Arsenic hazard in Asia: Human ecological case studies in Bangladesh and Nepal

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Arsenic pollution has become one of the most serious environmental health problems in Asia. In rural areas of Bangladesh, India, Nepal, China and many other countries, a huge number of people suffer from arsenicosis with symptoms of skin manifestation such as melanosis and keratosis, which eventually develop to skin cancer and then fatal internal organ cancers. Arsenicosis occurs due to long-term intake of arsenic contaminated naturally in groundwater through tubewells which have been dug out to provide bacteria-free drinking water.

Our research team, consisting of scientists of various disciplines from several countries, has conducted field investigations in Bangladesh and Nepal and laboratory analyses of water, urine and food samples collected in the field. Arsenic level in groundwater and thus in tubewell water varied microenvironmentally but its horizontal profile demonstrated the peak at the depth of about 30 m, from which water has been pumped up. This finding suggests a high possibility of worsening the situation.

Our toxicological analysis revealed that arsenic concentration in drinking water was highly correlated with urinary arsenic concentration. However, the clinical observation found that arsenicosis-derived skin manifestations developed more in males than in females. The causes of this sex difference have not fully been clarified, but our experimental work suggests that it is attributable to sex differences in metabolism of arsenic, especially methylation from inorganic arsenic to monomethyl-arsenic and then dimethyl-arsenic. There were two more important findings from the human ecological aspect. Firstly, arsenic taken by the people in these countries came from cooked rice to the similar extent as drinking water. Secondly, high urinary arsenic concentration tended to reduce the people’s body weight and this is crucial to Bangladeshi and Nepalese who are mostly malnourished.

Considering people’s health and survival in a wide purview, the programs for sustainable water supply in the arsenic-polluted Asian environment aim not only to reduce arsenic level in water for drinking and cooking but also to increase the amount of water irrigated to paddy fields for increasing rice production as the key of their food security. For these goals, various efforts should be concurrently made.
Special Lecture 2

Vo-Tong Xuan, Chair of Local Organizing Committee of 3rd Workshop of MeREM,
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Reaching the Water Targets: 12 Principles for an Effective Global Water Quality Monitoring Network

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An important question is whether or not the quality of inland waters is improving or declining. A second question is why we need to have a global water quality monitoring and assessment programme. In 2002 UNEP’s Global Environmental Outlook (GEO-3) reported that water pollution or water quality were priority issues in every major region of the world. The demand for fresh water is rising in response to industrial development, increasing reliance on irrigated agriculture, massive urbanization, and rising living standards. Global freshwater resources are also shrinking qualitatively because of pollution from a wide variety of wastes. In 2005 the Millennium Ecosystem Assessment concluded that “Globally, water quality is declining, although in most industrial countries pathogen and organic pollution of surface waters has decreased over the last 20 years. Nitrate concentration has grown rapidly in the last 30 years. The capacity of ecosystems to purify such wastes is limited, as evidenced by widespread reports of inland waterway pollution. Loss of wetlands has further decreased the ability of ecosystems to filter and decompose wastes.” Concomitant with these anthropogenic impacts, climate change is expected to directly affect both the quantity and quality of water, creating competing demands for this resource from multiple sectors of society. Furthermore, in addition to its direct effects, climate change may exacerbate the effects of many other human activities on waters.

Although the management of inland waters are a country’s responsibility many rivers cross international boundaries while others flow into coastal environments shared by more than one country. The Millennium Ecosystem Assessment conclusions notwithstanding, there is a general consensus that our knowledge of the state of the world’s freshwaters needs to improve if we are to answer the first question. The Millennium Development Goals of access to safe water and sanitation for domestic and productive uses are not limited to water scarcity and access. Water quality is an equally important determinant of availability since water which is not fit for a particular use is effectively unavailable.

In order to determine the current status and trends in water quality of inland waters at a global scale we must have a monitoring and assessment programme based on 12 principles:

1. Identify management and policy information needs
2. Define data and information needs and then design the monitoring network to meet them
3. Ensure reliable and timely data collection and reporting
4. Co-locate water quality and quantity stations
5. Decentralize, and enough monitoring stations to have accurate and reliable global coverage
6. Meet developing country needs and build capacity to participate
7. Promote free access to information interoperability and comparability of methods
8. Maintain systems up-to-date (IT, analytical, etc.)
9. Link to institutional arrangements with regulatory ability (i.e. to establish standards)
10. Be able to support key environmental water assessments and reports
11. Strengthen existing network infrastructure and institutions rather than creating new ones
12. Improve coordination among the 24 UN bodies involved in water, sanitation and ecosystem health.

In 1978 the UNEP GEMS/Water Programme was begun with the main goals of improving water quality monitoring and assessment capabilities in participating countries and to assess the state and trends of regional and global environmental water quality. To achieve these goals, GEMS/Water maintains a global database, GEMStat, which is designed to share surface and ground water quality data collected from the GEMS/Water Global Network. GEMStat covers more than 1,400 stations, two million records, and over 100 parameters. GEMS/Water also undertakes assessments and indicator development; capacity building and QA/QC. In order to share data, GEMS/Water maintains an interactive website (www.gemswater.org and www.gemstat.org) where users from the world can search for data and generate statistical summary tables and plot data of interest. Because a major concern to water managers is the load of nutrients, contaminants and sediments being carried by river systems and entering lakes, reservoirs and near-shore marine environments, GEMS/Water has developed a flux computation module on its website. The module uses water quantity data compiled by its sister programme, WMO’s Global Data Runoff Centre (GRDC), a global water quantity database, to calculate loads at different time scales up to an including annual loads. This is done by calculating daily loads and combining them to obtain the required loads, which can then be used to estimate temporal and spatial trends. Both the load computation and graphing modules are continuously undergoing refinement, providing increasing uses and functionality for users and will lead to improved understanding of how land-based activities affect water quality over large scales.

To effectively assess water quality and address key international issues at the global scale, GEMS/Water must have data that adequately cover all areas of the world, and are reliable, relevant, and current. It is also essential to have long-term data records, especially for trends such as climate change. GEMS/Water encourages countries with records pre-dating 1978 to provide them in order that an assessment of possible climate change impacts on aquatic systems in different regions of the world can be undertaken. It is important to extend the composition of data compiled to include biological variables, but these will be limited for most national water quality monitoring programmes. GEMS/Water is working towards achieving the 2015 water targets by providing solid water quality data and assessments to decision-makers at all levels.
Activities of MeREM Pilot Project in 2004-2005

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During 2004-2005, the MeREM Pilot Project has planned and implemented several workshops and training programs related to capacity building, as well as making visits to institutions that are actively involved in research and development of the Mekong sub-region in order to harmonize and integrate MeREM with existing projects.

On capacity building activity a number of workshop and training programs have been carried out including:
1. Training Course on Algae and Algal Toxins held in December 2004 at Kasetsart University, Bangkok, Thailand.
2. Workshop on Fish Genetic Diversity and Conservation held in March 2005 at Kasetsart University, Bangkok, Thailand.
3. Training Course on Fish Species Identification held in July 2005 at Charoen Hotel, Udorn Thani, Thailand.
4. Training Course on Water Quality Measurements will be held in February 2006 at Kasetsart University, Bangkok, Thailand.
5. Data and information sharing system and GIS training course. The tentative schedule will be announced soon.

