Asia-Pacific Network for Global Change Research

Asian Mega-Deltas: Monsoon Circulation in Relation to Deltaic-Coastal Hazards and Future Mitigation – Millennial to Seasonal Dimensions

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Final report for APN project: ARCP2008-08CMY-Chen

Asian Mega-deltas: Monsoon circulation in relation to deltaic-coastal hazards and future mitigation – millennial to seasonal dimensions

Project Reference Number: ARCP2008-08CMY-Chen

Final Report submitted to APN

Overview of project work and outcomes

Non-technical summary

This 2-years APN-project 'The Mega-deltas of Asia: A Conceptual Model and its Application for Future Delta Vulnerability' is the continuation of the former APN megadelta project completed in 2003-06. As strongly suggested by many of our megadelta colleagues – the capacity building networks established since 2003, we, on the basis of the previous project output, proposed the current project theme, and was luckily approved by the APN second strategic plan again. The main objective of the project is to: 1) continue the long-term capacity building networks of our Asia-Pacific megadelta family, 2) continue to exchange and disseminate the relevant knowledge of delta-coast monsoon and associated environmental evolution to all, especially those from developing countries; and 3) continue to enlarge the influence of delta-coast impact in response to global change to our society. The project has organized one seminar (Vietnam-venue, 2007), and two workshops (Dhaka-venue, 2008, and Shanghai-Qingdao venue, 2008). Totally, there were >two hundred participants attended the seminar/workshops, who came from 21 countries, of which 10 from developing countries. During the workshops, local policy-maker, social scientists were invited to present their ideas. Communication went effective among natural and social scientist, geoengineers, policy-maker, and government administrator, leading to possible modification of relevant policy of delta-coast in relation to mitigating monsoonal hazards in the future. It is certainly encouraging to see many younger scientists involved to our project. Post-workshop field trips to the B-G, Yangtze and Yellow river delta coast were organized, which provides unique opportunity for all to further understand the implications of monsoonal processes and hazardous mitigation.

Objectives

The main objectives of the project are:

1. To continue our Asia megadelta capacity building networks;
2. To exchange and disseminate knowledge of the delta-coast regarding Global change significance
3. To enhance more effective communication among natural and social scientists, government officers, decision makers and industrials for possible policy modification in delta-coast environmental conservation now and in near future.

Amount received and number years supported

The Grant awarded to this project was: US$ 58,000

US$ 38,000 for Year 1, 2007-2008:

US$ 20,000 for Year 2, 2008/2009:

Activity undertaken

The project runs primarily two International Workshops. i.e. Dhaka-venue, Bangladesh, January 6-12, 2008 and Shanghai – Qingdao-venue, China, Oct. 27 – Nov. 3, 2008. Tutorial training for younger earth scientists were organized during the workshops. Post-workshop field trips to the B-G, Yangtze and Yellow river delta/estuary were organized to view the monsoonal impact on the coastal hazards and management. Pre-meeting together with one-day seminar was held in Ha Noi of Vietnam, July 5-6, 2007, during when project Pi and Co-Pi met to discuss the project plan, assignment, and arrangement, etc. A large amount of raw data was collected and samples were treated in many institutions as the new results for all participants during the conferences. In addition, our Pi and Co-Pi actively led several fieldworks in selective river catchment – estuaries, including the Yangtze, Song-Hong, Mekong and Ganges-Brahmaputra river deltas. Means used for the project were coring, seismic profiling and ADP (Acoustic Doppler Profiler). Literature

documents, hydrological and precipitation data were primarily collected from local meteorological and hydrological gauging stations. Satellite images were requested from many of our key members, who have been dedicated to the establishing database.

Results

Through painstaking efforts have been made to the project, we are approaching aimed project outputs that can be presented below.

- The Asia megadelta building capacity networks has been further strengthened. During the workshops, our working groups derived from the previous project i.e. East Asia, Southeast Asia, South Asia, and Oceania working groups were integrated during thematic discussion, but were to focus on the local issues while standing separately. This flexibility. All participants attended the working-group discussions on the basis of their target regions and research objectives. Discussion went extremely well in terms of a series of proposed environmental issues, research foci, and future plan, etc. All have been summarized and shown in the workshop proceedings, and on the project website as well (Chen et al., 2005; East China Normal University, 2008; Geological Survey of Bangladesh et al., 2008; http://www:megadelta.ecnu.edu.cn);
- All participants are appreciate the existing capacity networks, and strongly supporting to seek any potentials to continue this networks as the most important Asia component while tackling with global change;
- A substantial communication took place among administrative officers, social scientists and natural scientists. During workshops, Minister and Deputy Minister of Department of Mineral Resources of Thailand, and director of Academy of Science of Vietnam ere present to give key-note presentations and relevant discussions;
- Two workshop abstract volumes, website, CD, and seminars contributed by >250 participants were issued to address the project objectives. On this base, our project leaders (Drs. Z. Chen, S. Yoshiki, and G. Steven) are editing a Special Issue on the International Journal of 'Earth Surface Processes and Landforms' - Holocene Megadeltas: Sedimentary Process, Evolution, and Future, which is planned to publish in 2010.
- A website for the project has been established: hppt://www.megadelta.ecnu.edu.cn which has been certainly useful in circulating project updates;

Relevance to APN's Science Agenda and objectives

The proposed project will focus on monsoon circulation in relation to hazard mitigation on deltaic-coastal regions. Specifically, the study will coordinate regional climatological databases with the process-response model developed in our previous APN Asia megadelta project (2003-05). With an established network of participants (>100, mostly from developing countries), the proposed study is in a strong position to integrate current understanding of the Asian monsoon with the resulting morphological modification of regional coastal environments, particularly via controls on precipitation and runoff. We believe that there is a persistent gap between science, assessment, and policy. Therefore, this study is trying to fill in this gap by the planned research developments and regional workshops under **CAPaBL**, aiming at an effective communication among physical, social scientists, and policy-makers towards policy modification to maintain a sustainable delta-coast system

Self evaluation

There are two aspects that I can fairly assess our project achievements set-forth as originally planned. For scientific goal, I should say that our project has been extremely successful, in terms of the establishment of capacity building networks, the conceptual modal of the Asia megedelta formation, and the conference publications, including peer-review papers in top journals. For the goal of societal sustainable development, I am still happy to see the progress that our project has achieved. This has reached the goal of what is proposed in the project proposal, such as effective communication with government

officers, administrators and decision makers, etc. It is quite obvious that our communication with delta-coast knowledge transfer went such well that it has helped the possible policy modification on the local delta coast conservation, such as in the Yangtze and Chao Phraya. However, as we all understand, policy modification linking to global change through project implementation is a long-term strategic goal and we need to be persistent in the future attempt

Potential for further work

By the time of project completion, many colleagues have expressed their sincerity to support the continuation of this long-term capacity networks established since 2003. The project leaders would also feel responsible for the future collaboration through any potential of funding sources. We realize that most important value of the megadelta project is such a great networks consisting of many experienced scientists that database and knowledge can be shared with each other. Taking the dual pressures of increasing climate warming and intensifying human activity into consideration, the project leaders would make it possible to sustain the networks, by calling attention for delta-coast response to global change. To do this, we are planning future financial sources, including APN, and inter-government and non-government organizations, such as IGBP, IHDP, LOICZ, and IGCP. This would help us further achieve Global-change related results. The project leaders are now planning next project, aiming at: 1) regional workshop to share information with each other; 2) integrating new database in combination with case study in some represented delta regions, and 3) continuation of our great effort to expend the knowledge of delta-coast environmental conservation.

Publications (APN acknowledged)

1. APN/IGCP476 – Shanghai International Conference on Deltas (abstract collection in conjunction with EMECS-8 International Conference), Harmonizing River Catchment and Estuary. Oct. 27 – 30, 2008, Shanghai, China, 246pp.
2. APN/IGCP476 - Dhaka International Conference on Deltas (abstract collection), 2008: Deltaic Gateways - Linking Source to Sink. Geological Survey of Bangladesh, University of Rajshahi, University of Dhaka, 86pp.
3. Chen, Z., Zong, Y.Q., Wang, Z.H., Chen, J., and Wang, H. 2008. Migration Patterns of Neolithic Settlements on the Abandoned Yellow and Yangtze River Deltas of China. Quaternary Research 70: 301–314.
4. Shafi Noor ISLAM, Albrecht GNAUCK, 2008. The Mangrove Wetland Ecosystems in the Ganges-Brahmaputra Delta in Bangladesh. Frontier of Earth Science in China. Front. Earth Sci. China 2008, 2(4): 439–448.
5. Yu, F., Chen, Z., Ren, X., and Yang, G., 2009. Analysis of historical floods on the Yangtze River, China: Characteristics and explanations. Geomorphology (on-line available).
6. Wang, Z.J., Chen, Z., Li, M.T., Chen, J., Zhao, Y.W., Wang, H., Yu, F.Y., 2009. Variations in downstream grain-sizes to interpret sediment transport in the middle-lower Yangtze River, China: A pre-study of Three-Gorges Dam. Geomorphology (on-line available);

Special Issue (in editing)

1. Chen, Z., Yanagi, T., and Wolanski, E. (eds.), 2009. Ecohydrology of Asian Estuaries (Special Issue on Estuarine, coastal and Shelf Sciences).
2. Chen, Z., Yoshiki, S., and Goodbred, S. (eds), 2009. Megadelta evolution – morphodynamical processes (Special Issue on Earth Surface Processes and Landforms).

CD-ROM

Thematic discussion and fieldtrip of Bangladesh venue, January 6-112, 2008, and Shanghai – Qingdao venue, October 27 – November 2, 2008.

Website:

http://www.megadelta.ecnu.edu.cn

References

Chen, Z., Saito, Y., Goodbred, S. Jr, Tran, D. T, and Islam, B., 2005. Asian Megadeltas: Geological Evolution and Human Impact. China Ocean Press, Beijing, 268pp;

Geological Survey of Bangladesh, University of Rajshahi, University of Dhaka, and IGG, Geological Survey of Japan, AIST, 2008. Abstract proceedings – International Conference on Deltas: Deltaic gateways – Linking source to Sink, Bangladesh Venue, January 6-13, 2008, Dhaka, 85pp.

East China Normal University, 2008. Abstract proceedings, EMECS-8 International Conference – Harmonizing River catchment and Estuary. Jointly with DeltaMAP and APN-Megadeltas of Asia. October, 27-30, 2008, shanghai, China, 246pp;

Acknowledgments

This Asia megadelta project is funded by APN (Grant No. ARCP2008-08CMY-Chen). Other funding sources are from IGCP-475 project, JSPS, Japan, CCOP, and the Science and Technology Committee of Shanghai, China and East China Normal University. The project leaders are indebted to all project participants for their persistent contribution to the project. The project will not see any success if without involvement of our networks. The project leaders are also grateful to APN administrators, who have been such effective in managing and advising, both technically and scientifically.

Technical Report
Preface

This megadelta project report, largely beneficially from great contribution of our capacity building networks (totally >200 individuals from >20 countries) narrates essentially the project background and outputs obtained during the project implementation time (2007-09). The report details the establishment and continuum of the megadelta capacity networks of Asia-pacific regions, participant involvement, relevance to APN's science agenda and objectives, and the scientific findings - monsoon circulation and distribution and their impact in the delta-coast areas and future mitigation. The outputs accentuate the application for local users and local government for possible policy modification at delta-coast environmental conservation under the dual pressures of increasing climate variability and intensifying human impact.

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1.0 Introduction

1.1 Project Background

This APN megadelta project (2007-09) is successfully renewed on the basis of our previous 2-years APN project: 'Mega-deltas of Asia: Conceptual Model and its Application to Future Delta Vulnerability' (2003-05). There are two major international workshops organized during the project implementation. Each project involves more than 100 participants, who are from >21 countries (mostly from Asia pacific regions), of which 10 are developing nations. Involved meagedeltas are: Hanjiang, Yellow (Huanghe) river, Yangtze (Changjiang) river, Pearl (Zhujiang) river, Red (Song Hong) river, Mekong river, Chao Phraya river, Irrawaddy river, Ganges-Brahmaputra river, Indus river and some deltas in other regions.

The previous project has summarized the different Asia delta conceptual patterns, including high-discharge flow and high sediment-load pattern, strong tidal and wave dominated pattern, high-discharge, but low coastal dynamics pattern. Also, a number of key controls in contributing delta formation were validated, including sea-level fluctuations, vertical ground subsidence, sediment dispersal dynamics offshore and climate effect. These together have determined the Holocene deltaic deposition, and as a consequence the framework for modern coastal environmental systems. Accordingly, the vulnerability of deltaic settings was assessed and effectively circulated through our website (http://www.megadeltas.ecnu.edu.cn). By completion of our former delta project, many colleagues realized that there were so many environmental issues on delta-coast region that have not been sufficiently addressed, including the Asian Monsoon processes. All remained extremely enthusiastic and encouraged that our Asia megadelta capacity building networks should keep continuum.

