

International Workshop  
on

## **CAPACITY BUILDING IN ASIA**

**"EARTH OBSERVATIONS IN THE SERVICE OF WATER MANAGEMENT"**

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### **Working Group Report on Water Quality**

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#### **INTRODUCTION**

In Bangladesh, there is a common expression “panir opor nam jibon”, which means water is life. All across Asia as well as the rest of the globe, clean water is necessary for human health and livelihood as well as being interwoven into many cultures. Today, water quality is a critical issue for many Asian countries, with a rise in water demand paralleled with a decrease in the amount of usable water, due to degraded water quality. Sound management requires clear and timely information on water quantity and quality, information which now is severely lacking across the Asian region.

This diverse working group of four women and six men, representing eight countries, convened to identify regional water quality problems and issues, monitoring and informational needs, and the efficacy of remote sensing technology in helping fill informational and data gaps. The working group’s three objectives were to 1) Identify capacity building issues, 2) Address ten specific water quality questions suggested by the workshop conveners, 3) recommend the next steps, i.e. a demonstration project, toward a regional water quality program using the GEO framework.

#### **IDENTIFICATION OF ISSUES**

The group’s first task was to identify issues and areas where capacity building was needed to help address water quality issues of the region. The group consensus centered on six areas. They included:

1. Recognition of water quality as an integral component of the water resources management and development
2. Public education and awareness

3. Infrastructure strengthening: monitoring, mapping, coordination and collaboration among governmental and non-governmental organizations.
4. Integration and coordination of agencies; improved cooperation among different sectors of water related issues (floods and droughts can exacerbate pollution and water quality needs to be considered in mitigation, IWRM).
5. Access to satellite and in-situ data by the stakeholders in countries and in the region; creating a regional database.
6. Funding for water quality related activities

## **DISCUSSION QUESTIONS**

The group was given ten specific questions to address during the working group session. These questions are stated below with abbreviated answers to follow.

### **1. What factors affect WQ in Asia? How are these factors and their effects on water quality monitored?**

Water quality is affected by both point and non-point sources of pollution. They include sewerage discharges, agriculture, forestry, overuse, and urban runoff. Water quality is also affected by hydrologic extremes, both floods and droughts. Water quality problems can also arise from a lack of education of how human activities in one area can affect other (downstream) users. All countries had some water quality monitoring in place but network systems were considered inadequate by the participants.

Changes are likely in 21st century, as a consequence of anthropogenic and natural factors on global warming and land use modifications/changes. Global change will affect hydrology and ecosystem and, hydrological extremes like droughts and floods may become more acute as climate warms. More acute droughts may increase the temperature of water bodies, lower oxygen levels, and change aquatic biology and habitats. Understanding and modeling to predict potential harm to aquatic environment is important for appropriate management.

### **2. What are the consequences of water pollution and how are measurements used to reduce these consequences?**

The consequences of water pollution are multidimensional and immense. One in three Asians don't have access to clean drinking water. Asia's rivers contain three times the world average for fecal coliform contamination. Effect of water quality on human health, as water is an important medium for the transport of toxins, viral and bacterial diseases and parasitic infections. Water borne infections account for about 2.5 billion cases, annually, the world over, such as diarrhea, malaria, dysentery and many others, particularly in Asia and mostly children are the sufferers. This results in 3 million deaths, annually, more than 500,000 infant deaths in the region. There is need to understand relationship between water quality/quantity and human health. In addition, poor water quality affects agricultural production, fisheries and other aquatic life. As there is no proper monitoring system/agency to do it on a national level, the measurements are rarely used to reduce the consequences

**3. Is there a set of standards that are applied to water quality sampling in Asia? Are these data used to enforce any environmental quality legislation or policies? How are the standards maintained?**

Every country has their own institution(s) with responsibilities for water quality related issues. For example, in Lao PDR, the Science, Technology and Environment Agency is responsible for the management and control of wastewater discharges. The Ministry of Health is responsible for developing and determining water quality standards for drinking water, health care, and waste water. In India, a number of agencies play a role in monitoring water quantity and quality. These include the Ministry of Water Resources (groundwater) and Ministry of Environment and Forests (large rivers and streams). In Thailand, the Ministry of Science, Technology and Environment develops national policies, plans, standards and regulations. Unfortunately, the enforcement of existing regulations is weak due to political will, inadequate coordination, low technical capabilities, and limited resources and access to information.

Almost all the countries in Asia developed the standards after the WHO guidelines for standards. The values of a few standards vary depending on the capability to measure them. There has been legislation to codify these standards but in-situ collection and measurement are not used to enforce them on a systematic basis because of the lack of resources. Most actions take place on an individual project basis.