On the other hand, a workshop, report and several missions to introduce MeREM to international and local communities were completed successfully. They are as follows:
1. A Joint Workshop between Journalists and Scientists held in June 2005 at Shiba Park Hotel, Tokyo, Japan.
3. Coordinating missions by Dr. Makoto M. Watanabe and Dr. Kunimitsu Kaya to introduce MeREM and forming ally with existing international projects on Mekong River such as Mekong River Commission (MRC), Greater Mekong Sub-region (GMSARN), UNEP RRC AP, etc.
4. Coordinating mission by Dr. Makoto M. Watanabe and Dr. Kunimitsu Kaya to local authority of the riparian countries that carried out research and data collection of Mekong River, for example, AIRC in Yunnan Province of China.

In conclusion, it can be seen that 2004 - 2005 is another year that MeREM has conducted and accomplished many things. I would like to give my appreciation and gratitude to the Chair of the International Committee and other members of the committee to make these activities possible.
Ecological Health Monitoring and Assessment of the Lower Mekong River and its tributaries

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In the 1995 Agreement on the Cooperation for the Sustainable Development, the 4 MRC member countries agreed to cooperate in sustainable development, utilization, management and conservation of water and related resources and to protect the environment aquatic life and ecological balance of the Mekong River Basin. To meet the agreement and to sustain these resources for long term benefits, it is necessary to assess the present condition of the ecological balance of the Lower Mekong Basin (LMB) and to monitor future change. The Ecological Health Monitoring and Assessment activity of the MRC Environment Programme of the LMB has been developed to apply this principle.

The indicative Ecological Health Report Card of the LMB has been prepared to assess and monitor the long-term ecological health of the Lower Mekong River and its tributaries, using indicators of water quality, its toxicological and biological status. However, the presentation in this workshop is limited to the Ecological Health Monitoring of the LMB, which has been studied since 2003 and is based on a biomonitoring approach. Benthic diatoms, zooplankton, littoral benthic macro-invertebrates, and channel-bottom benthic macro-invertebrates are being assessed as representative components of the freshwater communities of the Mekong River system, and the results are being related to environmental data. Overall the condition of the Lower Mekong Basin is relatively good.
Sustainable Development in the Greater Mekong Subregion

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ABSTRACT: This paper will focus on an overview of the Mekong River and the GMS countries, developments and trends, challenges and conflict resolution. The role of the Greater Mekong Subregion Academic and Research Network (GMSARN) and its contributions in the sustainable development of the region is highlighted.

KEY WORDS: GMS, Mekong river basin, GMSARN, sustainable development

INTRODUCTION

Development is more than the passage of poor to rich, from a traditional rural economy to a sophisticated urban one. This is evident in the Greater Mekong Subregion, a promising new growth center in the Asia-Pacific region composed of Cambodia, Lao PDR, Myanmar, Thailand, Vietnam, and China (Yunnan Province). The Mekong River, the world’s 12th and Asia’s 7th longest river, links the GMS countries culturally, politically, and economically.

Among many factors, development trends in the GMS have been a function of the ways by which common resources have been shared – particularly in food production, fisheries, trade, tourism and hydropower. More than 70 million people in the region depend on the Mekong River for their livelihood. Thailand is by far the largest economy in the GMS. Yunnan, like the rest of China, and Vietnam, are reforming socialist economies. Myanmar, Laos and Cambodia are poor, highly agrarian economies where agriculture provides the largest contribution to the GDP. Compared with Thailand, Yunnan Province and Vietnam, they have achieved relatively lower levels of economic integration with the outside world.

CONDITIONS IN THE GMS

Status of development in the GMS

Fundamental to the sustainable development of the GMS are enabling conditions that foster the formulation and implementation of initiatives. In recent years, national governments have demonstrated increased willingness to cooperate, making the implementation of initiatives less and less arduous.

Major initiatives at the national, regional, international and bilateral levels are now being taken in vital sectors: social infrastructure, transport and communications, agriculture and natural resources, energy, finance, etc. These are essential steps towards realizing the goal of sustainable development.

Development trends in the GMS have also been influenced by market policies, international relations, availability of skilled human resources, access to technology, environmental considerations, political issues, economic priorities, social issues and topographical conditions.

The prospects for economic, social and political stability in the GMS are better now than they have been for a long time. Ironically, however, the Mekong River which is both an integral link among the GMS countries and their peoples, is also a natural boundary that separates them.
Challenges and conflict resolution in the GMS

In the environmental front, conflicts are known to have arisen from upstream activities that bring about hydrological changes, threaten the ecology and biodiversity of fish species, damage reefs and the fragile ecosystem, as well as reduce fish yields and ruin the livelihoods of farming and fishing communities. Hydropower projects are commonly visited by conflicts arising from unfair resettlements and compensations. In border provinces, for example, the number of people who have access to electricity supply greatly varies, from 82% in Vietnam, 34% in Cambodia and 15% in Laos.

An essential component in the resolution of conflicts is the equitable utilization of natural resources and the equitable distribution of their benefits. For the region as a whole, it is the successful resolution of conflicts that will determine if development can in fact follow an environmentally sustainable path.

The notion of conflict resolution has always been implicit in the concept of development, and, it must be noted that the will to resolve conflicts always starts within an individual and/or community action. The fact is government policy instruments and legislation are not made in a vacuum. In the most fundamental sense, conflict resolution is the product of changing values, a process in which education plays a pivotal role.

Human resource development is a long process. Nevertheless, it must be strengthened if the region is to achieve development. Education, at all levels, is a key to the development of a relatively well-educated and highly motivated labour force that will serve the region’s needs. Additionally, government officials and policy makers should have the opportunity to attend short-term training in formulating and resolving – scientifically and objectively – complex problems that are common to the GMS countries.

The need for human resource development draws attention to the role of educational institutions in the region’s development. Linked to HRD are the need for research in the areas of vital importance to social, economic and political development, and the dissemination of information and intellectual assets.

A role for GMSARN in the sustainable development of the GMS

The opportunity for educational institutions to play a leadership role in the areas of human resources development, joint research and information dissemination came into fruition with the establishment of the Greater Mekong Subregion Academic and Research Network or GMSARN, in January 2001. The GMSARN is an alliance of eleven top ranking academic and research institutions in the GMS with the following objectives:

- To enhance the roles and functions of academic and research institutions in the Greater Mekong Subregion to take part in project evaluation and development planning for achieving truly self-reliant and sustainable development of the GMS in the long run.
- To foster multi-disciplinary research and academic development within and among academic and research institutions in the GMS through relevant joint activities.
- To formulate and resolve, scientifically and objectively, various complex GMS problems covering both cross-border issues and other issues that are common to GMS countries.
- To take stock of intellectual assets developed for the GMS region for transparent accessible reference and utilization among the GMS.