Under the great effort by all, our new APN project has been running, which focuses on the monsoon circulation and related environmental issues in the delta-coast region. Due to complexity of monsoon systems, in terms of temporal and spatial dimensions, all participants recommended that monsoon dynamics and related hazard assessment be brought into the forum at millennial to seasonal scales. We note that non-Asia megadeltas have not been affected largely by the monsoon circulation. From the last Glacial Maximum (LGM) to the post-glacial, the rapid global climate warming strengthened the monsoon circulation over the Asian continent, including deltaic coasts, and this forcing continued when the climate furthered its warming during what is called the mega-thermal period in the early and mid-Holocene. Many previous studies indicate that this monsoon-associated climate change played key roles in delta topographic evolution, and hence susceptibility to sea-level change. Historical records from existing database have also shown that tremendous precipitation and huge discharge on centennial to seasonal scales has resulted in extensive inundation of the lower delta plain where most people, agriculture, and

industry exist.

Nowadays, in the East Asia and Southeast Asia delta systems, the strong western Pacific summer monsoon extends into these lower delta-plain settings and even further inland along the river valleys to sediment source areas. This external forcing has brought about tremendous rainfall to the river basin, shaping river-delta topography through sediment transport. For example, more than 4000 mm/y rainfall on average have poured onto the Mekong basin, which has modified the entire coastal landscape in the past 5000 years. The well-known Tonle Sap Lake in Cambodia was built specifically by the over-siltation along the former coast. Also, in the Yangtze River valley, there has been more than 2000 mm/y precipitation that had dramatically changed the coastal land by bringing tremendous quantities of sediment to the coast. In this way, the large depression of Taihu Lake, about 50 km away from the coast was formed by this monsoon-related morphological aggradation. Inundation prevailed in the basin and delta coast region, with tremendous loss of land properties and people livelihood.

The similar case has happened in the Ganges-Brahmaputra (B-G) delta, where it is strongly affected by Indian Monsoon. Strong seasonal precipitation meets often with tropical cyclones on the delta coast to trigger huge floods with devastating inundation. During that time, coastal plain topography has been considerably modified via strong sediment transport onto the coast, and to offshore linked by a huge submarine channel system. As recently as 1991, over 100,000 people were killed by coastal flooding generated by a cyclone. The Bengal coast has since been spared for major storm, but the general population remains no better equipped than nearly two decades ago. In 2007, the Cyclone of Sidr devastated the coastal properties with death toll of >3000. Therefore, to understand the monsoonal mechanism and its impact becomes critical in the coastal region in relation to global change and hazardous mitigation.

1.2 Objectives

This APN megadelta project aims at the long-term strengthening of regional capacity networks to deal with delta-coast environmental constraints in response to global change. This collaboration, following our previous effort, is further intensifying not only scientific observation of regional scale, but, more importantly, communication with local government officers, administrators, and decision-makers, etc. Through this great effort being made by individual delta-coast scientists from each Asia megadeltas area, the project tends to approach the goal that focuses on monsoonal forcing and topographical change, which would help assess coastal environmental hazards and future mitigation.

1.3 Scientific significance

Fairly speaking, we understand in a broad sense the monsoon mechanisms and

hydro-circulation, and its impact on coastal topography. However a large knowledge gap still exists between monsoon circulation processes at different time dimensions and their associated hazards. Notably, these include 1) spatial and temporal distribution of monsoon precipitation on various Asian delta coasts; 2) similarity and dissimilarity of the monsoon effect on the megadeltas; 3) the resultant interaction between SE Pacific monsoon and Indian monsoon on those Southeast Asian deltas, especially, the Mekong, Red and Pearl deltas; 4) monsoon-proxy and its prediction via modeling; and 5) high-flow and high sediment flux and nutrient disperse to estuarine basin and offshore; and 6) the monsoon circulation in relation to El Nino and/or La Nila. **Thus, we propose a 2-year project that will seek to: 1)** establish a comprehensive database through our delta specialists from various deltas. This will serve as a fundamental base to approach the goal of this project; **2)** enhance understanding of the mechanisms of coastal landform change in response to monsoon circulation; and **3)** focus on monsoon-triggered delta hazards on centennial to seasonal dimensions, and **4)** improve policy modification through communication to policy-makers, project workshops, and website, etc.

Monsoon circulation has been closely associated with global change. Climate warming intensifies energy exchange between ocean and land, accelerating hydrological circulation on catchment-coastal land surface. Flood inundation, coastal erosion, and coastal water level rise while meeting typhoon or cyclone, etc. can potentially threaten environmental safety. Because of intensifying human activity, to understand the role of monsoon processes has become increasingly complicated. Also, the monsoon variability in different time dimensions makes analysis of database processing more difficult, leading to uncertainties of future predication through modeling. Thus, we will call for establishing an effective and high-resolution database from the various mega-deltas, which will help differentiate the role of monsoon mechanism from other climatic-related signals, such as El-Nino and summer typhoon, etc.

In fact, the scientists involved in the proposed study represent almost all Asian mega deltas and have done extensive monsoon-related research in the region over the past decade. However, these relatively isolated works have not yet revealed their broader regional significance, which in association with risk assessment is a primary goal of the proposed project. Past failures in coastal planning suggest that the lack of a fundamental monsoon context for risk-assessment studies has harmed our socioeconomic and sustainable development, and this will continue in the future unless better information can be brought to regional planners and managers.

2.0 Methodology

The main approaches of the project stand on the established long-term networks of megedelta of Asia-Pacific regions. The flowchart attached shows the methodology that

has been used for our project (Table 1). After approval of our project, Pi and co-Pis met to have a pre-workshop to discuss details of project implementation, including quarterly time schedule, task designation to each leaders, website set-up and database establishment, etc. Since there have been existing megadelta capacity networks, communication to our key members goes very effective. Representatives from each Asia megadelta region have been called for their contribution of existing database, which comprises hydrological, geomorphological and sedimentological aspects. The database from each delta regions has been widely shared with each other before, during and after workshops, in terms of workshop abstract collections, presentation and publications. Besides, our key members of the project have run many times of fieldtrips supported by their own funding sources. This has helped test typical environmental issues of monsoon-related mechanism. Drs. Y. Saito, S. Goodbred, Tran Duc-Thanh Islam Badrul and Z. Chen carried out their fieldworks in the Red, Mekong, B-G and Yangtze delta coast and river basin. Numerous newer data were collected and demonstrated during the project workshops. We established website to circulate project results in order to welcome public critiques and comments. This is quite effective that more comments and interviews come from news-media and publics that promote project knowledge transfer and debate as well, leading to delta-coast environmental conservation.

Two workshops were held, i.e. Dhaka venue (January 6-13, 2008 and shangh-Qingdao Venue, Oct. 27 – Nov. 3, 2008). This allows demonstrating their historical and newly-obtained databases, results on monsoon circulation and related hazard. Project CD, abstract proceedings were effectively circulated to all participants, especially those from developing countries Considering a large amount of unique database from each delta region, project leaders are organizing a peer-reviewed Special Issue on the International Journal of 'Earth Surface Processes and Landforms' - Holocene Megadeltas: Sedimentary Process, Evolution, and Future. This special issue is planned to publish in 2010.

3.0 Results & Discussion

The 2-year APN project has helped us to intensify better understanding of the monsoon forcings and related environmental impacts on the delta coast. The Asian delta region has strongly affected the processes of monsoon precipitation and flooding hazards. High-discharges, high sediment loads and nutrients have been carried into the seas via Asia large river flows, which dramatically shape the delta-coast landforms, and influences social sustainable development. Taking global warming into consideration, the monsoonal variation in response to climate change with various dimensions should be debated among our project participants. The following aspects of monsoonal forcings and responses with millennium to seasonal dimensions obtained highlight the project key findings.

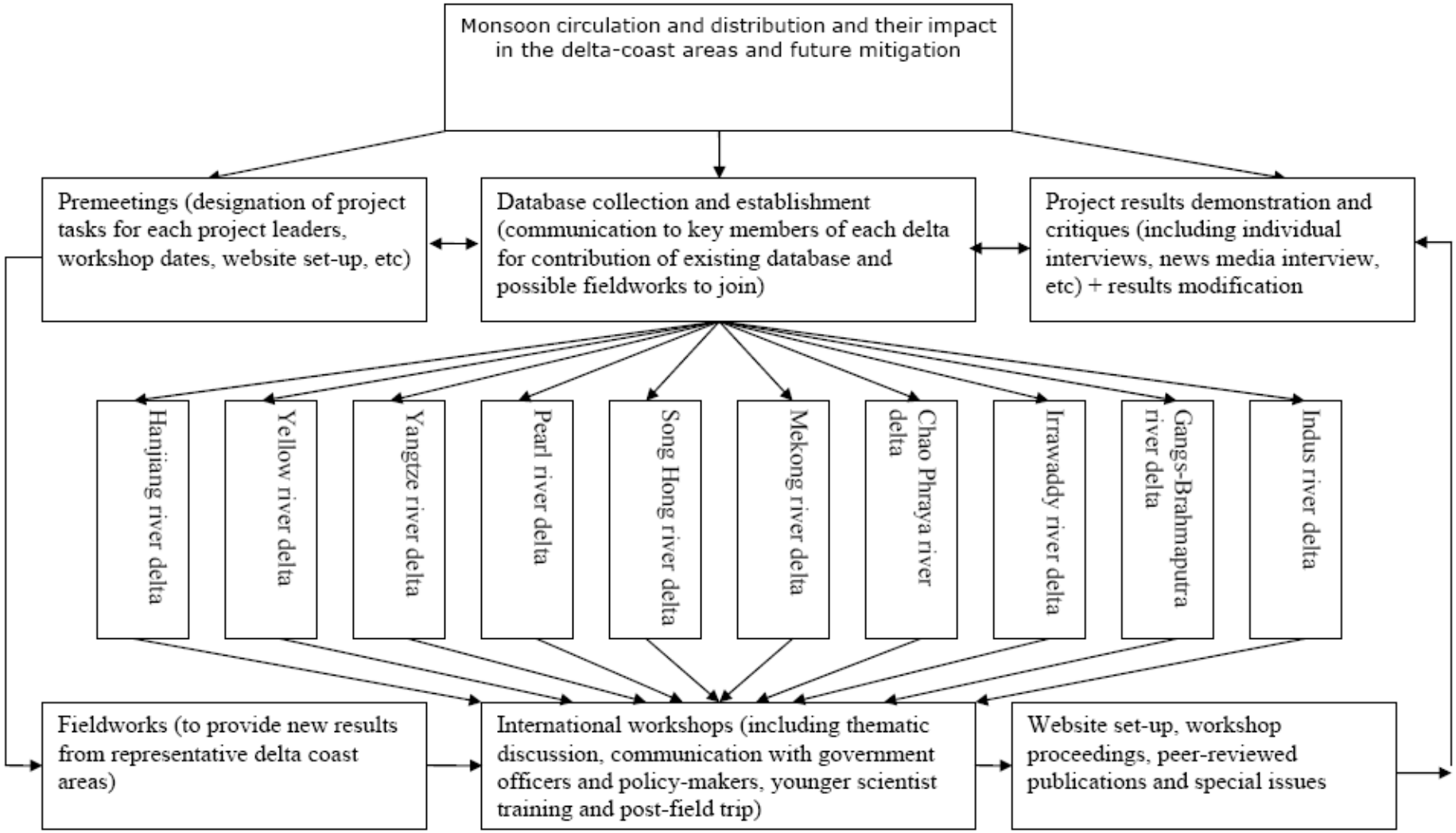

Table 1, Project methodology – flow chart

3.1 The general concept of monsoon and its characteristics

Monsoon is the unique climatic phenomenon that prevails in the Asian region, whose initiation is probably related to solar insolation onto the largest area of Eurasian continent and the Pacific Ocean. Monsoon has come to mean a seasonal reversal of winds, a general sea-to-land movement (on-shore flow) in summer and a general land-to-sea movement (offshore flow) in winter. Associated with the monsoon wind pattern is a distinctive seasonal precipitation regime – heavy summer rains derived form the moist maritime air of the onshore flow and a pronounced winter dry season when continental air moving seaward dominates the circulation. The Asia delta-coast region has no been exceptional to be affected by monsoon precipitation and its related processes. Early study indicated that almost 70-80% of annual rainfall is concentrated during summer season (May – August, in general). Accordingly, this climate mechanism has determined highly-concentrated sediment loads from sources area (Tibetan plateau) into delta-coast areas at the same time.

