2010

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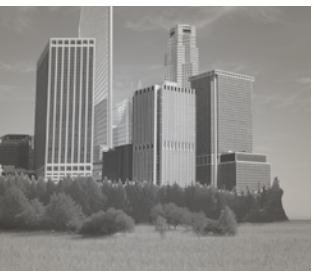

WATER AND KNOWLEDGE MANAGEMENT IN VIETNAM: Understanding the Mekong Basin

Thomas Menkhoff, Solvay Gerke & Hans-Dieter Evers

A Passenger ferry on the Mekong, near the city of Can Tho, South Vietnam - *Photo taken by Solvay Gerke*

The Mekong river basin is one of the world's longest rivers affecting the livelihoods of the many communities living along its banks. Combining integrated watershed management and knowledge management theories, the authors describe how the WISDOM project, a joint programme between Vietnam and Germany, is seeking to devise sustainable solutions to life in the Mekong Delta.

About the Authors

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A fascinating example of such a river basin is the Mekong, one of world's longest rivers with an estimated length of 4,350km.The Mekong drains an area of 795,000 km² and discharges 475.17 cubic kilometres of water annually. The river originates on the Tibetan Plateau and runs through China's Yunnan province, Myanmar, Laos, Thailand, Cambodia and Vietnam. On March 9, 2010, the Straits Times reported that the "mighty Mekong is drying up." One of the root causes, according to residents in Thai fishing communities along the river, is the construction of dams upstream, causing crops to wither, drinking water levels in wells to fall, and fish stocks to decline.

BACKGROUND AND CHALLENGE

Integrated watershed management plays an important part in the sustainable use, preservation and analyses of water resources. The term watershed refers to the geographic boundaries of a particular waterbody, its ecosystem and the land that drains to it.[1] Each person is inevitably part of a watershed community, and individual behaviour has a tremendous influence on its balance and sustainability depending on how each person treats watershed resources such as water, air, soil, ground water, plants or animals. If we pollute our own small watershed, we also negatively affect the larger watersheds downstream which are sometimes referred to as river basins.[2]

A fascinating example of such a river basin is the Mekong, one of world's longest rivers with an estimated length of 4,350 km.The Mekong drains an area of 795,000 km² and discharges 475.17 cubic kilometres of water annually. The river originates on the Tibetan Plateau and runs through China's Yunnan province, Myanmar, Laos, Thailand, Cambodia and Vietnam. On March 9, 2010, the Straits Times reported that the "mighty Mekong is drying up."[3] One of the root causes, according to residents in Thai fishing communities along the river, is the construction of dams upstream, causing crops to wither, drinking water levels in wells to fall, and fish stocks to decline. Other challenges at the Mekong's upper reaches include extreme seasonal variations of flow, changing climatic conditions and rapid population increase. All this leads to severe changes in the lower Mekong Delta further south in Vietnam resulting in extreme floods, lack of drinking water, acidification and destruction of habitats.

TOWARDS EFFECTIVE INTEGRATED WATERSHED MANAGEMENT

According to development experts, these problems call for effective integrated watershed management which refers to the process of creating and implementing plans, programmes, and projects to sustain and enhance watershed functions that affect plant, animal, and human communities within a watershed boundary.[4] Watershed features which agencies seek to manage include water supply, water quality, drainage, stormwater[5] runoff, water rights, and the overall planning and utilisation of watersheds. Landowners, land use agencies, stormwater management experts, environmental specialists, water use purveyors and communities all play an integral part in the management of a watershed. For this purpose, hydrologic, hydraulic, ecologic, and sociological factors must be studied and turned into relevant data points. Inter-agency cooperation among national institutes and authorities at all levels (international, national, regional and local) is also required.