In line with these objectives, GMSARN has to-date undertaken the following activities:

- Human resource development in the form of workshops and seminars
- Development of joint research activities among member institutions that deal with the issues pertinent to the environment, conservation and biodiversity, infrastructure development, border trade, etc. Primary emphasis is placed on complementary linkages between technological and socio-economic development issues.
- Dissemination of information to encourage vibrant exchange of ideas, through the internet as well as conventional print media.
Regional cooperation may be an old objective but within the context of GMSARN, it has rekindled a long-standing desire among the member institutions for concerted efforts towards achieving self-reliance and sustainable development. Fueling this desire is their strengths: their reputation as leading institutions for higher learning, the substantial support provided by national governments, their teaching and research capabilities, their extensive networks of alumni, and their capability to build new networks and partnerships with like-minded institutions and collaborators.

CONCLUSIONS

The establishment of GMSARN consolidates embryonic efforts by different institutions to keep pace with the region’s accelerating economic and environmental interdependence. A needs assessment study of GMSARN member institutions reveals efforts taken by the members, individually or in partnership, to set the region’s development on a sustainable course. These efforts include capacity building through formal training programs, knowledge exchange and joint research.

Working together to resolve current conflicts is only half the battle. The GMSARN member institutions would also have to be forward-looking and therefore anticipate the need for interventions that address potential conflicts in different areas.

As one definition of “development” states: Development is more than the passage from poor to rich, from a traditional rural economy to a sophisticated urban one. GMSARN recognizes that development goes beyond achieving economic betterment and is fully committed to building self-reliance in the region, the only sure path to sustainable development.

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Water Quality Monitoring Report of the Lancang-Mekong River

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1 Background

Originating from China's Qinghai-Tibet Plateau, the Lancang-Mekong River stretches 4,880 kilometers and has a valley area of 810,000 sq km. Running across China, Myanmar, Laos, Thailand, Cambodia and Vietnam from north to south, the river has been well known for its important geological situation. Its section within the Chinese borders is called the Lancang River and the sections outside China is named Mekong. Two-thousand sixty-one kilometers of the river are in China, including 31 kilometers where it forms the boundary between China and Myanmar.

Presently, the Mekong river basin has better water quality. At this point, the water quality of most of the supply in the middle and lower mainstream is rated at grade two, whereas some areas are rated at grade three. Fewer part’s (mainly located in the branches) water quality are not so good, the reasons for that being the impacts of environmental degradations by development activities. Furthermore, certain areas of the river have higher mineral content, including Cd and P.

2 REVIEW Of Water quality monitoring

Since 1983 China has been monitoring the water quality in the Lancang-mekong river. In that year the government set up 8 sections at mainstream and main branches. The quality was monitored 6 times in 3 seasons, each seasons have 2~4 times monitored. 12 Monitored items were pH, DO, CODMn, NH3-N, volatile phenol, CN⁻, Hg, As, Cr⁶⁺, Pb, F⁻, etc.

In 1985, the monitored sections has increased to 14, 4 in mainstream and 10 on the branches, and had the same frequency of monitoring. But the monitored items increased to 20, besides the 12 items in 1983, added items were: BOD5, NO3-N, NO2-N, Cd, Cu, TP, etc.

In 1990 the monitored sections increased to 23, 6 in mainstream and 17 on the branches, and had the same frequency of monitoring. The monitored items increased to 22, two added items were TN and conductance.

In 1995 the monitored sections and monitored frequency were kept the same, along with the 22 monitored items, but added the oil to instead of chroma.

In 2000 the monitored frequency and items were kept the same, but the monitored sections decreased to 22, 7 in the mainstream and 15 on the branches.

From 2000 to 2004 Chinese government increased the input of water quality monitoring of Lancang-mekong river. Up to 2004, for the strength of the water quality monitoring in Mekong river, monitored sections decreased to 36, 8 in mainstream, 28 on the branches. 19 monitored items included: temperature, pH, conductance, DO, CODCr, CODMn, BOD5, NH3-N, volatile phenol, CN⁻, As, Hg, Cr⁶⁺, Pb, Cd, Oil, TP, F⁻, Anionic surface-active agent. Every year the water is monitored 6 times in 3 seasons: In March, April, July, August, November, and...
December. If we think the water will be use as resources of drinking water, the water quality should be monitored every month, or 12 times in a year. Furthermore, 2 items should be added to the list of things monitored: TN and fecal coliform.

3 Trends of water quality

Up to now, water quality has been kept good in the mainstream of the Mekong River; most cases were grade two or three. In recent years, China had stronger the protection of water and environment, and therefore trends of water quality shifted to better than in the past.

4 Online water quality auto-monitoring station

In December of 2003, an online water quality auto-monitoring station had been setup on the main stream located at Menghan ferry in Ganlanba Township, xishuangbanna Prefecture, (longitude 101°55′22″ East, latitude 21°51′08″ North). The distance to the boundary river between china and Myanmar is 83 Km. 7 monitoring items included TOC, Water Temperature, Nephelo, Conductance, pH, NH3-N, DO. Every hour the station can sample and record the data of 7 items.

5 Trend and expectation of water quality monitoring of Lancang-Mekong river

Following this, we can expect and believe that the capacities of water quality monitoring and biology monitoring in recent years will be advanced greatly. More skilled technicians from China will be involved the task of water quality monitoring using more advanced equipment. Furthermore, 7 online water quality auto-monitoring stations will be set up in the main stream. Furthermore, we will have more and more communications and cooperation in environmental protection between China and GMS countries.
Hydrological Modeling of the Mekong River Basin

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The whole Mekong River basin hydrological simulation is made possible by a distributed hydrological model: YHyM. Using all available information on climate, precipitation, land cover, geomorphology, and daily hydrological simulation on 2 minutes size grid cells is conducted for the past 20 years. The daily hydrological data from 1972 to 1976 is used for model calibration and from 1977 to 2000 for validation.

Such a model development is very important to analyze the basin-wide hydrological cycle and plan the efficient, fair and ecologically sound basin water management. A large basin hydrological simulation is not an easy matter as many processes are involved and the necessary data are not necessarily available. In YHyM, the precipitation including snow, radiation and other climatic data, topography, geology, land cover including vegetation and soil type, discharge, reservoir control, water intake etc. are integrated and streamflow, groundwater, water quality, sediments etc. are estimated.

What will be reported is mainly the simulation results on water quantity. The whole basin is divided into eight sub-catchments considering the natural sub-basins and the Köppen climate classification. The model parameters are calibrated manually considering their physical interpretation. In the calibration process, observed discharge from five gauging stations (Vientiane, Mukdahan, Nakhon-Phanom, Yasothon and Pakse) and the precipitation measured at 65 gauging stations over the catchment are used. Spatially distributed monthly average potential evaporation (PET) and potential interception evaporation (PET₀) are calculated using the Shuttleworth-Wallace method. In the PET and PET₀ calculations, mostly the publicly available sophisticated data such as NDVI, LAI, daily maximum and minimum temperature, wind speed, vapor pressure, radiation data, etc. are used. However the human impacts on water resources (e.g. dam operations, irrigation and domestic water use etc.) are neglected in this study due to lack of observed data.