3.2 Millennium dimension

The Holocene monsoon and precipitation probably can be traced back to 8-7 ka, when the global temperature warmed up after the Lat Glacial Maximum (LGM). Database of pollen-spore is often used as paleoclimate proxy to reveal the temperature warming and climate implications. The pollen spectrum from sediment core ZX-1 of the Yangtze delta plain (Figure 1) clearly reflects the high-resolution climate fluctuations chronologically assisted by many AMS dating.

Assuming an even sedimentation rate, the six pollen-spore zones (I to VI, Figure 1) defined in the present study can approximate to 200-400 years resolution. They can therefore reflect palaeoclimate (monsoonal) fluctuations in the Yangtze delta on a millennial timescale. Zone I represents a short-term (ca. 200 yr) warming at about 8000-7800 BP, as witnessed by the large proportion of evergreen broad-leaf species and low percentages of Pinus and Betula. The proportion of these evergreen species is the highest of the Holocene, suggesting the hottest and wettest climate setting, which starts the overwhelming monsoonal circulation. A similar warming trend in the early Holocene was also recorded in many other Asia coastal areas, but probably with different on-set of monsoon climax.

The mega-warming trend, termed the 'mid-Holocene optimum' can be recognized from Zone III, which dates from c. 7500-5000 BP (Figure 1). A large proportion of evergreen broad-leaf species, such as Cyclobalanopsis glauca and Castanoposis appears, accompanied by Magnolia, Eurya and Myrica, most of which are of subtropical hygrophilic and thermophilic significance and are typical of the present monsoon evergreen broad-leaf forest in the southern and middle subtropical zones of China (Zheng, 2000). This indicates

that the warm-wet climate setting affected by enhanced monsoon circulation in the eastern Yangtze coast began around 7500 BP. During the climate optimum, a slightly cool fluctuation (core depth - 10.5 m) lasting for 200-300 years occurred as an increase in coniferous and deciduous species represented by Pinus, Betula, Ephedra and Ulmus (Figure 1).

The temperature, to some extent, declines after 5000 BP, as indicated by the pollen-spore assemblage of Zone IV (Figure 1). Of particular note is a cooling event at c. 4200 BP in the upper portion of Zone IV (Figure 1), in which Pinus and Cupressaceae increased as a large proportion of evergreen broad-leaf species vanished, i.e., Eurya, Magnolia and Myrica, etc. This is further witnessed by the prominent appearance of Fagus indicative of a cool and wet climate (Zheng, 2000) and Potamogeton signaling significant lake/marsh system expansion at the same time. Also, this event was recorded in some Neolithic trench profiles in the delta plain, such as the Songze and Weiting sites (Wang and Zhang, 1981; Wang et al., 1984: Figure 4b, c). Jian et al. (1996) demonstrated a similar climatic cooling at about the same time period, evidenced by a large decrease in the foraminifera species Pulleniatina obliquiloculata (a winter-season seawater temperature indicator), in the Okinawa trough of the East China Sea and the South China Sea.

Temperature warmed after 3000 BP but remained cooler than in the mid-Holocene (Zones V and VI). The large amount of Gramineae occurring in Zone VI probably reflects recent rice cultivation.

Our study also has indicated that Holocene monsoonal fluctuations of millennium dimension can explain the migration pattern of numerous Neolithic sites on the delta coast (Figure 2). Presumably, the mid-Holocene optimum would promote the monsoon precipitation in the Yangtze drainage basin, which had resulted in the transport of a large quantity of fluvial sediments to the coast, leading eventually to the recent delta build-up. Fertile deltaic sediments attracted the settlement of early people from the highlands west of the study area onto the delta plain during the climate warming with associated monsoon rainfall (Figures 1 and 2). The early Neolithic civilization (Majiabang Culture) was reliant on rice cultivation, which began c.7000-6000 BP (Figure 2a), chiefly based on delta sediments and monsoon precipitation (cf. Chang, 1986; Stanley et al., 1999). Subsequent cultures, termed 'Songze' and 'Liangzhu', were successively to follow the Majiabang culture from c. 6000 to 4000 BP, migrating from west to east across the delta plain (Figure 2B, C). After that time, a 'cultural break-up' prevailed as a large number of the late-stage Liangzhu sites and the subsequent historical sites named 'Maqiao' (Bronze Age equivalent) disappeared in the delta plain (Figure 2C, D). This probably related to a short climate cooling event in late Holocene.

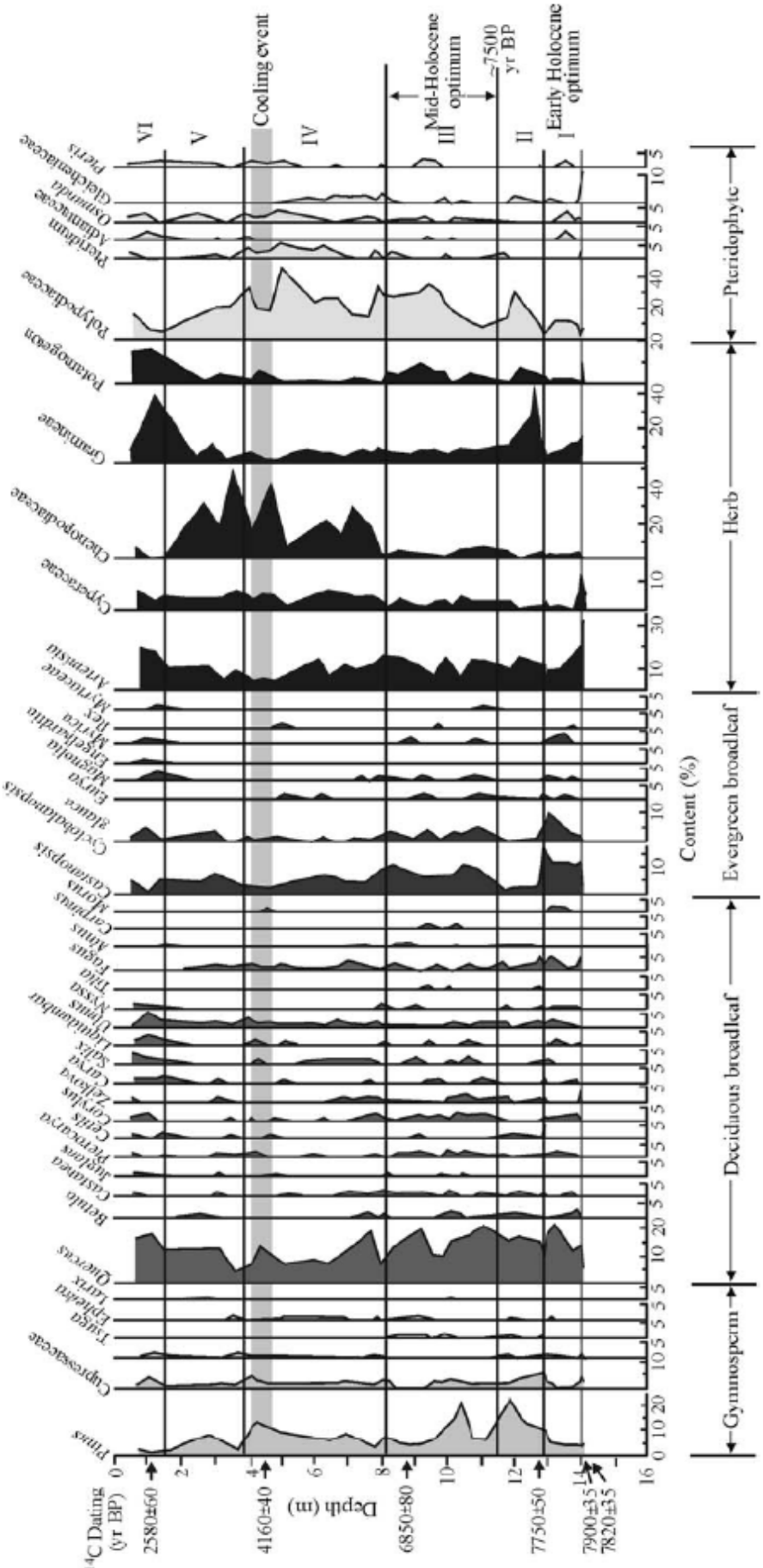

Figure 1. Yangtze delta region, Holocene pollen-spore spectrum to reflect monsoon climate changes

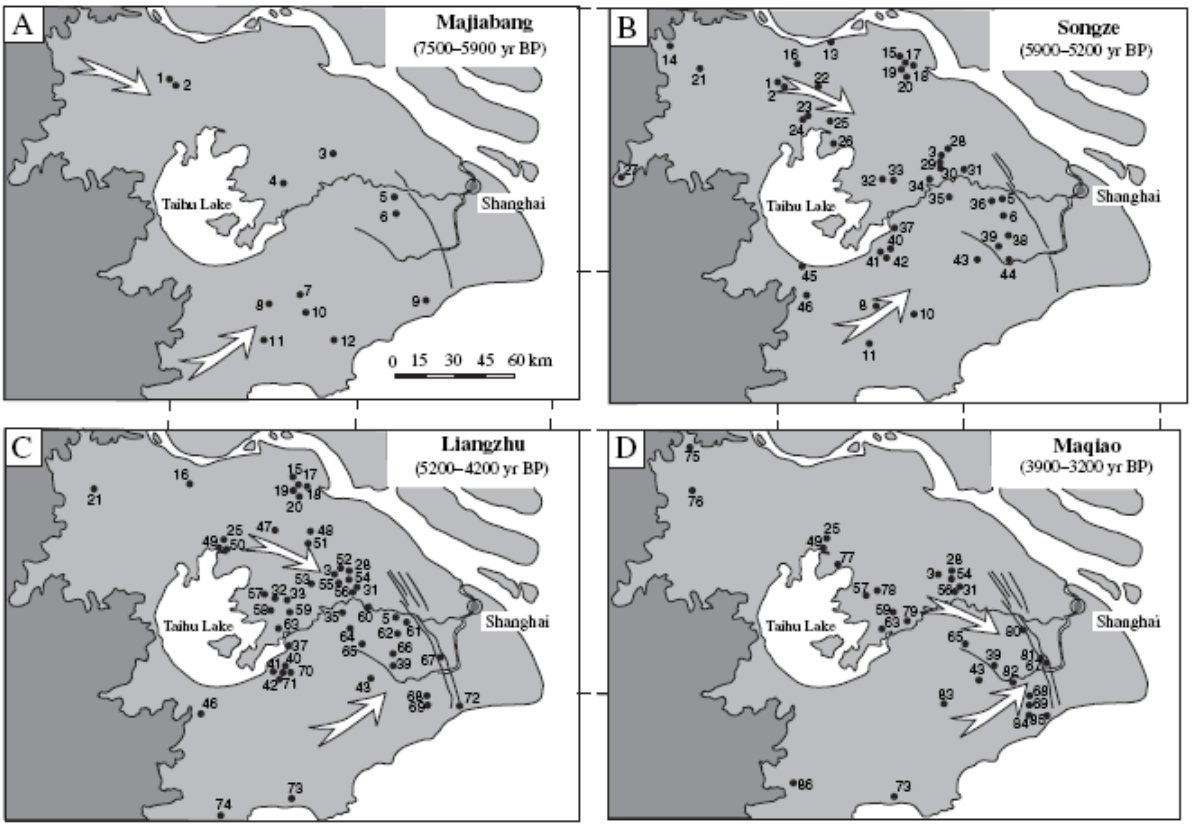

Figure 2 Distribution of Neolithic and prehistoric sites in the southern Yangtze delta plain. The migration route was established to explain climate (monsoonal) change in combination with sea level fluctuations of Holocene time (modified after Chen, 2005).

3.3 Centennial dimension

Fairly speaking, to establish monsoon record of centennial time scale by using meteorological and hydrological data is difficult in the Asia delta regions due to unavailability of such longer historical observation. There is seemingly a gap of monsoon records and associated environmental impacts between millennium dimension and human dimension. To find monsoon record from coastal sediments is possible, but it needs to meet: 1) continuous sedimentation, 2) high-resolution dating and 3) effective climate proxies (e.g. geochemical and pollen records etc). The short sediment core (Y8) derived from the Yangtze subaqueous delta meets in general the above conditions and can highlight monsoon fluctuations in the East Asia. The findings below are contributed by our project key members of Yi et al. (2003a).