**4. What are the most urgent needs for WQ measurements at present? How these problems are presently being addressed?**

The group identified a number of urgent needs related to water quality measurements. They are (no priority given)

- Water monitoring mechanism and funding establishment. National and international support for water resources monitoring needs to be advocated. Countries need to develop infrastructure for network monitoring systems and analytical laboratories
- Public and organizational education of water quality issues. How human activities can effect receiving waters
- Involvement of academic institutions, governmental and non-governmental organizations based on specified rules and roles. Developing partnerships between institutions, agencies and the private sector.
- Development of baseline database including data collected from remote sensing and in-situ sources. The integration and standardization of these data bases is important.
- Making sure water quality data from all countries in the region is getting put into the Global Environmental Monitoring System (GEMS)

- Skill development and training of agency staff involved in water quality monitoring. Having sufficient level of staffing to adequately operate monitoring networks.

The above needs are being addressed sometimes through sporadic and/or identified problem-based projects (e.g. arsenic mitigation water supply project in Bangladesh and India tested arsenic content in water from groundwater based sources).

**5. Are there any difficulties with the current procedures for the collection, analysis and distribution of information on water quality and groundwater in Asia?**

Yes, the current procedures and protocols are not complete and systematic monitoring is lacking along with reliability. In addition, institutional organization makes open dissemination of data difficult. For example, in Thailand, thirty agencies within six ministries share authority and jurisdiction over water management and communication can be lacking.

**6. What groups in Asia are currently archiving and distributing water quality data? Are these groups also distributing groundwater data or are these different groups? If there are different please describe the group.**

There is limited data is archived by GEMS. In addition, the UNESCO World Water Assessment Program (WWAP) has recently started collecting and archiving data. There are questions about the validity of the data and a limited number of parameters that are included. Because many agencies don't have computer resources available to them or lack the technological skills and training, access to the data can be limited to the end-users.

**7. Examples of places where remote sensing could be applied to WQ problems? Please describe the conditions and how remote sensing data could be used to monitor the pollution problem.**

A number of water quality parameters important to the region could be measured using satellite remote sensing. These include chlorophyll, suspended solids, clarity, temperature and surface area. Associated issues include sedimentation and sediment transport, channel morphology, salt water intrusion, algae blooms. Specific major river basins and catchment areas in Asia areas where these data could assist are: Ganges, Meghna, Brahmaputra, Mekong, Mahaweli, Red, Indus, and Yellow River.

Data from satellite sensors including LANDSAT, MODIS, and IKONOS could also be used for mapping, estimating water quality parameters to enhance the in-situ baseline dataset, identifying the risk zones, and anticipate the problems.

**8. To what extent can satellite images be used to assess water supply in arsenic and fluoride contaminated groundwater areas?**

It can help to a large extent to identify and develop alternative water sources in arsenic and fluoride affected areas.

## **9. How can satellite data be used to effectively monitor groundwater losses from aquifers and to estimate recharge?**

Satellite data can be used to monitor soil moisture, changes in groundwater table, to help to understand interconnectivity between surface water and groundwater, etc. New satellite technology may be able to explore groundwater resources through differences in gravity.

### **RECOMMENDATIONS BY WORKING GROUP ON WATER QUALITY**

1. This working group endorses water quality as an integral component of water management and development.
2. The group further proposes an Asian Water Quality initiative under the GEO framework. The GEO members as well as non-member countries should be encouraged to agree to provide the required support and cooperation

#### ***The Asian WQ initiative under the GEO framework***

To address the important issues under the identified water quality capacity building needs, we are proposing the following initiative to GEO and strongly advocate for their support. This activity will proceed initially through the formation of a demonstration project, calling for a collaborative and cooperative effort between national and local agencies, institutions, NGOs and space agencies. Parallel with these activities will be a workshop to develop a full proposal. The ultimate goal of this effort is to improve regional water quality management by bringing together disparate data sources and information, addressing interoperability and synthesis issues together while addressing stakeholder needs.

#### **ACTIVITIES AND TIME FRAME:**

- Step 1:** To draft and submit one paragraph about the proposed initiative to GEO by 2 October 2006.
- Step 2:** To form a task team by the end of October 2006 and draft the first concept note of the proposal (2 pages) and submit it to GEO Plenary (29 – 30 Nov 2006). Initial proposal to GEO: Why it is needed; what we want to do and needs; brief timeline
- Step 3:** The initiative to be recognized by GEO as a GEO program. Immediately after the recognition the GEO will inform the countries about the opportunity and about a proposal development workshop, January 2007. The workshop is tentatively proposed be held by June 2007.
- Step 4:** Planning, holding the proposal development workshop, final proposal developing, and implementing the demonstration project(s) by 2007.
- Step 5:** The task team will submit the final proposal to GEO, participating countries and agencies for approval and mobilization of the funds by end of 2007.

**Step 6:** The initiative approved, funds allocated and implementation of activities started by early 2008.