The validation results indicate that the model could achieve Nash-Sutcliffe coefficient 75.9% and the annual total volume error –6 to +11% relative to what is observed in the upstream area of Pakse. The hydrographs at different locations show that the simulated discharge agrees reasonably well with the observed discharge hydrograph. However it is noticed that the peak flow discharges are not simulated well compared to low flow events. This is basically because the simulated flow is higher than the observed at Yasothon, Thailand (upstream of Pakse), where the actual discharge is very low due to the irrigation use and barrage/weir regulations.

The actual evaporation (ET) and the interception evaporation (ET₀) calculated by the model at different locations and for different land cover types in the basin are compared for the period 1982-1986. The points are arbitrarily selected to cover the whole basin and land cover types. The maximum ET₀ is observed in the mixed forest and minimum in the grasslands. The croplands at Laos and Thailand have different values of ET and ET₀ since their crop types are different. They all are quite reasonable.

It is observed that the variation of average root zone storage (SRZ) and that of ET are similar each other which agrees with the fact that the most evaporation takes place from the root zone.
The $SRZ$ in the basin varies between 15 and 27 cm while the actual root zone depth is about 50-250 cm depending on the land cover type. It is noticeable in the model output that when there is enough rainfall ET reaches nearly to its potential (PET) which agrees with physical reality.

The model accuracy (discharge, soil moisture state, etc.) of the internal points of the sub-basins has been examined and found physically reasonable. The soil moisture state and the ground water redistribution in the basin are well replicated by the BTOP model. This assures that model can achieve equal accuracy at any point in the catchment, which is an extremely important asset in water resources planning and management.

Model applications to other basins indicate that the model can be successfully applied to small as well as large catchments in humid region. However, the BTOP model performance in arid regions is poor as many other hydrological models are. This is due to extreme complexity of hydrological processes of arid region hydrology.

The BTOP model still needs improvements but the performance so far in humid region is good enough to assess the natural as well as human made changes of the water resources of the basin. Presentation will be made on the methodology and the potential area of application of this model to the Mekong River Ecological Monitoring.
MeREM Training Course:
Determination of microcystin and microalgal pigments

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In the training, we planed microcystins as cyanobacterial hepatotoxins, phycocyanin as a characteristic pigment of cyanobacteria, peridinin as a characteristic pigment of dinoflagellate and chlorophill-a as the indicator of bio-mass. However, the peridinin analysis was not performed by the limitations of time, equipment and sampling. In the case of microcystin analysis, the data obtained by the trainees from Cambodia and Lao PDR were quite different from the data obtained from professional analysts. In the pigments analyses, the data obtained by the trainees also varied. To make good use of this experience, we discussed the variation of the data. As a conclusion, accumulation of the analytical experience through the MeREM training course is necessary. The analytical methods used in the training are shown as follows:

1. Microcystin Analysis
In this training, microcystin is analyzed by HPLC, and confirmed by the addition of glutathione (GSH). Acetic acid (2.5mL) is added into a sample solution (50 mL). The mixture is sonicated for 3 min, and centrifuged at 2500 rpm for 20 min. Microcystin is extracted with 5% acetic acid solution, then the precipitated residue is sonicated with 5 ml of MeOH, and separated by centrifugation. The supernatants are combined and passed through a preconditioned solid extraction cartridge. The cartridge is washed with 1 mL of water and 1 mL of 20% methanol. Microcystin fraction is eluted with 0.4 mL of 80% methanol, and then squeezed out of the cartridge with 0.6 mL of water. The microcystin fraction is divided 0.5 mL each. One is used as a HPLC sample. Another is reacted with GSH in the presence of K2CO3 for 2 hr. The GSH-microcystin is eluted faster than microcystin by HPLC. Microcystin is confirmed by this peak migration.

2. Peridinin
Peridinin is a characteristic pigment of dinoflagellate. The pigment is extracted as follows: The filtered samples are extracted in 10 mL of ice-cold 90 % acetone, which had been degassed with nitrogen. The extraction is performed in the dark. Pigment extracts are obtained after homogenization of the filter with a glass grinder followed by centrifugation. The extract (25-400 μL) of the pigment is directly injected into an HPLC system after filtration with a Millipore FH filter (0.5 μm pore size).

The gradient-elution of HPLC is performed as follows:
From 100 % solvent A (ion-pairing solution-water-acetone-acetonitrile, 5:25:20:50, v/v) to 100 % solvent B (acetone-ethyl acetate, 50:50, v/v) in 20 min, followed by an isocratic hold at 100 % B over 5 min at a flow rate of 1.0 mL/min. In a fast flow mode, each time period of gradient elution is shortened to half of the original period, and the flow-rate is maintained at 2.0 mL/min. The ion-pairing solution consisted of tetrabutylammonium hydroxide (10 mL of a 0.5 M solution) and ammonium acetate (7.7 g) made up to 100 mL with distilled water. The solution is neutralized with acetic acid to pH7.1. The HPLC columns use ODS (3 or 5 μm, such as Mighty-sil C18 or Zorbax-ODS).
The eluted pigments are monitored at 440 nm. This method was cited from Kohata, K. et al. (1991) J. Chromatography, 558, 131-140.

3. Chlorophyll-a


Chlorophyll-a (CHLa) is also analyzed by HPLC. The HPLC condition is the same as that of peridinin. According to the results of Kohata et al., Peridinin is eluted at 11.34 min, whereas CHLa is eluted at 20.50 min.

UV-Vis spectrum methods of CHLa

Extraction: the same method as peridinin.

Determination: The UV-Vis spectrum of filtered raw extract is recorded and instrument derived absorption values recorded at 630, 645, 647, 664 and 665 nm for use in CHLa equations. All results are in \( \mu \)g/mL. "A" is the absorption at the wavelength (nm) indicated by subscript:

"SCOR-UNESCO (1966) 90% acetone;

\[
\text{CHLa} = 11.64A_{665} - 2.16A_{645} + 0.10A_{630}
\]

Jeffrey and Humphrey (1975) 90% acetone;

\[
\text{CHLa} = 11.85A_{664} - 1.54A_{647} - 0.08A_{630}
\]

Jeffrey and Humphrey (1975) with Humphrey (1979) 90% acetone;

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\text{CHLa} = 11.47A_{664} - 0.40A_{630}
\]

4. Phycocyanin

(T. Fukushima & M. Aizaki NIES Report F-72-'95)

Vis spectrum method

Extraction: Phycocyanin is extracted with 50 mM phosphate buffer (pH 7.0) at 4 °C for 10 hr. The extract is centrifuged at 5000 rpm for 10 min, the resulting supernatant is frozen at -20°C for 3 hr, and then thawed. The pH of the solution is adjusted to 4.5 with 1M citric acid for removing chlorophyll-protein. After the centrifugation at 9000 rpm for 10 min, the concentration of phycocyanin in the supernatant is determined at 620 nm as the \( \text{max} \) of phycocyanin and 750 nm. The absorption at 750 nm means existence of suspended substances in the sample. Therefore, phycocyanin concentration in the sample is shown as \([A_{620} - A_{750}]\)