Five pollen zones were established with ages presented in calibrated calendar years (Figure 3). The pollen records of Y8 reveal changes in the vegetation composition and inferred climate (monsoonal) during the past about 1600 years. Conifers, Pinus (Diploxylon), predominate among the arboreal pollen, along with common tropical monsoonal evergreen and broad-leaved deciduous trees such as Quercus (Cyclobalanopsis), Q. (Lepidobalanus). During the basal period (AD 385–910; Pollen Zone Y8-I), cool, dry climatic conditions are indicated by the possibly mixed coniferous and

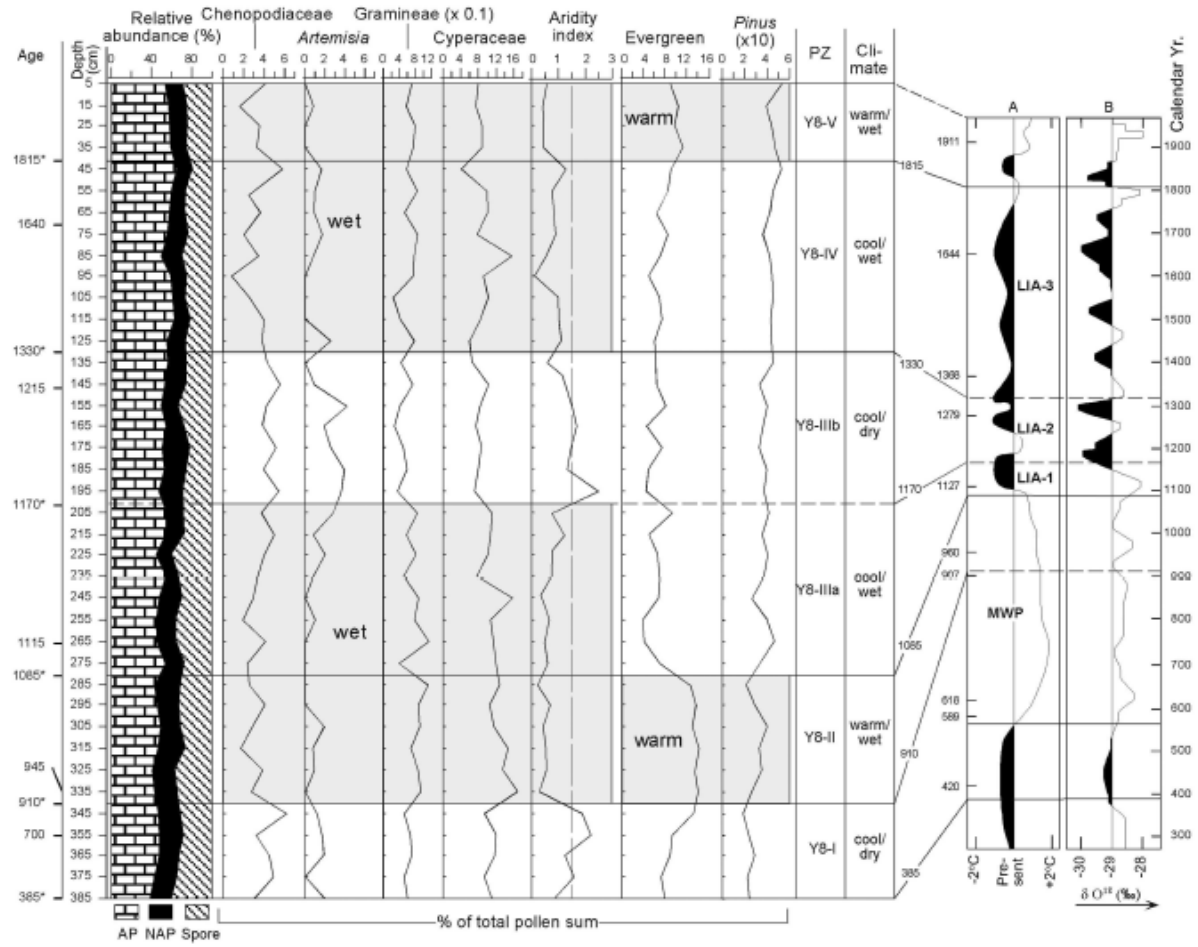

Figure 3. Schematic diagram showing the pollen zones with climatic changes during the last about 1600 years in the Changjiang delta region. A: Phenologic data for China (from Chu, 1973); B: Greenland ice sheet (GRIP). MWP, Medieval Warm Period; LIA, Little Ice Age. Aridity index=(Chenopodiaceae+Artemisia)/Gramineae.

cool-loving grasses. Relatively high values of the aridity index indicate that the prevailing climate was drier than at present (Figure 3). This interpretation can be supported by the phenological data indicating cooler at AD 490s with temperature reached about 1 °C lower than that of today, for eastern China region (Ge et al. 2003). The possibly Medieval Warm Period (MWP; AD 910– 1085), which corresponds to Pollen Zone Y8-II, was warm with high humidity, as reflected by the sudden increase in the subtropical monsoonal evergreen oak, Quercus (Cyclobalanopsis), which is present along with diverse broadleaved deciduous trees such as Q. (Lepidobalanus), Salix, Pterocarya, Corylus/Ostrya, Liquidambar, and Castanopsis/Lithocarpus. Although Liquidambar is a broadleaved deciduous tree, it is a common subtropical element in the forests of south China (Li et al. 1995). The low values of the aridity index (Figure 3) and the coincident increase in the abundance of Cyperaceae pollen suggest that the climate had become wetter. Our interpretation is also supported by the Beijing stalagmite record (Qian and Zhu 2002), which indicates that precipitation increased as the monsoon became stronger between AD 960 and AD 1180 in China.

As demonstrated by both phenologic data (Chu 1973; Ge et al. 2003) and multiple paleoclimate proxy records of ice core, tree ring, lake C/N, lake TOC and peat (Yang et al. 2002) from China, the mean temperature during this period was 1–2 °C warmer than that of today. The possibly Little Ice Age (LIA; AD 1085–1815), which comprehends Pollen Zones Y8-III and Y8-IV, is characterized by generally cool and wet conditions, as reflected by abrupt reductions in the subtropical monsoonal evergreen Quercus (Cyclobalanopsis) and broad-leaved deciduous trees and, in contrast, the increasing frequency of pine (Pinus) (Figure 3). Moisture-loving grassland herbs such as Chenopodiaceae, Cyperaceae and Artemisia are well represented, whereas grassland taxon preferring relatively arid conditions (Gramineae) is somewhat low in frequency. The cool and wet climatic conditions caused the contraction of the thermophilous hardwood forest and the expansion of coniferous forests and grassland. Multiple paleoclimate proxy datasets (e.g., Chu 1973; Shi et al. 1999; Qian and Zhu 2002; Yang et al. 2002; Ge et al. 2003) record cool conditions in eastern China beginning about 780 BP (AD 1170) followed by a warmer and wetter MWP. In this study, the Little Ice Age from AD 1085 to AD 1815 can be subdivided into three events, LIA-1 (AD 1085–1170), LIA-2 (AD 1170– 1330), and LIA-3 (AD 1330–1815), on the basis of the pollen assemblages and the aridity index (Figure 3).

During LIA-1 (AD 1085–1170) is almost same humidity as MWP, as reflected by the aridity index. The apparent decline in the subtropical monsoonal evergreen and broadleaved deciduous mixed forest and the increase in conifers reflect the climatic cooling that occurred during the early LIA. LIA-2 (AD 1170–1330) was possibly a brief arid interval recorded by a spike in the aridity index and remarkable increases in dry grassland plants, including Gramineae, whereas the decreases in moisture-loving grasses such as Chenopodiaceae and Artemisia. LIA-3 (AD 1330–1815) marked a return to relatively humid conditions following the brief arid interlude. Pollen Zone Y8-V corresponds to a period of increasing humidity (AD 1815–Present), which is characterized by a climatic shift back to warmer and wetter conditions than had prevailed in the preceding interval. These climatic conditions are also shown by a remarkable decrease in the aridity index, which indicates a gradual increase in moisture availability after AD 1815.

The pollen spectrum also indicates relatively more humid conditions compared with the preceding interval (Figure 3). Furthermore, an enhanced warming trend during the last hundred years has been observed in eastern coastal regions (Wang and Gong 2000; Ge et al. 2003). Finally, the general cool/warm trends shown in Figure 3 coincide with the temperature changes reconstructed from other natural proxy dataset: pollen (Xia and Wang 2000), stalagmitic varves (Qin et al. 2000), tree rings (Liu and Shao 2000) and lake sediments (Luo and Chen 1997; Cao et al. 2000). Moreover, the cool/warm trends of eastern China during the past millennium are in correspondence with the temperature variation of the Northern Hemisphere (Mann et al. 1999).

3.4 Decadal to Seasonality

There is rich information of monsoonal precipitation and associated discharge in the Asia megadelta regions. Availability of established meteorological and hydrological gauging stations on river-basin and coastal regions in the last century provides substantial observation and database, which can be used to examine monsoon climate change of decadal to seasonal scale. Here, we take the Ganges-Brahmaputra and the Yangtze River as example.

As shown in Figure 4, the annual river discharge of Ganges-Brahmaputra river has been enormous, ranging from 80,000 – 100,000 m^3s^{-1} in the flood (monsoon season, July-August). B-G River is the forth biggest river discharge in the world, which pours down 80% of its annual discharge during the monsoon season. In contrast, lower discharge of less than 8000-10,000 m^3s^{-1} occurs in the dry season. It is known that annually the river system maintains a flow of about 435 m^3s^{-1} out of which 60% is contributed by the Himalayan Rivers. The wet maritime air flow invades into the lower G-B basin, where the ground elevation only remains several meters above the sea level, but it is densely populated. It is often case that high monsoon precipitation and flood meets cyclone on the coast to cause devastated disaster in the human history.

The Yangtze River is also dominated by monsoon floods during wet season (from June – September, in general). River discharge recorded at the river mouth area ranges from 20,000 m^3s^{-1} (dry season) to 80,000 m^3s^{-1} (wet season). Since monsoon precipitation starts from early April in the eastern river coast and the lower river basin, about 50% of the annual monsoon discharge is contributed from the lower-mid basin. After June, monsoon rainfall migrates to the upper basin, where it contributes another 50% of annual precipitation. It is of note that catastrophic monsoon floods occur frequently in the Yangtze River basin. Figure 5 shows the historical basin-wide flood in 1998. The monsoon floods lasted about 2.5 months, which had inundated vast basin area, where it is densely populated. Our recent study seems to indicate that the recurrence (year) of monsoon flood is getting shorten (Yu et al., 2009), i.e. from 18 of hundreds of years ago to 3-4 of the present time (Figure 6), last about 1600 years in the Changjiang delta region. A: Phenologic data for China (from Chu, 1973); B: Greenland ice sheet (GRIP). MWP, Medieval Warm Period; LIA, Little Ice Age. Aridity index = (Chenopodiaceae +Artemisia) /Gramineae (modified after Yi et al., 2006).

3.5 Impacts on delta-coast and assessments

The impact of monsoon fluctuations on the river coast has been significant both in the Ganges-Brahmaputra and the Yangtze River delta-coast. As indicated in Figure 7, on-shore monsoon stress pushes sea-level set up on coast at the rate of ca. 50-80 cm primarily in summer season. This is particularly critical while taking into account: 1) the

relative sea level rise of ca. 05 cm per year in the last 30 years, and 2) lower monsoon discharge in summer season.

