Planet Earth, Planet Water-Panel Discussion
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Q1: One of the frustrations that has been expressed is that the work and expertise of scientists, engineers and academics may not be actionable by local actors such as Governments, citizens and businesses. Water related challenges touch every aspect of human behaviour from agriculture to health, economic development to agriculture and disaster mitigation. How do you see location analysis, GIS and geodata based collaboration overcome these challenges in your field?

The International Ocean Institute (IOI) is a knowledge-based non-profit organization, international organization devoted to the sustainable development of the oceans. It operates through the activities of its Headquarters in Malta and 22 Operational Centres around the globe. The IOI Training programme on Ocean Policy, Law and Management has produced 1,000 ocean managers in 100 countries for more than 30 years.

In answering the first question, I will use an example of the 2004 Indian Ocean Tsunami as a case since I was part of the system.

We know that the tsunami early warning systems have been established since 1949 in Hawaii and Alaska in the Pacific Ocean. In 1998, Dr. Smith Dharmasaroja, Former Director-General of Thailand Meteorological Department of Thailand warned that from historical records tsunamis could occur in the Indian Ocean. At that time, people did not know about tsunamis and they did not believe that it could happen. They did not pay attention and prepare anything. I would like to quote a presentation yesterday made by UNOSAT, "**You don't know what you need to know until you know it**."

On 26th December 2004, there were tsunamis which killed around 300,000 people in 15 countries. People in 17 countries surrounding the Indian Ocean Rim have been woken up. They asked for help from policy to local levels. In early 2005, I asked for technical assistance from IOI, Pacific Tsunami Warning Center, Pacific Disaster Center and the Japan Meteorological Agency. They all cooperated in sending experts to Thailand for presenting their knowledge and experiences in dealing with tsunamis in their regions. The Intergovernmental Oceanographic Commission (IOC) has been credential with the coordinating body for the establishment of the tsunami early warning and mitigation system. Numbers of expert working groups were set up to deal with observation, modeling, interoperability, mitigation, preparedness and response. Time is critical. The early warning system must be based on a decision support system, GIS and spatial information, and an automatic system. Risk maps, inundation maps, and evacuation maps were developed as tools for local planning. Like Thailand, 514 villages will need to have these tools for local planning. However, they will need to understand and to know how to use them. Government officers and experts have important roles in introducing the tools and to advise about useful applications.

In case of water, the Governments have played a vital role in water resource management. This means the role in water governance (including the nature of decision making and implementation) and sustainable development (elimination of poverty; conservation and enhancement of the resources, development of economic growth and social and cultural development; and the unification of economics and ecology in decision making at all levels).

They are not easy tasks when we look at how a Government can drive its policy and strategies across multi-sector and multi-level management to have desirable impacts at the local level.

From my experiences as a Government officer working in areas of rural development and disaster early warning and mitigation systems, I found that the Government requires three important strategies to achieve its policy goals;

(1) To strengthen institutional mechanisms by involving interagency departments (data/information sharing and integration) and Government function levels to make decisions and to communicate and interact with people effectively;

(2) To strengthen community-based management by involving schools and communities starting from small-scale pilot projects aimed at project scalability and expansion. Experts, engineers and academicians play an important role in technical consultations, whereas stakeholders in communities play an important role in the decision making process based on scientific information and indigenous knowledge;

(3) Capacity development. This means increasing people's ability to learn and construct new understandings based on their existing knowledge and experiences.

GIS and geodata based collaboration will be required for planning, to set up criteria and to prioritize work programmes. This will be very useful to implement the required strategies in the decision making process in water resources management and disaster risk reduction.

Q2: Technology is an instrument of change but on its own it is powerless. What other tools, adaptations and enablers do we require to achieve the vision that so many of us share regarding planet earth, planet water?

We share the vision of having effective water governance and sustainable development. Governance implies the inclusive nature of decision making and implementation. Sustainable development covers the three pillars of social, economic and environment.

In order to eliminate poverty permanently, governance and sustainable development shall be blended in the governmental policy. Technology of GIS and spatial planning can be used to obtain actionable information for operations. This actionable information can be disseminated or used for planning among governmental interagency departments and their function levels from central to provincial to district and sub-district to village levels and to relevant stakeholders. Capacity development will be required at all levels. It will be a long-term plan such as 10-20 years before technology can be the instrument of change.

Q3: World events, such as the Arab Spring[1], have shown us how many individuals working together can affect real change at a national and global level. Where do you see the next major changes coming from in the world of water? What will drive them and how will they impact our future?

The 2011 flood disaster in Thailand can be used as a good example in which **multi-level stakeholders** (Government ministries, interagency departments, private industries, academic institutions, civil society, media, communities, international organizations and consultants) needed to use their knowledge of past experiences to work together to coordinate, to communicate and to get involved in decision making on how to deal with the disasters which had affected them severely in terms of human lives, agriculture, industries, tourism, social conflicts as well as connected businesses in other countries.