HPLC Method

(T. Fukushima & M. Aizaki NIES Report F-72-'95)

Phycocyanin is also determined by HPLC using a gel-permeation column. The HPLC condition is as follows: Extraction, 10 mM phosphate buffer pH 7.0, at 3 °C for 12 hr. (Treatment of ultrasonic is not effective for the extraction); Column, TSK SW-3000, 6.4 mm × 60 cm): Mobile phase, 10 mM phosphate buffer pH 7.0; Flow rate, 1.0 mL/min; Detection, UV at 620 nm; Fluorometric, Ex at 605 nm, Em 638 nm; Minimum detection limit by fluorometric: 0.2 ng; Rt of phycocyanin: about 12 min.
For long-term monitoring of microalgae in the Mekong River and its basin, the acquisition of identification skills of microalgae seems to be a top priority. We have proposed a provisional protocol of monitoring methods of algae (Watanabe et al. 2005a). To practice these monitoring methods, as well as for further improvement using modern techniques, we have to know various things. International Training Course in Microalgae and Their Toxin Analysis was held in Kasetsart University, Bangkok, from December 20 to 25, 2004 (Watanabe et al. 2005b). This training course was held as a part of capacity building activities for biodiversity monitoring of Mekong River. Lectures on taxonomy of cyanobacteria, diatoms and other eukaryotic algae, and collection, isolation and cultivation techniques for living algae, and biomass measurement techniques for fixed samples are given, as well as chemistry of cyanobacterial toxins (reported by Prof. Kunimitsu Kaya). After the field trip for collection of algal samples, practical training on isolation and identification of microalgae was also conducted. Participants were each two persons from Cambodia, China, Laos, Thailand and Vietnam. Lecturers and instructors were Prof. Makoto M. Watanabe (NIES), Prof. Ladda Wangrat (Kasetsart University), Dr. Wichien Yongmanitchai (Kasetsart University), Dr. Masanobu Kawachi (NIES) and Dr. Fumie Kasai (NIES).

For cyanobacterial taxonomy, bacteriological approaches are used based on guidelines including morphological, biochemical, genetic, physiological and ecological characteristics (Castenholtz 2001). In the lecture, examples of these approaches were indicated on the colonial cyanobacterial genus *Microcystis* and the filamentous cyanobacterial genus *Oscillatoria*, which are two major genus producing water bloom. Based on cell sizes, colony morphology, biochemical and molecular characteristics, five different species of *Microcystis* (*M. aeruginosa*, *M. ichtyoblabe*, *M. novacekii*, *M. viridis* and *M. wessenbergii*) were unified into a single species, *M. aeruginosa*. Diatoms are easily recognized by siliceous cell walls, composed of two valves, and are the main component of the lotic environment such as the Mekong River. The cell size, shape and sculpturing of cell walls are taxonomically diagnostic. In the lecture, these characteristics were explained using light and scanning electron microscope photographs. Recent extensive studies on evolution and phylogeny of eukaryotic algae disclosed polyphyletic states of algae; some are close to protozoa and others are close to plants than other algal groups. However, such diversified organisms are clearly distinguished by the molecular phylogeny, ultrastructure (e.g. flagella, chloroplasts, cell coverings), photosynthetic pigment compositions and storage products. Now, nine phyla and more than 20 classes are recognized. Evolution by endosymbiosis and key characters of each phylum were reviewed in the lecture. Determination of species composition and biomass measurements of phytoplankton and benthic algae represents standard methods of algal monitoring. These methods, as well as isolation and cultivation techniques for living materials were also reviewed in the lecture. The provisional protocol adopted these standard methods for monitoring of algal composition and biomass. Although these methods are essential for basic information, these are laborious and require experiences. However, participants’ specialties were not always biology. Thus, simple methods
may be appropriate. In this sense, proposal of an additional protocol using modern identification
techniques by DNA sequence analysis would be required.

Reference
Report of the workshop on bio-diversity in species and genetic markers of fish in Mekong river

Apichart Termvidchakorn\textsuperscript{1} and Nobuhiko Taniguchi\textsuperscript{2}

\textsuperscript{1} Inland Fisheries Resources Research & Development Institute, Department of Fisheries, Thailand
\textsuperscript{2} Graduate School of Agricultural Science, Tohoku University

I. Training on taxonomy of Mekong fish held in Udonthani, Thailand

The workshop on identification of Mekong fish was held at Udonthani provinces in northeastern Thailand during July 25-29, 2005. The number of participants was increased from 10 to 21 persons by which the Assessment of Mekong Capture Fisheries Component under the MRC Fisheries Program supported, in part, for the extra participants from the lower Mekong Basin countries including Thailand, Laos, Cambodia and Vietnam for capacity building of their young scientists. The workshop contents include taxonomic survey, techniques for adults, post-larvae and juvenile fish species identification and data recording in term of drawing and photography. The training consisted of classroom lecturing and field sampling. The participants were also showed how to prepare the species list paper and how to draw fish larvae under the stereomicroscope and camera lucida.

Schedule of the workshop

24 July 2005 Arrival in Bangkok
25 July 2005
\begin{itemize}
  \item 0900-1000 Opening ceremony
  \item 1000-1200 Principle of taxonomy
  \item 1200-1300 lunch
  \item 1300-1630 Principle of taxonomy (Continue)
\end{itemize}
26 July 2005
\begin{itemize}
  \item 0830-1000 How to collect specimens
  \item 1030-1200 How to preserve and do the collection
  \item 1200-1300 lunch
  \item 1300-1430 How to take pictures
  \item 1500-1630 How to describe
\end{itemize}
27 July 2005
\begin{itemize}
  \item 0800-1700 Field collection in Nongkhai province
\end{itemize}
28 July 2005
\begin{itemize}
  \item 0830-1630 Practical work on fish identification
\end{itemize}
29 July 2005
\begin{itemize}
  \item 0830-1630 Practical work on fish larvae identification
\end{itemize}
30 July 2005 Depart Udonthani to Bangkok and home countries

Remark: There will be 2 coffee breaks at 1030-1045 and 1440-1445
List of Participants

1) Japan Support

Lecturers
1. Apichart Termvidchakorn (Inland Fisheries Resources Research & Development Institute Department of Fisheries, Thailand)
2. Chavalit Vidthayanon (Freshwater Fish Systematic Unit Museum Division, Department of Fisheries, Thailand)
3. Pairoj Sirimontaporn (Inland Fisheries Resources Research & Development Institute Department of Fisheries, Thailand)

Resource persons
1. Dr. Nobuhiko Taniguchi (Graduate School of Agricultural Science, Tohoku University)
2. Dr. Masamashi Nakajima (Graduate School of Agricultural Science, Tohoku University)
3. Mr. N.uepon Sukumasavin (Inland Fisheries Research and Development Bureau, Department of Fisheries, Thailand)