Also, the similar situation of 'mechanism-response' in the Yangtze can be viewed. Although the annual runoff that discharges to the Yangtze estuary can be as high as 8.94×10^{11} m^3, this is however, much less than the volume of tidal water incoming from the sea. The annual tidal prism into the river mouth has a total volume of 83.98×10^{11} m^3, which

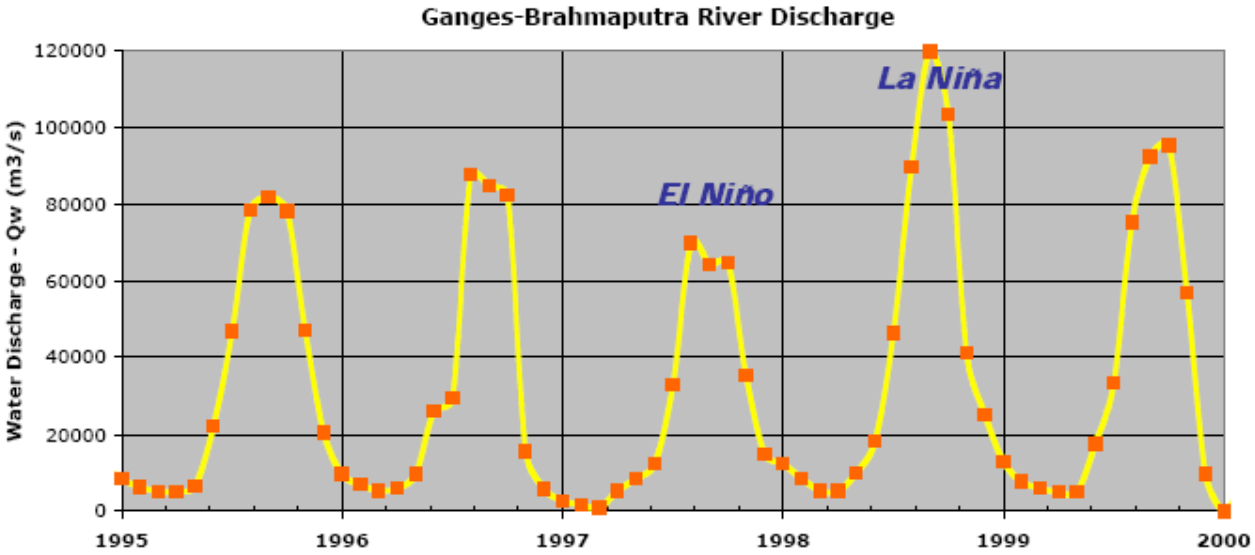

Figure 4. Annual river discharge of Ganges-Brahmaputra (1977 – 2001; Curtsey of Steven Goodbred)

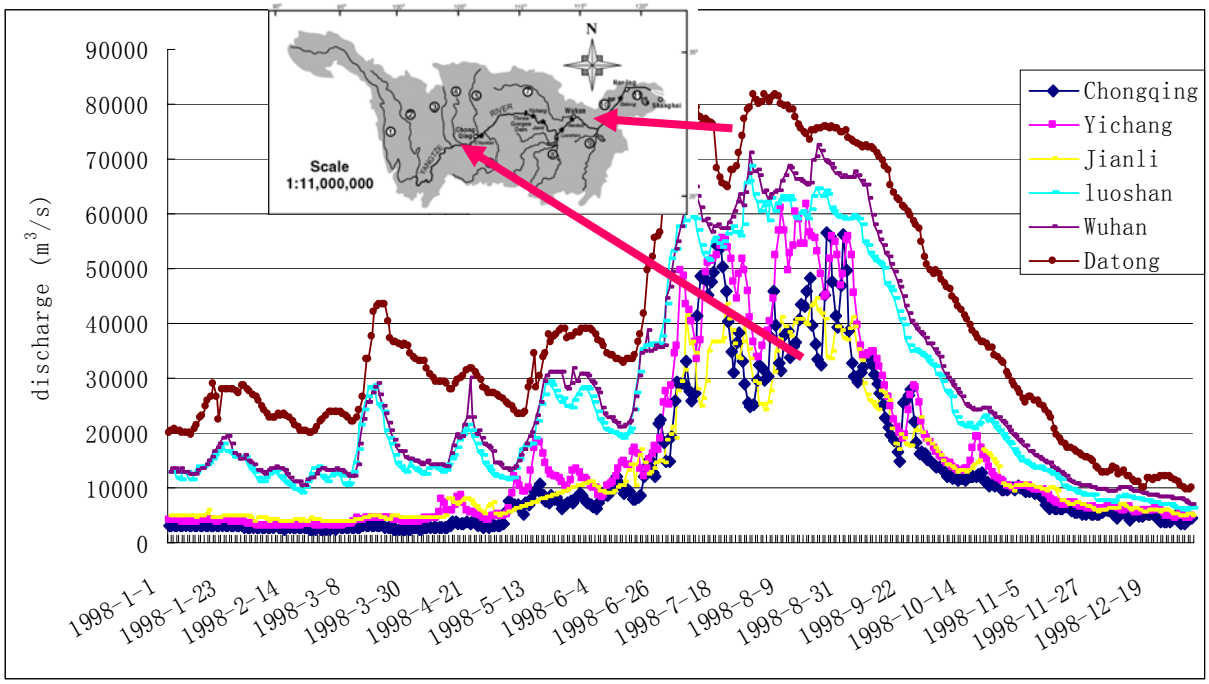

Figure 5. basin-wide discharge fluctuations of the Yangtze river recorded in 6 major hydrological stations in 1998 (Curtsey of Zhongyuan Chen)

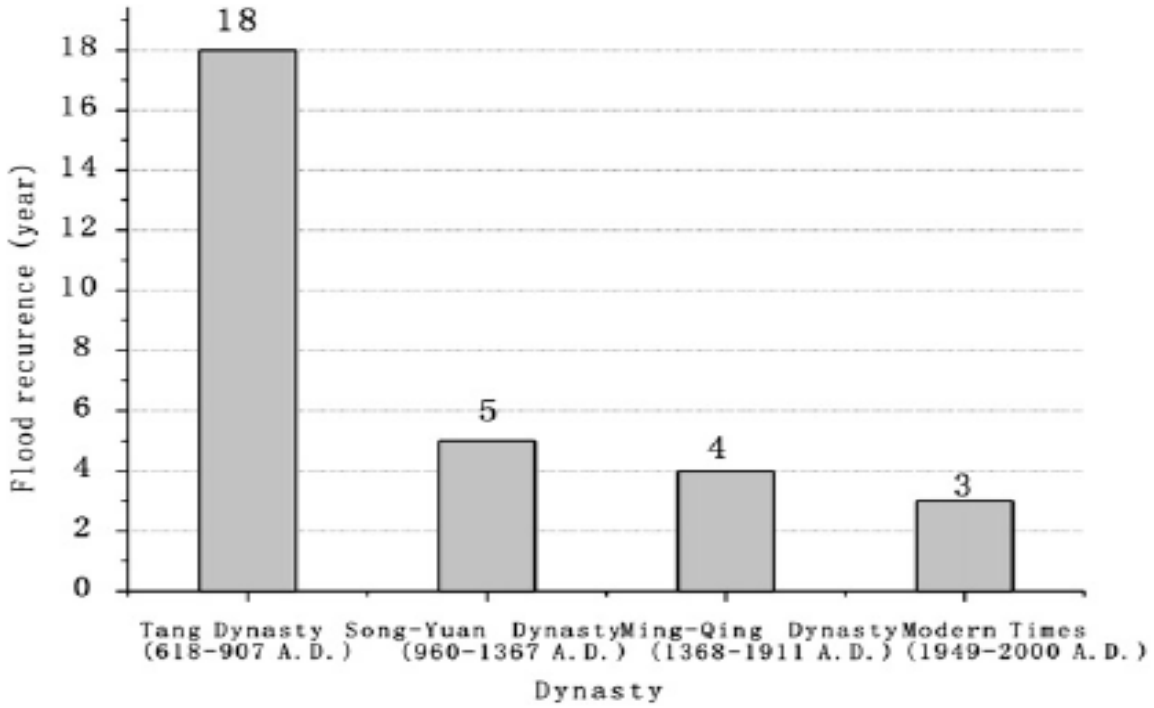

Figure 6. Yangtze River basin: shortened historical monsoon flood occurrence since Tang Dynastic (168–907 A.D.; modified after Yu et al., 2009).

is an order of magnitude greater than that of the annual Yangtze runoff discharge to the sea. The water chemistry in the estuary therefore will be sensitive to the impacts of "South to North Water Transfer Project", which has been planned upstream. Saltwater will intrude further into the estuary, especially in the lower monsoon climate season. This could affect irrigation, and domestic and industrial water supplies in the estuarine region, where the metropolitan city Shanghai, with >12 million people located.

Another case of response to monsoon climate fluctuations is the lower farmland and migration of residence in the B-G delta plain. The project result contributed by our key member Mr. Shafi Noor Islam has illustrated the fact that monsoon plays critical role in affecting the societal sustainable development in the recent history.

Bangladesh is the great deltaic floodplain of the world. This deltaic floodplain is formed by the deposition of the Ganges, Brahmaputra, Meghna, Januma and Tista River. The *Char-land* consists of reverine landscapes, features created by three mighty rivers Ganges Brahmaputra and Meghna (GBM) systems. The land which is newly emerged and deposit known as locally called *Char or Diara*. *Char-land* is the Bengali term for mid channel island that periodically emerges from the riverbed as the result of accretion. This new land is fertile and a valuable natural resource.

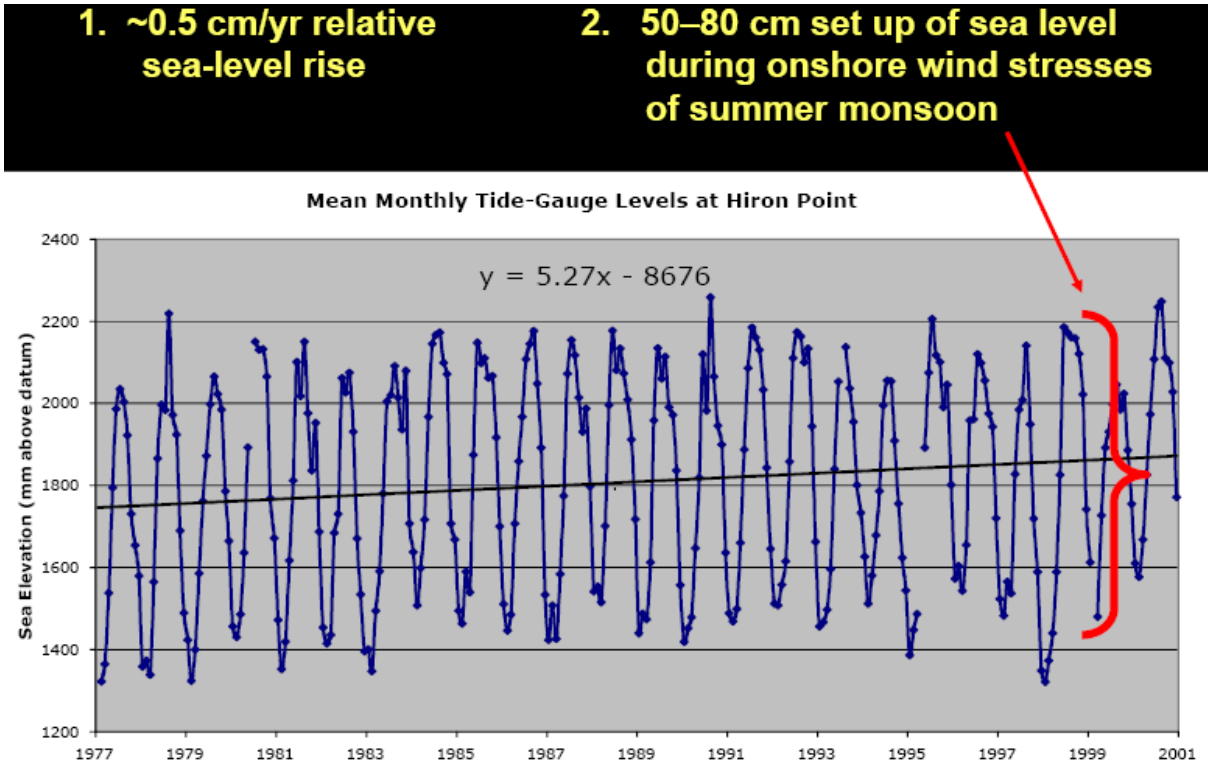

Figure 7. Mean monthly tide-gauge levels recorded at Hiron Point (1977 – 2001; Curtsey of Steven Goodbred)

The *Char-land* landscapes of Bangladesh are of great importance for its exceptional hydro-geographical setting. The physical characteristics of the land, geographic location, the multiplicity of rivers and the monsoon climate render the *Char-lands* highly vulnerable to natural disasters, such as floods and cyclones. There are over twelve million *Chaura* people are living in the *Char-lands* and struggling against monsoon floods and river bank erosion in Bangladesh. The *Char-lands* of Padma River are undergoing rapid hydro-morphological changes due to natural and anthropogenic causes. The Padma is a meandering river and has high rate of river bank erosion and accretion character in the channel. In the monsoon time (June-September) only Brahmaputra (Jamuna) transports water discharge 100,000 m^3/sec which is 15 times more than Danube at its mouth. The excesses of water during the monsoon cause wide spread of flooding which damage *Char-land* settlements, agricultural crops, infrastructures, communication networks and lives. The Jamuna River carries 2.4 million tons sediments in every year and loads are settling down on the bed of the rivers and having negative impacts on the floodplain and *Char-lands*.