THE WISDOM PROJECT

Against this background, the WISDOM project, a joint programme between Vietnam and Germany, has been conceptualised to design and implement an actionable knowledge system for the Mekong Delta. The project draws from various disciplines such as hydrology, sociology, information technology and earth observation so as to create an optimised, integrated resource management system.[6] The project planners hope that the integration of various types of data will enable the system's end-users to perform action-oriented analyses on very specific questions aimed at providing them with valuable decision-making tools in supporting regional planning activities. Possible applications include: (a) monitoring of floods and droughts; (b) evaluation of flood and drought risk, damage potential and actual damage; (c) analyses of water quality, pollution and sediment load; (d) improvement of flood prediction via remotely sensed precipitation information; (e) detailed adaptation of surface and sub-surface discharge models; (f) information of land cover and land use changes; (g) observation of settlement development, surface sealing and population growth.

THE WISDOM PROJECT'S MANDATE - EDUCATION AND CAPACITY BUILDING

The project's key components are education and capacity building. It brings together eight partner organisations from Vietnam and 10 from Germany.

Communities living and travelling on the Mekong, Can Tho, South Vietnam - *Photo taken by Solvay Gerke*

Key actors include the Vietnamese Academy of Science & Technology (Division of Remote Sensing & Geographic Information System) and the German Remote Sensing Data Centre of the German Aerospace Centre (DFD-DLR). Dozens of German and Vietnamese scientists are part of the WISDOM project team together with several PhD. students from Vietnam and selected European countries. The latter are coordinated by the United Nations University - Environment and Human Security (UNU-EHS) in Bonn in close collaboration with the Bonn Interdisciplinary Graduate School for Development Research BIGS-DR at the Centre for Development Research (ZEF) at Bonn University. Knowledge Management is an important part of the capability development efforts.[7] In November 2009, the authors of this article conducted a training workshop on Knowledge Management at the Mekong Delta Development Research Institute (MDI) at Can Tho University (Vietnam) to enable the participants to understand the power of strategic Knowledge Management and to appreciate what it takes in terms of leadership, organisational culture, human resource deployment, technology and knowledge process management to create actionable knowledge assets in organisational contexts such as the WISDOM project.

KNOWLEDGE MANAGEMENT

Knowledge Management refers to the totality of organisational strategies aimed at creating a smart organisation, which is able to leverage upon its various knowledge assets, to learn from past experiences, whether successful or unsuccessful, and to create new value through knowledge. At the people level, Knowledge Management puts emphasis on the education, learning abilities and competencies of organisational members. At the organisational level, Knowledge Management is concerned about the creation, utilisation and development of the collective intelligence of an organisation. Technologically, effective Knowledge Management requires the efficient organisation of a suitable communication and information infrastructure (e.g. intranet) based on relevant taxonomies and knowledge repositories.

KNOWLEDGE MANAGEMENT CHALLENGES IN THE MEKONG DELTA

In the context of the WISDOM project, the Knowledge Management challenge is to craft and design an information system, which allows absorption of various types of relevant data such as remote sensing data, Geographic Information System data, socio-economic data, digital maps or interpolated point measurements and to organise them in such a way that end-users can query the data depending on the issue they wish to tackle. Key elements include a data entry portal, a database for organised data storage, a visualisation tool to display the data and a query mask so that end-users can conduct meaningful analyses with respect to issue-related questions such as: "Which agricultural land areas are most vulnerable to increased flooding?" or "Which socio-economic strata of the population is most affected by river pollution and saline intrusion?"

A key component of the ongoing project work is awareness and capacity building amongst diverse target groups such as government officials and river communities with regard to the tangible benefits of strategic information and knowledge management in the Mekong delta. As policy-makers,

While local communities at district and village level often have considerable local knowledge and traditional technologies to implement cost effective and sustainable flood control solutions, they sometimes find it difficult to prepare for flood-induced losses by extending their agricultural production into the dry season through to irrigated crops. Here, thematic knowledge-based communities of practice (COPs) comprising members of local river communities can help to leverage on indigenous know-how and innovations.