Cambodia
1. Mr. Leng Sam Ath (Department of Fisheries, Inland Fisheries Research and Development Institute)
2. Mr. Thach Panar (Department of Fisheries, Inland Fisheries Research and Development Institute)

Lao PDR
1. Mr. Sinthavong Viravong (Fisheries Research in Fisheries Division, Department of Livestock and Fisheries)
2. Mr. Somphan Phanousith (Living Aquatic Resources Research Center)

Vietnam
1. Mr. Nguyen Nguyen Du (Research of the Division Environment and Fishery Resources)
2. Mr. Lam Ngoc Chau (Research of the Division Environment and Fishery Resources, Institute for Aquaculture)

Thailand
1. Ubolratana Suntornratana (Udonthani Fisheries Research Center, Department of Fisheries)
2. Noppamard Nipionkit (Inland Fisheries Research and Development Bureau Department of Fisheries)
3. Apiradee Hunpongkittikul (Inland Fisheries Research and Development Bureau Department of Fisheries)
4. Siriwan Suksiri (Inland Fisheries Research and Development Bureau Department of Fisheries)

Japan
1. Thawatcahi Ngamsiri (Graduate School of Agricultural Science, Tohoku University)
2) AMCF (MRC) Support

Lao PDR
1. Mr. Kongpheng Boukhamvongsa,
2. Mr. Vannaxay Soukaseum,
3. Ms. Vannida Boulaphanh

Thailand:
1. Ms. Tiwarat Thalerngkietleela,
2. Mr. Anupong Sanitchon,
3. Ms. Siranee Ngoichansri
4. Ms. Wirawan Rayan

Cambodia
1. Dr. Chea Tharith

II. Outcomes from the mini-workshop on fish genetic diversity held in Bangkok, Thailand

Place: Walailuk Building, Kasetsart University, Bangkok, Thailand

Time of workshop: 15-16, March 2005

In attendance: Dr. Nobuhiko Taniguchi (Japan); Dr. Masamashi Nakajima (Japan); Dr. Uthairat Na-Nakorn (Thailand); Dr. Wongpathom Kamonrat (Thailand); Mr. Lieng Sopha (Cambodia); Mr. Mr. Sinthavong Viravong (Lao); Mr. Nguyen Van Sang (Vietnam); Mr. Naruepon Sukumasavin (Thailand); Mr. Kent Hortle (MRC Fisheries Programme); Ms Ubohratana Suntornrattana (Thailand).

The purpose of the mini-workshop

Purpose of meeting was to exchange information among the riparian countries and organization that work on the fish diversity in the Mekong River.

Issues for the workshop

Four issues were discussed during the workshop as follows:

1. The workshop discussed about the possibility of information exchange on the Mekong fish diversity including genetic diversity and species diversity. The workshop also shared their opinion on the present status of the fish diversity project under the MeREM. The workshop also agreed upon selected fish species that will be monitored under the MeREM project. In addition, the representative from MRC Fisheries Programme agreed with the concept of the MeREM and looking forward to exchange information and work closely with the MeREM.

2. The workshop discussed and agreed on the preparation of the Training course on fish identification which will be held in Thailand during 25-30 July 2005 at Udonthani, Thailand. Two participants from each riparian country will be invited. The MeREM welcomed if the MRC Fisheries Programme support its counterparts to join this workshop.
3. The workshop discussed and agreed to develop a training course on method of fish genetic diversity study. This training course will be held in Thailand in 2006 at Bangkok, Thailand. The precise date and number of participant will be further discussed.

4. Finally, the workshop discussed on collaboration work on evaluation of genetic diversity of the Mekong giant catfish.

Schedule for the International Meeting on Genetic Diversity of Mekong Fishes

14 March 2005

9.00-9.25 a.m. Opening Ceremony and Address on Importance of the Project by Professor Dr. N. Taniguchi, Tohoku University

9.25-9.50 a.m. Genetic diversity of catfishes of the family Pangasiidae in Thailand based on mt-DNA by Ms. Srijanya Sukmanomon, Kasetsart University

9.50-10.15 a.m. Identification of Mekong catfishes using microsatellite DNA markers by Mr. Thawatchai Ngamsiri, Tohoku University

10.15-10.40 a.m. Genetic diversity of the captive Mekong giant catfish by Associate Professor Dr. M. Nakajima, Tohoku University

10.40-11.05 a.m. Coffee break

11.05-11.30 a.m. Genetic population structure of seven line barb by Mr. Naruepon Sukumasvin, Department of Fisheries

11.30-11.55 a.m. The monitoring success and impact of hatchery stocks on three different fish species in the lower Mun River by Dr. Wongpathom Kamonrat, Department of Fisheries

11.55-13.00 p.m. Lunch Break

13.00-13.25 p.m. An attempt to avoid inbreeding in Mekong giant catfish using parentage study by Ms. Kednapat Sriphairoj, Kasetsart University


13.50-14.15 p.m. Genetic diversity of Pangasius sanitwongsei in Thailand by Mr. Panya Sae-Lim, Kasetsart University

14.15-14.40 p.m. Current status of endangered ornamental fishes in Mekong River by Dr. Chavalit Vidthayanon

14.40-15.05 p.m. Coffee break

15.05-15.30 p.m. Information on larvae collection in Mekong River by Dr. Apichart Termvichakorn, Department of Fisheries

