has summarized: *I believe that there are no technical issues in developing cadastre in any Country of the world. The procedure may vary depending on the history, legal system, culture and economic situation of each Country. In deciding on the right procedure, mistakes can be made, but people tend to learn from them (see The problem in Greece is the excessively bureaucratic and ineffective manner that public administration is set up. When an organisation needs over two years to award a single contract (due to objections, appeals and court cases), when hiring even temporary staff takes over a year to be approved, when agencies do not share data and when the responsibility of parts of the project is scattered among different state agencies, the project has inevitably long delays. The problem is not developing cadastre but reforming state administration.*

5. CONCLUSIONS and RECOMMENDATIONS

The problem is not developing SDI, but reforming environmental administration. Today it is possible to design and calculate the costs for a globally accessible and transparent Water Management data repository. By only channeling a minor share of the "international" public finance that is and has been used for data collection and storage, such a system will be financially sustainable. Lets us start with *sharing* our understanding of the essence of a functioning water administration. Selected and structured SDI providing key data bound to place and time will make "translation" of all fundamental observations possible.

- The main aim of a global SDI for key data on water resources management is **breaking the SILOS Syndrome**
- Any inter agency coordination must be meaningful to the respective organizations involved. A well functioning common and shared **spatial data repository** will be meaningful when it is **in place** and when it contains validated and easily accessible information key to the user needs.
- The SD infrastructure should clearly distinguish between facts and politics to be deemed useful.
- We are still struggling with insufficient information, lack of baseline data and data kept in inaccessible boxes, either black ones or locked ones.
- Look for the natural questions, what needs to be done to preserve our water resources for the future needs in an equitable way? Who has the decision-making powers and what information is needed to make the right decisions?
- Embark from the technical achievements made in our global world.
- Open access is challenging, but rewarding and will require substantial and genuine collaboration.

Surveyors have the skills to connect the Earth with the Cloud. Like water dragons we can make smart decisions, based on broad experience and are able to see eye-to-eye with other people. We have a contribution to make in a global world, as *Surveyors Without Borders*.

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BIOGRAPHICAL NOTES

M.Sc. Environmental Engineering (Land Surveyor), Royal Institute of Technology, Stockholm 1980,

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Areas of work: Sustainable Development. Policy analysis. Environmental Management. Urban environment issues. Land administration. Development of Democracy. Water-resources Management. The global Energy sector-prospects and challenges of the future. International Conventions and Agreements in Environment (MEAs) and related issues. Specializes in Institutional development and Pre- and post project/ programme evaluations.

Worked internationally since 1993 as Senior Adviser Environmental Matters at Sida (Swedish International Development Co-operation Agency) and as Director of International Affairs at IVL Swedish Environmental Research Institute. Own consultancy firm since 2002- **energy environment & sustainable development, eesd**. Business Concept: Improve international cooperation towards a sustainable and equitable global development

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