Government officials represent a strategic group in the project landscape who play a key role as knowledge leaders in the ongoing transformation and sustainable development of Vietnam.[8] The resulting information and knowledge management system has to be user-friendly and navigable. This assures sound decision-making and execution with regard to smart watershed-related interventions. Terms such as knowledge management or remote sensing are not always understood by those who can greatly benefit from it. One way of obtaining buy-in amongst potential beneficiaries is to demonstrate how a thoughtful and simple knowledge management approach can help to support decision-making and to tackle calamities such as floods.

TOWARDS CLIMATE CHANGE RESILIENCE

While local communities at district and village level often have considerable local knowledge and traditional technologies to implement cost effective and sustainable flood control solutions, they sometimes find it difficult to prepare for flood-induced losses by extending their agricultural production into the dry season through to irrigated crops.[9] Here, thematic knowledge-based communities of practice (COPs) comprising members of local river communities can help to leverage on indigenous know-how and innovations.[10] While remote sensing makes it possible to collect all kinds of scientifically interesting data and to perform sophisticated queries, effective knowledge management implies that the resulting information is actionable and in line with strategic imperatives. In the case of the mighty Mekong, one of the key challenges is arguably that the river's local woes are trans-boundary and global in nature.

In this respect, the project is ongoing and aimed at achieving a variety of outcomes in areas such as hydrologic modelling, pesticides, endocrine disruptors, knowledge management, socio-economic and vulnerability assessment. Some of its programmes include the following:

PESTICIDE MONITORING

As part of the pesticide monitoring campaign, systematic surface water samples were taken at selected study sites from field discharges and irrigation canals which helped to detect 13 of 15 target compounds (buprofezin, butachlor, cypermethrin, difenoconazole, endosulfan sulphate, fenobucarb, fipronil hexaconazole, isoprothiolane, profenofos, pretilachlor, propanil and propiconazole). Fenobucarb, for example, is an insecticide. It is insoluble in water and highly toxic for humans. Once it is detected in rural areas where surface water is often used for drinking, measures can be taken to improve water quality. As such this project component helps to assess the potentially adverse effects of pesticides on humans and aquatic life by comparing measured concentrations with water-quality benchmarks, such as those published by the World Health Organization.

Communities living and travelling on the Mekong, Can Tho, South Vietnam - *Photo taken by Solvay Gerke*

Communities living in the cities like Can Tho, by the Mekong, are affected by flood and water pollution because of ongoing industrialisation and water quality problems - *Photo taken by Solvay Gerke*

As part of the efforts to monitor water constituents in selected sites around Can Tho, particular types of satellite data are used to map and assess the "turbidity" of water. The term turbidity refers to how clear the water is. Murky water usually implies the existence of particule matter or suspended solids such as clay, silt, and sand from soils, phytoplankton (suspended algae), decaying vegetation, industrial waste and sewage. The extent of turbidity can be mapped with the help of a Modular Inversion and Processing System (MIP).

MONITORING OF WATER CONSTITUENTS WITH REMOTE SENSING DATA

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VULNERABILITY ASSESSMENT RESEARCH

A Knowledge Management-related objective of the project is to provide data and information about major local vulnerabilities to water-related hazards and climate change. Through the combination of different research methods such as household interviews and wealth rankings, it was found that low-income families who live directly along the river are exposed to various water-related hazards in form of floods, water-level rise and river bank erosion. River bank erosion forces families to rebuild, shift or elevate their homes regularly.

This puts a strain on their limited household income. The vulnerability assessment research findings are expected to be instrumental in further increasing the level of sophistication and implementation of planning and flood control institutions aimed at arriving at an integrated approach towards risk and climate change management.

CONCLUSION

The essential goal of the WISDOM project is to ensure that the Mekong Delta becomes an internationally renowned flagship of innovation and achievement in intelligent, integrated watershed management and climate change resilience. Towards this goal, the project's team members hope that the integration of such data will enable the end-user of the system to perform analyses on very specific questions and thus supply the end-user with a tool supporting regional planning activities. In this regard, the integration of natural and social sciences is of utmost importance for the development of the Water Information System, since it has to show both changes to the natural environment, as well as the socio-economic processes that affect the people living in the Mekong Delta.

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