15.30-15.55 p.m. Conclusion of the meeting

15 March, 2005 (For invited participants)

9.00-12.00 a.m. Group discussion

12.00-13.30 p.m. Lunch break

13.30-1500 p.m. Group discussion
## List of speakers and organizers

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<td>1</td>
<td>Prof. Dr. Uthairat Na-Nakorn</td>
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<td><a href="mailto:ffisurn@ku.ac.th">ffisurn@ku.ac.th</a></td>
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<td>2</td>
<td>Prof. Dr. Nobuhiko Taniguchi</td>
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<td><a href="mailto:nobuhiko@bios.tohoku.ac.jp">nobuhiko@bios.tohoku.ac.jp</a></td>
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<tr>
<td>3</td>
<td>Ms. Srijanya Sukmanomon</td>
<td>Department of Aquaculture, Faculty of Fisheries, Kasetsart University, Bangkok 10900, Thailand</td>
<td><a href="mailto:g4882012@ku.ac.th">g4882012@ku.ac.th</a></td>
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2. Ramangala Institute of Technology, Ayutthaya Huntra Campus, Hantra, Pranakorn Sri Ayutthaya 13000, Thailand | nngamsiri@yahoo.com         |
<p>| 5 | Asso. Prof. Dr. Masamichi Nakajima | Laboratory of Population Genetic Informatics, Graduate School of Agricultural Science, Tohoku University, Sendai 981-8555, Japan Tel. +81-22-717-8741, Fax. +81-22-717-8743 | <a href="mailto:mnkjm@bios.tohoku.ac.jp">mnkjm@bios.tohoku.ac.jp</a>    |
| 6 | Mr. Naruepon Sukumasavin    | Department of Fisheries, Ministry of Agriculture and Cooperatives, Chatuchak, Bangkok 10900, Thailand                                                                                                        | <a href="mailto:naruepos@fisheries.go.th">naruepos@fisheries.go.th</a>    |
| 7 | Dr. Wongpathom Kamonrat     | Department of Fisheries, Ministry of Agriculture and Cooperatives, Chatuchak, Bangkok 10900, Thailand                                                                                                         | <a href="mailto:wongpatk@fisheries.go.th">wongpatk@fisheries.go.th</a>    |</p>
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|   |   | 8 Ms. Kednapat Sriphairoj  
Department of Aquaculture, Faculty of Fisheries, Kasetsart University, Bangkok 10900, Thailand  
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|   |   | 9 Ms. Jitraporn Phong-isara  
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Department of Aquaculture, Faculty of Fisheries, Kasetsart University, Bangkok 10900, Thailand  
g4762024@ku.ac.th |
|   |   | 11 Dr. Chavalit Vidthayanon  
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chavaliv@wwfthai.org |
|   |   | 12 Dr. Apichart Termvichakorn  
Department of Fisheries, Ministry of Agriculture and Cooperatives, Chatuchak, Bangkok 10900, Thailand |
Listing dragonfly species of Mekong Watershed and database construction

Yoshitaka Tsubaki and Chihiro Kato
Biodiversity Conservation Research Project
National Institute for Environmental Studies,
16-2 Onogawa, Tsukuba, 305-8506 Japan

As a first step of inventory study on invertebrates in Mekong Watershed, we have collected scientific papers and books reporting records of dragonflies from Thailand, Vietnam, Laos, Yunnan, and Cambodia. In addition, we have collected photographs and drawings from various papers, books and web sites, which might be helpful for identification. If locations of species records were available, we plotted them on maps. Although records were usually not from the Mekong Watershed, the species list we made probably may cover the most of dragonflies inhabiting this area. Although not complete yet, we constructed a electronic version of a dragonfly identification guide.

All information we collected was stored in the database software Linneus II. Until today, the species list includes 769 species without including synonyms from 57 literatures. The numbers of species in each taxonomic group (family) were as follows; Amphipterigidae (3), Chlorocyphidae (31), Euphaeidae (30), Calopterygidae (35), Lestidae (26), Synlestidae (2), Megapodagrionidae (22), Platystictidae (34), Protroneuridae(27), Platyctemidae (69), Coenagrionidae (90), Diplebiidae (7), Gomphidae (124), Isostictidae (3), Aeshnidae (61), Chlorogomphidae (20), Cordulegastridae (5), Corduliidae (54), Libellulidae (129). In some taxonomic group (for example Cordulegastridae, Gomphidae), there seems many species not described yet, most species in other group probably have described.

Among these families, forest/river dwelling group would be suitable as indicator species because they are usually most sensitive to water quality and riverside vegetations. They may be found mainly from Zygoptera including Chlorocyphidae, Euphaeidae, Calopterygidae, and Megapodagrionidae. Number of species recorded in each country (or province) is as follows; Thailand (547), Vietnam (364), Laos (248), Yunnan (8), Cambodia (81).
Science-Journalism Collaboration: 
An Experiment in Closing the Communication Gap

Penelope Canan, Ph.D., Executive Director, 
International Project Office, Global Carbon Project, 
National Institute for Environmental Studies

Public support for science, public understanding of environmental risks, and public involvement in environmental protection and decision making—are a few of the reasons that scientists and journalists need to collaborate in order for both professions to fulfill their common mandate to serve society. Unfortunately, there exist a number of differences to effective communication between scientists and journalists, e.g., communication styles and skills, professional jargon, mistrust, time constraints, and orientation to knowledge types and "facts." This paper reports on an experiment in building bridges across these differences in a three-day training workshop aimed at journalists and scientists in Southeast Asia and Japan. Efforts to forge science-journalist partnerships were partly successful and received positive evaluation by participants. Strengths and shortcomings of the training and the outcomes are discussed. One very positive outcome was the continuation of dialogue among the participants as scheduled at a formal meeting of the group at a subsequent workshop in Vietnam scheduled for November 2005.
**Transboundary Environmental Issues in the Mekong River Basin:**
Perspectives from Civil Society and Recommendations for MeREM

Satoru Matsumoto & Kaori Ohsawa, Mekong Watch

Mekong Watch has been working with local people and civil society in the Mekong River basin since 1993. As such NGO working for more than 10 years on this region, we welcome MeREM project as an initiative with the potential to contribute not only to scientific knowledge base of the natural environment in the basin, but also to the efforts of practitioners in the region who are working to address transboundary environmental issues, who includes local people, researchers, community organizers and various NGOs.

As to MeREM related research activity in 2004, Mekong Watch reviewed existing social science reports compiled by researchers and NGOs in the past several years. Focus was placed on those reports related to water quality, hydrology and biodiversity. We also interviewed NGO staff, researchers and community organizers to collect information about their current and planned activities related to hydrology, water quality and biodiversity (in particular, aquatic plants and fish). Some of them also provided us their own opinions or hopes towards MeREM project. Based on that information, we summarized our findings and put them into 2004 report to inform MeREM of the concerned activities in the region, and provided recommendation on the way of monitoring hydrology, water quality and biodiversity along the river.

Through the activity, we found out the fact that local people face various serious problems as a result of the changes of ecosystem of the Mekong River. More specifically, they suffered from the phenomena such as: decline of their fish catch, unnatural flood and water fluctuation followed by the sweep of their houses, fish gear, boats and riverbank gardens, changes of ebb and flow pattern of the lake which makes villagers hard to predict when to cultivate, disappearance of waterweed such as Kai; lives lost due to sudden flushing water from upstream, serious health problems including itchiness, rashes and eye irritation after bathing in the river, diarrhea, malaria and water-relevant diseases in their floating villages, and so on. MeREM should monitor these issues recognized by local people and such monitoring will lead to mitigation of future negative impacts.

In terms of geographical interests among civil society groups in the region, Mekong Watch identified following 4 focal areas where the above problems have some relations each other and are considered to be significant among local people and civil society in the basin: 1) upstream on the Lancang Mekong’s mainstream, 2) Mekong River Tributary which flows across national borders, 3) Domestic Tributaries, case studies in Thailand, and 4) Tonle Sap Lake in Cambodia. Among these regions, Mekong Watch recommended MeREM in particular to focus on Upstream Mainstream and International Tributaries of the Mekong River due to their seriousness of transboundary impacts and potential positive roles of scientific data in order to address concerns among local people and NGOs (specific issues in these two areas are described below).

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1 Representative Director of Mekong Watch and lecturer at Hitotsubashi University
2 China Program Coordinator of Mekong Watch
In addition to concrete impacts and geographical targets to be monitored, Mekong Watch recommended MeREM to respect present relevant studies and people’s initiatives. Mekong Watch found that several local groups are doing or interested in community-based research/monitoring projects, which may help compile relevant and significant data to MeREM. At the same time, such methodologies will make scientific data useful for local people and NGOs working on this field. Mekong Watch recommended MeREM to contact and collaborate with such local groups as a preparation for future comprehensive monitoring system.