The Purba Khas Bandarkhola Mouza of Char Janajat union of Madaripur district is part of the Ganges Active Delta and located in the main channel of the Ganges-Padma River. The Char Janajat inundate by the monsoon floods every year, as impacts people have to displaced and the settlements are scattered from one place to another places (Figure 8). The elite class of *Char-land* lives in the main land and they control all most all the social and

administrative functions of their self. The agricultural crops of the *Char* depend on the soil quality or fertility. The soil quality and fertility of *Char-land* is depending on floods and accretion. It has been asserted from the study that the agricultural cropping pattern in the *Char-land* is different from the other places of the country because of uncertainty of agricultural land. The study finding shows that the *Chaura* people have to displace because of the interval of massive floods and the trends of river bank erosion. The dwellers are displaced from the *Char* and again come back to the native *Char* when the new land emerges in the river channel. The mobility distance of the *Char* settlements is 12 km range in an average distance (Figure 8). The study shows the interval of displacement is every 5 years at Purba Khas Bandarkhola Mauza in an average (Figure 8). The settlements displacement and population increases and decreases are deepened on floods and river bank erosion that have been summarized at the Bandarkhola Mouza (Figure 9).

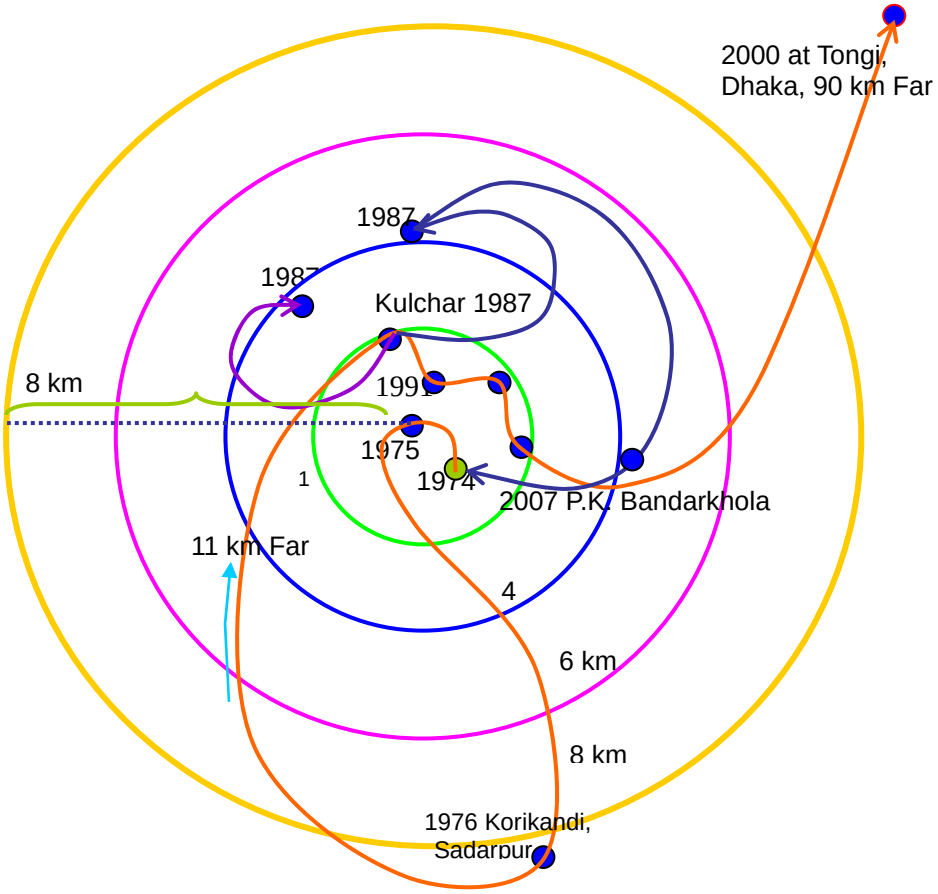

Figure 8. The Model of settlement displacement and char people mobility cycle (Remote Sensing Imageries have been used to investigate the changing pattern of agricultural crops and settlement displacement trends; Courtesy of Shafi Noor Islam)

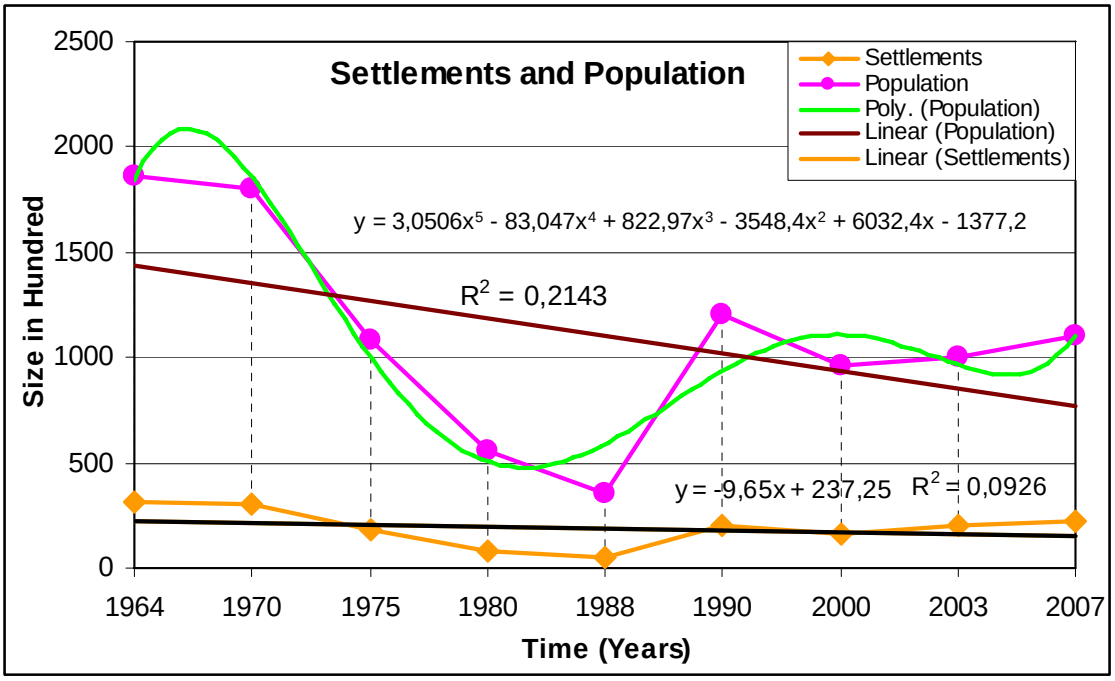

Figure 9. The Settlement and population displacement at Purba Khas Bandarkhola Mauza (Remote Sensing Imageries have been used to investigate the changing pattern of agricultural crops and settlement displacement trends; Courtesy of Shafi Noor Islam)

3.6 Hazardous assessment – possible approaches

The Asia megadelta covers the vast low-lying deltaic coasts, where it is widely recognized to be experiencing coastal erosion and inundation along their ocean margins. IPCC (WGII, 2007) made a clear prediction that the relative vulnerability of coastal deltas as indicated by the indicative population potentially displaced by current sea-level trends to 2050 (Extreme $\geq$ 1 million; high 1 million to 50,000; medium 50,000 to 5,000) (Figure 10). This would further increase disaster consequences in the region if adding climate fact as represented by the monsoon precipitation during wet season.

The densely populated megadeltas of the Asian monsoonal region are undergoing rapid changes as a result of human modification of land use both in the catchment and across the coastal plains, including water extraction and diversion. Global climate change presents an additional threat that will make the management of these dynamic systems increasingly difficult. Our revealed results of monsoon occurrence of centennial to decadal dimension have emphasized its significance of influence on the human sustainable development.

The potential impacts to which individual megadeltas are exposed are related to the climate drivers and the way in which they are changing, and the susceptibility of different sections of a delta is a function of the geomorphology of the shoreline and the delta coast. The adaptive capacity of the population in each delta is relatively low, rendering large numbers of people vulnerable, as tragically demonstrated during the Cyclone Sidr of Bangladesh, 2007. The threat is accentuated as a result of local factors including crustal

flexure, subsidence and sediment compaction, as well as a reduction of resilience that often follows where the natural ecosystems have been transformed for agriculture, aquaculture or urban development.

Subtle geomorphological variations in response to monsoon floods between and within the extensive low-gradient delta plains reflect sedimentation patterns during aggradation and shoreline progradation over the past 6000 years. Substantial impacts result where rivers are dammed and sediment supply is decreased; in some cases, subsidence or compaction exceeds the rate of supply of new sediment, and the longer-term prospect of inundation is increased. The relationship between elevation of the plains surface and flood and storm surge levels is critical for sustainable management of these systems but sediment pathways and the interactions of river, wave and tide processes are rarely understood in sufficient detail.

There are relatively few approaches to assessing the vulnerability of coastlines that are appropriate for application to these multi-stressed sedimentary coasts (Figure 11). Dr. Colin D. Woodroffe of our key member pointed out that the vulnerability in Asian deltas is multi-faceted and assessment needs to address all its dimensions. We need to further examine the factors that contribute to vulnerability and review the tools that are available to assist the assessment and management for monsoonal vulnerability on Asia megadelta coasts.

Figure 10. Relative vulnerability of coastal deltas as indicated by the indicative population potentially displaced by current sea-level trends to 2050 (Extreme ≥ 1 million; high 1 million to 50,000; medium 50,000 to 5,000; source: IPCC WGII, 2007 - http://www.ipcc.ch/)

Coastal Adaptation (IPCC CZMS, 1990)	*Adaptation Objectives (Klein and Tol, 1997)*	*Adaptation Responses (after Cooper et al., 2002; DEFRA, 2001)*	*Examples*
		Advance the line →	Land claim; polders
Protect →	Increased robustness →	Hold the line →	Dyke; beach nourishment
Accommodate →	Increased flexibility →		'Flood proof' buildings Floating agricultural systems
Retreat →	Enhanced adaptability →	Retreat the line →	Managed realignment
		Limited intervention →	Ad hoc seawall
		No intervention →	Monitoring only
	Reversing maladaptive trends →	Sustainable adaptation →	Wetland restoration
	Improved awareness and preparedness →	Community-focussed adaptation →	Flood hazard mapping; flood warnings

Figure 11. Many adaptation options are available now, but less insufficient adaptive capacity is often the most important contributory factor to human vulnerability (Courtesy of Colin Woodroffe, source: IPCC, WGII, 2007- http://www.ipcc.ch/)

4.0 Conclusions

Our megadelta project concludes that the monsoonal processes serves as a critical role in shaping delta-coast morphology and driving environmental hazards. For the millennium to centennial time scale, monsoon records can be effectively established by climate proxy, such as pollen spore, which has been widely used in Asia megadelta area, to reflect the fluctuations of temperature and moisture in the coastal region. It is clearly shown in the Yangtze delta coast that monsoonal processes was closely associated with mega-thermal climate optimum initiated at about 7000 years BP. This coevally happened with Holocene delta development at the same time, when the global sea level reached to the present. This implicates that the climate of millennium scale may drive the sea level rise and sediment transport from basin to coast for delta construction. There were a few climate warming fluctuations of 100-200 year intervals before 7000 years BP, but, they did not represent the major tendency of monsoon development in the early Holocene. During the mega-thermal epoch, there were several climate warming and cooling events as revealed by the pollen records until about 4000 years, when the climate gently cools down to present. This evolution trend of the Holocene Yangtze monsoon can be applied to other Asia megdelta regions, but, it remains 'unknown' if monsoon was reactivated at the same time in the Asia megadelta scale.

In general, there is a gap of monsoon record between millennium and centennial dimension, simply due to difficulties to find useful climate proxies, neither from historical literatures nor from hydrological records. Pollen records in the subaqueous Yangtze delta where continuous sedimentation presumably occurred could be also helpful in reflecting

monsoon climate while assisted by high-resolution AMS dating. This record contributed by our project key members can be fairly linked to the fluctuations of monsoonal temperature of the region of centennial dimension. At least 5-6 pollen climate fluctuations can be reconstructed in the past 1600 years, which can be well compared to the 'Little Ice' age.

Aside from longer time scale, monsoon climate fluctuations of decadal to seasonal dimension are well recorded by hydrological gauging stations in the Asia megadelta region, such as the B-G delta of Bangladesh and the Yangtze delta of China. Huge discharge (60,000 – 100,000 m^3s^{-1}) of the two mega-rivers during wet season has dominated in the topographic construction in the delta region, as flooding processes. This can represent the monsoon mechanism at all Asia megadelta regions.