The floods were described as the worst flooding in terms of the amount of water and people affected. The World Bank has estimated an economic loss of about US$ 50 billion (Tang, 2011, Wikipedia, 2011) and is classified as the fourth among the most damaging disasters in the world surpassed only by the 2011 earthquake and tsunami in Japan, the 1995 Kobe earthquake, and Hurricane Katrina in 2005 (Zhang, 2011). The floods affected private industries or supply chains in various countries.

This drives the Thai Government;

(1) to overcome its long standing institutional constraints by integrating their multi-ministerial policies, expertise, and resources for operations;

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[1] http://en.wikipedia.org/wiki/Arab_Spring. The **Arab Spring** (Arabic: الثورات العربية *al-Thūrāt al-ʿArabiyy*; literally *the Arabic Rebellions* or *the Arab Revolutions*) is a revolutionary wave of demonstrations and protests occurring in the Arab world that began on Saturday, 18 December 2010. To date, rulers have been forced from power in Tunisia,[1] Egypt[2] Libya,[3] and Yemen;[4] civil uprisings have erupted in Bahrain[5] and Syria;[6] major protests have broken out in Algeria,[7] Iraq,[8] Jordan,[9] Kuwait,[10] Morocco,[11] and Oman;[12] and minor protests have occurred in Lebanon,[13] Mauritania, Saudi Arabia,[14] Sudan,[15] and Western Sahara.[16] Clashes at the borders of Israel in May 2011,[17] as well as protests by Arab minority in Iranian Khuzestan,[18] have also been inspired by the regional Arab Spring. The protests have shared techniques of civil resistance in sustained campaigns involving strikes, demonstrations, marches, rallies, as well as the use of social media to organize, communicate, and raise awareness in the face of state attempts at repression and Internet censorship.[19]Many demonstrations have met violent responses from authorities,[20][21][22] as well as from pro-government militias and counter-demonstrators. These attacks have been answered with violence from protestors in some cases.[23][24][25] A major slogan of the demonstrators in the Arab world has been Ash-shaʻb yurīd isqāṭ an-niẓām ("the people want to bring down the regime").[26]

(2) to commit to collaborate and to consult with multi-level experts from international, regional and local levels to integrate water resource management and effective flood risk management models;
(3) to plan, to improve existing systems, to set up a national flood data bank, to upgrade the disaster early warning system for the general public, to put in place a 24/7 emergency call center, to increase the accuracy of spatial planning using GIS, to link telecommunication modes from government to target last miles, as well as to utilize disaster early warnings via the internet system;
(4) to commit to involve all local stakeholders in the planning and implementation and to provide full support to local communities within their existing managerial and economic capacity.

These can be seen as major changes in Thailand so as to build human capacity for the adaptation and resilience to flooding. We have to develop new ways of predicting the future (model the future) so that we can restore our ability to function and enjoy a meaningful life.

Many major cities around the world are vulnerable to flooding because they were built close to rivers or the coast to facilitate trade via the oceans. The top ten cities in terms of an exposed population are Mumbai, Guangzhou, Shanghai, Miami, Ho Chi Minh City, Kolkata, New York, Osaka-Kobe, Alexandria and New Orleans[2].

I would like to quote Mark Maslin in his pocket book on global warming: A very short introduction where he wrote that the impact of global warming will increase significantly as the temperature of the world rises[3]. At the moment, 1/3 of the world's population lives within 100 km of a shoreline and 13 of the world's 20 largest cities are located on the coast. This means billions of people could be displaced, starting an environmental mass migration. The North Atlantic Ocean circulation would collapse, plunging Western Europe into a succession of severe winters which would be followed by severe heat waves every summer. At least 3 billion people in the world would become water-stressed. Agricultural production would start to fail, and billions of people would face starvation. Water and food security would become issues of conflict between countries "eco-wars". Public health systems around the

[2] UNHABITAT. 2011. Global report on human settlements 2011. Cities and Climate Change. 279 pp.
[3] Maslin, Mark. 2009. Global warming: A very Short Introduction. Oxford. 192 pp.

world may collapse, unable to cope with the demands. Global biodiversity would be devastated. Let's not go there.

I look forward to seeing significant global cooperation and collaboration to use the best information available to plan and to analyze risks and to implement all possible actions at all levels. This should be carried out without delay or hesitation. The United Nations organizations may be in a position to take the lead role in defining the knowledge for peace and knowledge for modeling our future using preventive measures. Relevant private sectors and civil societies can help bring their selected audiences, pilot communities, and volunteers to participate in such water governance and sustainable development actions.