**Focal Region 1: Upper Mainstream from Yunnan Province to Northern Thailand**

In this region, there are 2 completed, 2 under construction, and 10 dams planned for construction on the mainstream of the Lancang River, and are considered to have great impacts both on Yunnan local communities and on downstream countries, especially in terms of water flow change and sedimentation. Although the real impacts caused by these dams are controversial as it is hard to clarify its causal relation, there are some voices from downstream communities such as Laos and Northern Thailand to claim possible causal relations with dam projects in China. Blasting of rapids to promote commercial navigation between China and downstream countries may also cause great concern among local people who depend on complex natural systems of the river. We found there is a research conducted by local people called *Thai Baan Research* in Northern Thailand. In this study, local people put their knowledge about Mekong’s complex ecosystem into document, which is expected to be precious base line data for future change of the ecosystem.

**Focal Region 2: Tributaries, which cross national borders of Vietnam, Cambodia and Laos**

Se San and Sre Pok rivers whose sources are located in the Central Highlands of Vietnam, converge at a point about 50 km east of the town of Stung Treng in Cambodia, and then are joined by the Se Kong River, which originates in the southern part of Laos. In 2001, the Yali Falls Dam was completed on a tributary of the Se San River in Vietnam. According to the survey report conducted by Ratanakiri Province in Cambodia and local NGOs, the Yali Falls Dam caused severe impact on downstream communities in 2000. The report found that 32 people’s lives were lost, instances of flooding, water quality deterioration and damage to fisheries was caused at the local community at Ratanakiri Province. In August 2005, the water release from Yali Falls Dam caused flood in Ratanakiri Province again, and it led to the death of one woman and severe injury of three people as a result.
Establishment of Core Laboratory at Kasetsart University

Dr. Wichien Yongmanitchai (fsciwcy@ku.ac.th)  
Kasetsart University, Bangkok, Thailand  
Prof. Dr. Kunimitsu Kaya  
Tohoku University, Sendai, Japan  
Dr. Akio Imai  
National Institute for Environmental Studies, Tsukuba, Japan

Introduction
The major activity of MeREM is to collect quality data of Mekong River with regards to water quality and diversity of selected organisms including fish, algae, invertebrate, benthos and microorganisms. From the capacity building survey completed in 2003, it was made clear that most of the participating institutions of the riparian countries were not sufficiently equipped to analyze collected samples to obtain anticipated data. In view of the limited funding to established sophisticated laboratory in each country, the International Committee of MeREM has agreed upon establishing a Core Laboratory. The laboratory space is provided by Kasetsart University while the equipments are financially supported by Ministry of Education, Cultures, Sports, Science and Technology and the National Institute for Environmental Studies.

Objectives
1. To facilitate analyses of samples collected from Mekong River by researchers of riparian countries.
2. To provide analytical services of samples collected from Mekong River.
3. To improve research capability of researchers from riparian countries through training programs at the core laboratory.

Equipments
A dedicated laboratory space has been allocated at the Department of Microbiology, Faculty of Science, Kasetsart University. A set of equipments designed for analyses of water quality parameters includes,
2. Autoanalyzer (Bran + Luebbe AA-II ).
4. UV- Vis Spectrophotometer (UV-1700, Shimadzu, Kyoto, Japan).

Activity Plan
1. A training program in water quality assessment will be conducted probably around the end of February 2006.
2. Preliminary trials on practical procedure of sample handling from riparian countries to the laboratory.
3. Supporting researchers from riparian countries to perform sample analyses at the laboratory with limited funding supports by MeREM.
Set up the first Core Laboratory in Kasetsart University

Kunimitsu KAYA
Graduate School of environmental Studies
Tohoku University, Sendai, Japan

From the beginning of the MeREM project, we have planned to establish laboratories for the monitoring of the Mekong River basin in each country. This year, we had a chance to set up a laboratory in the Department of microbiology, Faculty of Sciences, Kasetsart University, Bangkok, Thailand. The instruments set up in the laboratory are LC/MS, TOC meter, UV spectrophotometer, and some research equipment. These instruments were provided from Shimadzu Co Ltd (Kyoto, Japan) at discount prices. In the case of LC/MS, the power supply unit was exchanged for the Thailand electricity, and a nitrogen gas making machine was attached with the ionization apparatus of LC/MS. Photodiode array detector was also combined with the LC/MS.

The Core Laboratory will be open at the beginning of this December, and start to analyze the monitoring samples.

The training for operation and maintenance of LC/MS was held for 3 days at the last week of September, 2005. Two scientists belonging to Kasetsart University and NIES participated the training.

Outline of the training at Technical Center of Shimadzu Co. Ltd in Kyoto is shown below.

1st day 10:00 Welcome address and guidance on the training
11:00 Operation training of LC/MS
   1. Basic system of LC/MS, Components, Connection of LC and MS, Flow lines, Flow rate and tube diameter, Mobile phases.
   2. Ionization system, Operation guide using computer
   3. Basic operation
16:00 Finished

2nd day 9:30 Operation training
   Auto tuning
   Analysis of microcystins, Quantitative determination
   Data and methods files making
   Operation
16:00 Finished

3rd day 9:30 Maintenance Training
   Dismantle and assembling of ESI
   Exchange of CDL
   Cleaning of the spray unit
   Cleaning of the lens unit
   Explain of the Q-MS unit
16:00 Completion Ceremony

Training for TOC operation was also held at NIES, Tsukuba, Japan. Next year the Core Laboratory will produce excellent data on the monitoring.
Data and Information Sharing System

Toshiaki ICHINOSE, Shinobu NIWA and Kumi KATAOKA
(National Institute for Environmental Studies)

1. Web Page
In order to upload data and information sharing system, a web page for MeREM has been prepared (Figure 1). The main part of the data and information sharing system is now under development. A compilation of the data that we have already obtained is opened only for project members.

2. Data Base
Four large organizations and databases dealing with data of the Mekong River are already in existence.
1. MRC (Mekong River Commission)
2. GMS (Greater Mekong Sub-region)
4. Global map edited by the International Steering Committee for Global Mapping
   Data from those organizations and databases are supposed to be added our MeREM database. In addition to collecting data from such kind of existing databases, arranging original data of our MeREM project is quite important. It is necessary to collect data from study group in the MeREM project.

3. Data and Information Sharing System
The frame of the data sharing system is almost completed and in the process of trials. (Figure 2). It is planned to obtain and add data under restriction of user’s category. In the future, this system will be uploaded on the MeREM web page. The computer server is scheduled to be set at the MeREM office in the Kasetsart University.

4. Future Requirement
It is vital to keep working with this data and information sharing system and checking the data quality after the completion of the MeREM project.

Figure 1. MeREM Web Page
Figure 2. Frame of data and information sharing system