The response to monsoon impact on the Asia megadelta region with various time scales is enormous. The pre-historical migration of settlement of the Yangtze delta was closely associated with monsoon climate warming and related sea level rise. The settlement migration of the recent society of the B-G delta has been also driven by the monsoon discharge, even lasting for only 1-2 months.

Monsoonal hazardous assessment of Asia megadelta becomes urgent and necessary. However, the establishment of assessment criteria to be applied to all delta regions remains further study because of regional geological and hydro-climatological scales. There are some effective approaches proposed by our project key members and various international organizations that have lightened our study, especially the future practice.

5.0 Future Directions

This 2-year APN project that focuses on the monsoonal processes and related environmental impacts on the Asia megadelta has been complete. But, incomplete is the project theme, since there are so many issues and doubts that still remain as 'unknown and unsolved', although we received a large amount of project outputs. By now, the project leaders have been largely encouraged by many of our key members for sustaining the established networks by future planning our Asia megadelta study, as highlighted below:

1) Eco-hydrology health of the Asia megadelta and estuary;
2) Response of eco-hydrology health of the Asia megadelta/estuary to climate change (variability) and human activity;
3) Conceptual model of eco-hydrology health of regional scale – sharing similarity and reorganizing uniqueness;

We believe that the new directions of the megadelta project are following the current major trend of global change research, which has been proposed by various intergovernmental and non-governmental organizations.

References

Cao, J., Wang, S. and Shen, J., 2000, The primary study of paleoclimate change during the past millennium in Daihai Lake, Inner Mongolia. Marine Geology and Quaternary Geology, 20, 15−20. (in Chinese)

Chang, K.C. 1986: The archaeology of ancient China. Fourth end New Haven CT: Yale University press.

Chu, K.C., 1973, A preliminary study on the climatic fluctuations during the last 5000 years in China. Science Sinica, 16, 226–256.

Ge, Q., Zheng, J., Fang, X., Man, Z., Zheng, X., Zheng, P. and Wang,W.-C., 2003, Winter half-year temperature reconstruction for the middle and lower reaches of the Yellow River and Yangtze River, China, during the past 2000 years. Holocene, 13, 933−940.

Jian, Z.M., Li, B.H., Plfaumann, U. and Wang P.X. 1996: Cooling event in late Holocene in west Pacific. Science in China (Series D) 26, 461-66.

Li, H.M., Li, W.Y. and Liu, J.L., 1995, Quaternary floras. In: Li, X.M., Zhou, Z.Y., Cai, C.Y., Sun, G., Shu, O.Y. and Deng, L.H. (eds.), Fossil Floras of China Through the Geological Ages. Guangdong Science and Technology Press, Guangzhou, p. 552–588.

Liu, H. and Shao, X., 2000, Reconstruction of early-spring temperature at Zhenan from 1755 using tree ring chronology. Acta Meteorologica Sinica, 58, 223−233. (In Chinese)

Luo, J. and Chen, Z., 1997, Paleoclimatological and paleoenvironmental records since 4000 a BP in sediments of alpine lakes in Taiwan. Science China (Series D), 40, 424−431.

Mann, M.E., Bradley, R.S. and Hughes, M.K., 1999, Northern Hemisphere temperature during the past millennium: inferences, uncertainties, and limitations. Geophysical Research Letter, 26, 759−762.

Qian, X., Tan, M. and Liu, D., 2000, Characteristic of annual laminae gray level variations in a stalagmite from Shihua Cave, Beijing, and its climatic significance. Science China (Series D), 30, 239−249.

Qian, W. and Zhu, Y., 2002, Little Ice Age climate near Beijing, China, inferred from historical and stalagmite records. Quaternary Research, 57, 109–119.

Shi, Y., Yao, T. and Yang, B. 1999, Decadal climatic variations recorded in the Guliya ice core and comparison with the historical documentary data from East China during the last 2000 years. Science in China (Series D), 42 (Supplement), 91−100.

Wang, K., Zhang, Y., Jiang, H. and Han, X.B., 1984, Palynological assemblages from the Holocene sediments of the Yangtze River Delta and their geological significance. Marine Geology and Quaternary Geology, 4, 69–88. (in Chinese with English abstract)

Wang, K.F. and Zhang, Y.L. 1981: Some inferences of the climatic changes in the region of Shanghai-Hangzhou during the more than 10,000 years based on spore and pollen analysis. Historical Geography 1, 126-31 (in Chinese, with English summary).

Wang, S. and Gong, D., 2000, Enhancement of the warming trend in China. Geophysical Research Letter, 27, 2581–2584. Wu, Z. (ed.), 1980, Vegetation of China. Science Press, Beijing. (in Chinese).

Yang, B., Braeuning, A., Johnson, K.R. and Yafeng, S., 2002, General characteristics of temperature variation in China during the last two millennia. Geophysical Research Letter, 29(9), doi:10.1029/2001GL014485.

Yi, S., Saito, Y., Chen, Z., and Yang, D.Y., 2006. Palynological study on vegetation and climatic change in the subaqueous Changjiang (Yangtze River) delta, China, during the past about 1600 years. Geosciences Journal, 10(1), 17−22.

Yi, S.H., Saito, Y., Oshima, H., Zhou, Y.Q. and Wei, H.L. 2003: Holocene environmental history inferred from pollen assemblages in the Huanghe (Yellow River) Delta, China: climatic changes and human impact. Quaternary Science 22, 609-28.

Yu, F.L., Chen, Z., Ren, X.Y., and Yang, G.F., 2009. Analysis of historical floods on the Yangtze River, China: Characteristics and explanations. Geomorphology, xxx-xxx.

Zheng, Z. 2000: Vegetation and climate since the Late Pleistocene in southern China. Journal of Geoscience of China 2, 7-20.

Appendix

An International Conference on DELTAS (Bangladesh venue): Deltaic Gateways – Linking Source to Sink

Dates:
January 6–13, 2008

Local Host:
Geological Survey of Bangladesh

Organizers:

IGCP-475 DeltaMAP: http://unit.aist.go.jp/igg/rg/cug-rg/ADP.html
APN Mega-deltas: http://www.megadelta.ecnu.edu.cn

—— Call for Abstracts ——

–––– Registration application form ––––

Project Background:

River deltas are one of the most significant coastal morphological features and depositional systems. Most of the sediment delivered to the oceans by rivers has been deposited in the coastal zones, where it has built numerous deltas. These delta systems are significant not only for helping sedimentary and marine geologists understand modern processes and ancient rocks, but also for their human populations, port and City infrastructures, and natural and living resources. The Asian coast has many large and distinct river deltas, which have abundant resources and products and sustain a huge human population. These delta systems receive approximately 75% of the worldwide sediment discharge from the land to the oceans and collectively compose the largest depocenter on Earth. On the other hand, these deltaic environments are vulnerable to numerous and frequent geo-hazards, such as tsunamis, typhoon storms, monsoon floods, droughts, and sea-level rise, and recently they have been subject to anthropogenic impacts from engineering projects, urbanization, and land-use changes.

International Geoscience Programme (IGCP) Project 475, *Deltas in the Monsoon Asia–Pacific Region (DeltaMAP),* has been organizing international conference on deltas annually. First meeting was held in Bangkok and Ayutthaya on January 15–20, 2004 in conjunction with 5th International Conference on

Asian Marine Geology partially, and 2nd meeting was held in Ho Chi Minh City on January 9-16, 2005. Both meetings were co-organized with APN project Mega-Deltas of Asia (2003-2004: PI, Zhongyuan Chen). CCOP DelSEA project also co-organized 2nd meeting and 3rd meetings held in Brunei on January 13-19, 2006. Through the first three meetings, more than 300 participants have joined from 22 countries, and a regional capacity of networks has been established. Participants from various fields exchanged scientific ideas and new findings and discussed scientific issues and cooperation during the conference. Each meeting report can be found at web pages of IGCP-475 and APN Mega-deltas given on the Circular cover page.

Under the painstaking effort made by all involved participants, we have also been successful in obtaining a new APN funded project (2-years: 2007-2009). The project theme is Asian Mega-deltas: Monsoon circulation in relation to deltaic coastal hazards and future mitigation – millennial to seanal demensions. We are thus combining the Asian Megadeltas' conference through Bangladesh venue like the previous pattern, and do hope this provides you all respective delta coast scientists a forum to deepen our exchange on the project goals.

Meeting Introduction:

The fourth meeting will be held in Bangladesh, on the Ganges-Brahmaputra river delta, from January 6–13, 2008. It was scheduled in 2007 originally and postponed to 2008 by political unrest. The meeting will begin at the Razmoni Isha Kha hotel in Dhaka, the capital city of Bangladesh, and will continue at the Jamuna Resort near the banks of the Brahmaputra River (note: this reach of the river in Bangladesh is called the Jamuna). Field excursions will include a one-day visit to the large channel bars, locally called chars, within the Brahmaputra braidbelt. Our post meeting field trip will involve an overnight boat trip into the Sundarbans, the world's large mangrove forest, a UNESCO International Heritage Site. Together, the Ganges and Brahmaputra rivers tie the Amazon for the world's largest sediment discharge at about 1 billion tones per year. The delta itself links the world's highest mountains and plateau, the Himalaya and Tibet, with the largest sedimentary deposit, the deep-sea Bengal Fan. The entire dispersal system is characterized by coupled feedbacks among the regions monsoon climate, collisional tectonics, and active sediment erosion and transport. Many of these characteristics are also shared with other mega-river-deltas of the Himalayan/Tibetan region, including the Indus, Irrawaddy, Mekong, Yangtze, and Yellow, all of which comprise the world's highest and largest sedimentary source area and sediment dispersal system. As but one example of these systems, the Ganges-Brahmaputra is an outstanding natural laboratory of global significance, and Bangladesh provides a green and gracious host for our meeting. We welcome your participation and abstract submission and are looking forward to discussing with you during the technical sessions and field excursions.

Project Descriptions:

IGCP-475: Deltas in the Monsoon Asia–Pacific Region (DeltaMAP)

International Geoscience Programme (IGCP) Project 475 is to run for five years until 2008. The IGCP has been a joint endeavor of UNESCO (United Nations Educational, Scientific and Cultural Organization) and IUGS (International Union of Geological Sciences) since 1972. The general objectives of IGCP-475 DeltaMAP are to significantly improve our understanding of Asian river deltas by **1)** synthesizing recent research results; **2)** bridging the traditional gaps between terrestrial, coastal, and marine research; and **3)** identifying the major needs and goals of future research. Furthermore, in pursuing these goals, we expect significant advances in fundamental research on monsoon-driven sediment-dispersal systems.

APN Mega-deltas: Monsoon Circulation in relation to Deltaic-Coastal Hazards and Future Mitigation – Millennial to Seasonal Dimensions

This APN-funded project is a continuation of our previous APN program, *Mega-deltas of Asia: Conceptual Model and its Application to Future Delta Vulnerability,* completed successfully in 2003-2004. The new project will focus on monsoon circulation in relation to hazard mitigation on deltaic-coastal regions. Specifically, the study will coordinate regional climatological databases with the process-response model developed in our previous mega-delta project. The main objectives are: 1) to organize the current knowledgebase on monsoon circulation affecting the region's megadeltas. This will be based on the integration of large databases existing for various delta systems; 2) to understand the role of monsoonal impact on delta-coastal landform change. This will particularly focus on: a) hydromorphological observation and modelling, in order to establish a high resolution database at millennial to seasonal dimension; b) comparison among all mega-deltas to identify similarity and distinctions in monsoon circulation; c) geohazard assessment and future mitigation, closely linked with policy-modification and coastal conservation; and 3) to upgrade the regional capacity for geo-hazard assessment and the design of sustainable-development scenarios for all the mega-delta systems, particularly given ongoing and predicted changes to the earthscape from natural and human influences.

IGCP-475 DeltaMAP leaders:

Co-PIs: Steven Goodbred, Jr.: Vanderbilt University, Earth & Environmental Sciences, Nashville, TN 37235-1805, USA; steven.goodbred@vanderbilt.edu

Yoshiki Saito: IGG, Geological Survey of Japan/AIST, Tsukuba, Japan; yoshiki.saito@aist.go.jp

APN Asian Mega-deltas leaders:

PI: Zhongyuan Chen; East China Normal University, Shanghai 200062, China. z.chen@ecnu.edu.cn

Co-PIs: Yoshiki Saito: IGG, Geological Survey of Japan/AIST, Tsukuba, Japan; yoshiki.saito@aist.go.jp

Steven Goodbred Jr: Vanderbilt University, Earth & Environmental Sciences, Nashville, TN 37235-1805, USA; steven.goodbred@vanderbilt.edu

Md. Badrul Islam, Department of Geology and Mining, University of Rajshahi, Bangladesh; hellobadrul@hotmail.com

Tran Duc Thanh: Institute of Marine Environment and Resources (IMER), 246 Danang Street, Haiphong City, Vietnam; thanhtd@imer.ac.vn

An International Conference on DELTAS (Bangladesh venue): Deltaic Gateways – Linking Source to Sink

January 6-13, 2008

Local host: Geological Survey of Bangladesh

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With field excursions to the Brahmaputra River braidbelt and Sundarbans mangrove delta plain

Call for Abstracts and Registration

The focus of the 4th annual meeting of *IGCP-475 DeltaMAP* is delta as sedimentary and geochemical gateways linking fluxes from a vast source area to sinks on the continental margin and deep sea. This combines with the 1st APN meeting that aims at the monsoonal function on delta coast morphological change. Sessions will be organized around traditional subjects of sedimentary facies and processes, stratigraphy and sequence development, indicators of monsoonal circulation on different time scales, geochemical fluxes and transformations. In addition, there will be special sessions focused on broader source-to-sink linkages and on the threat of deltaic geohazards to human populations in the region, particularly arsenic-contaminated groundwater, cyclone storm surges, earthquakes and tsunamis. We welcome your participation and abstract submission.

Organizers/Sponsors

UNESCO/IUGS, IGCP-475, *DeltaMAP* (4th Annual Meeting): *http://unit.aist.go.jp/igg/rg/cug-rg/ADP.html*
Asia Pacific Networks – Asia Megadelta project (1st meeting)
http://www.megadelta.ecnu.edu.cn
Geological Survey of Bangladesh (GSB)
University of Rajshahi: *http://www.ru.ac.bd/gmn/geology&mining.html*
Dhaka University: *http://www.univdhaka.edu/department/index.php?bodyid=GLG*
IGG, Geological Survey of Japan/AIST: *http://unit.aist.go.jp/igg/en/index.html*
SE&E Asia Regional IPO Node of IGBP-LOICZ-II: *http://www.loicz.org/*
World Deltas Network (WDN): *http://www.ww2bw.org/Members/jjk/wdn/*

Local Organizing Committee

Ms. Afia Akhtar, Director General, Geological Survey of Bangladesh

Prof. Md Badrul Islam, Rajshahi University

Mr. Sirajur Rahman Khan, Director, Geological Survey of Bangladesh

Venue and Schedule, January 2008

- 6th: Arrival and registration at Razmoni Isha Kha hotel, Dhaka
- 7th: Inauguration, Technical session, and Banquet in Dhaka
- 8th: Field excursion to Brahmaputra braidbelt and transfer to Jamuna Resort
- 9th: Conference technical sessions at Jamuna Resort
- 10th: AM technical session, PM departure for delta plain excursion and transfer to boat
- 11th-12th: Overnight boat trip to Sundarbans and Bengal coastline; return Dhaka
- 13th: Departure

Sessions

Scientific sessions consist of several 30 minute keynote talks plus 15-minute oral presentations and posters. Specific sessions and technical program to be announced.

Official Language

English is official language of the conference.

Call for Abstracts

Abstracts should be e-mailed or arrive by post to Yoshiki Saito, <yoshiki.saito@aist.go.jp>) by **October 1, 2007**. Abstract format: MS Word file; title, authors, affiliation(s), e-mail address of corresponding author, main text (A4, 1 page including figures, less than 500 words). All abstracts will be published in an abstract volume that will be distributed to all participants.

Field Excursion

Field excursions will include a one-day visit to the large channel bars, locally called chars, within the Brahmaputra braidbelt. The 5-m relief of these bars with 1-m scale cross-bedding, cut-and-fill features, and massive scours were first immortalized in Jim Coleman's 110-page seminal publication, *Brahmaputra River: Channel Processes and Sedimentation*, published in Sedimentary Geology in 1969. As the meeting will take place during the dry season, the low-flow stage leaves much of the 5-10 km wide braidbelt exposed and available for study. Fluvial bedforms, bars and channel structures of all sorts can be found, with some surfaces locally reworked by dry-season aeolian activity. Some of the chars are also semi-stable (lasting decades), and after becoming vegetated they typically support populations of 'nomadic' farmers, grazing cattle, and small villages that are seasonally displaced during high-flow stages. As across most of Bangladesh, the Brahmaputra chars present a dynamic and fascinating geological system that interfaces strongly with local human populations and culture.

Following the technical session and business meeting, our post-conference field trip will take us to the Ganges lower delta plain for an overnight boat trip into the Sundarbans, the world's large mangrove forest and a UNESCO International Heritage Site. Home to over 500 Bengal tigers, spotted deer, and saltwater crocodiles, the Sundarbans is the last remaining area of pristine deltaic coastal plain in South Asia. Most of the Sundarbans coastal reach was deposited by the Ganges river and is on the order of a few thousand years old. Much of the Sundarbans is a 'dry' mangrove system that is flooded only during the summer southwest monsoon, when onshore winds force 1-1.5 m of regional sea-level set up. At the coast, we will visit a chenier plain and hike to a remote eroding beach face on the Bay of Bengal. A second stop will be to a forestry outpost with elevated boardwalks through the mangrove forest. On the way back to Dhaka we will drill in a peat basin (>40 m) using local hand-operated techniques by tubewell drillers, affording us to reconstruct the stratigraphic history of the system on site. We will also carry a hand-auger to investigate the late Holocene deltaplain facies.

Weather and Currency

The weather in Bangladesh in January is typically dry and sunny, although occasional cold fronts can bring cool, damp conditions (about 5°C below normal). Typical temperatures in January are 20-24°C for the daily high and 10-15°C for the daily low.
The currency in Bangladesh is Taka (1 US$ = ca. 65 Tk). Foreign currency is best exchanged at the airport upon arrive, but can also be done at the conference hotel and some local banks.

Health Requirements

Please consult travel agents in your own country to obtain up-to-date information on recommended immunizations and other health precautions.

Travel Arrangements

Biman is the national airline of Bangladesh and has direct flights to several regional locations. There are also direct flights to Dhaka from London (British Air), Bangkok (Thai Air), Kuala Lumpur (Malaysian Air), Singapore (Singapore Air), Dubai (Emirates), Hong Kong (Dragon Air), as well as others routes via Pakistan, India, and the Middle East.

Visas

Bangladesh requires a valid visa for the citizens of most nations. All participants are requested to check with their local consulate regarding current procedures and application process. Generally visas are not difficult to obtain for Bangladesh, but rules change regularly. Letters from the local host and home institute in Bangladesh will be provided to assist participants with their visa application.

Accommodations

All accommodations are included in the registration fee, which is set up as an inclusive package based on single or double occupancy (single available in Dhaka and Jamuna only; accommodations on Sundarbans excursion are double/quad). All hotels, most meals, and food and lodging on both excursions will be included in the registration fee. At Dhaka, accomodation will be made at Razmoni Isha Kha hotel. At the Brahmaputra venue we will stay at the Jamuna Resort, although a slightly less expensive option can be taken at the nearby Elenga Resort. Accommodations for the Sundarbans excursion will be on the ship, including meals, with double and quad occupancies available.

Hotel Contact Information

Rhazmoni Isha Kha: VIP Road, Kakrail, Dhaka: email: razmoni@bdcom.com
Jamuna Resort: web: http://www.jamunaresort.com
Elenga Resort (alternate housing at Brahmaputra): web:http://www.ipsslgroup.com/about_us.htm

Registration Fee

Full Registration fee includes abstract volume, field excursions, accommodations, and lunches and dinners from January 6-12.

Cost:

- Full Package: US$600 single room; US$500 shared; US$450 shared & Elenga Resort option.
- Spouses may participate in the meeting and excursions at a cost of US$400.
- Technical Sessions Only: US$150, includes abstract volume, three lunches and dinners on January 6-10.
- Local participants: Cost is to be announced, but all efforts will be made to keep this at a nominal fee (<US$20), includes abstract volume, three lunches and dinners on January 7-10, but they have to bear the accommodation cost at Brahmaputra venue Jamuna Resort/Elenga Resort or other local hotel by themselves .

Advanced Payments

All prices are quoted in US dollars. Payment should be made by telegraphic transfer to arrive by November 1st, 2007. Further information will be provided in the Second Circular.

Financial Assistance

IGCP-475 funds will be available to partially support a limited number of speakers from developing countries including host country. In the past we had been able to support about 15 participants. Preference will be given to younger scientists who present a paper at the conference. Such funds will be provided cash-in-hand to receipts during the conference. Applications for such funding, including the abstracts of the proposed paper and your short CV, should be submitted to Steve Goodbred <steven.goodbred@vanderbilt.edu> and Yoshiki Saito <yoshiki.saito@aist.go.jp>, by September 15, 2007.

NOTE: This support will cover the full package Registration Fee and local incidentals. The earlier deadline is required to give IGCP headquarters, Paris, sufficient time to approve the funding, which is recipient specific. Also note that *additional funds for air travel are not possible* due to the limited funding available through IGCP programs. However, some countries have a national IGCP fund to support attendance by their scientists and graduate students at IGCP conferences. Potential delegates should ascertain whether their national IGCP Committee distributes travel grants.

In addition, APN funding will invite more than 15 scientists from all unique Asian megadeltas, and from other pacific regions. Local administrators and policy-makers will be also invited during the conference. For querying details, please email Dr. Zhongyuan Chen at: Z.Chen@ecnu.edu.cn

Key dates:

September 15, 2007; Application of financial support
October 1, 2007; Registration form and abstract submission.
Please send both to Yoshiki Saito by e-mail <yoshiki.saito@aist.go.jp>
November 1, 2007; Advanced payment of the registration fee (more information to follow)

All correspondence and special requests should be directed to:

Dr. Steven Goodbred, Jr.
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Mr. Sirajur Rahman Khan, Director
Geological Survey of Bangladesh
153 Pioneer Road
Segun Bagicha, Dhaka, Bangladesh
Email: romu.gsb@gmail.com

Registration Form

Please return this form by e-mail in the body of the message or with attachment to <yoshiki.saito@aist.go.jp>, by fax to +81-29 861 3747, or by post (Yoshiki Saito, Geological Survey of Japan/AIST, Central 7, Higashi 1-1-1, Tsukuba, 305-8567, Japan).

If you do not receive any response showing receipt from Yoshiki Saito, please contact him.

Deadline: October 1, 2007 (firm)

International Conference on DELTAS:
4th Annual Meeting of IGCP-475 *DeltaMAP*
Geological Survey of Bangladesh

Surname_____ Given Name_____

Prefix (select one) Prof./Dr./Mr./Mrs./Miss * Male [ ] Female [ ]

Address _____

_____

Tel: _____ Fax: _____

E-mail: _____

Presentation:

Type of presentation: [ ] Oral [ ] Poster [ ] Either

Title of poster or oral presentation:

_____

Abstract enclosed* Yes [ ] No [ ]

Do you intend to submit a manuscript for inclusion in conference proceedings? Yes [ ] No [ ]

Passport information for required for visa support letter:

Name on passport: _____

Passport Number: _____

Country of Issue: _____

Date of Birth: _____

Date of Issue: _____

Date of Expiry: _____

(Provide passport information for spouse also, if participating.)

Conference Package Choice

[ ]	Full Package, single occupancy	US$600
[ ]	Full Package, double occupancy	US$500
[ ]	Full Package, double with Elenga Resort option	US$450
[ ]	Full Package, accompanying spouse	US$400
[ ]	Meeting Package, meals, sessions, no excursions	US$150
[ ]	Local Package, technical sessions only	TBA

• For participants wishing to share a room with twin beds with another conference participant, please name your roommate, if known [name:_____], or are you willing to have your roommate assigned by the organizers? Yes [ ] No [ ]

• Check-in date: January_____ , Check-out date: January _____

• Special requests (dietary restrictions, wheelchair access, etc.): _____

Participant list and presentation of APN workshop, Dhaka venue – January 6-13, 2008

Date/Time	Name	Abst No.	Presentation title	Oral/Poster/Either
January 7 (Monday) Dhaka session - theme: Bengal delta and South Asia				
0815-0845	**Registration**			
0845-0900	**Opening Remarks**			
0900-0925	Kudrass, Hermann	**29**	Variation of sediment distribution in the submarine delta of the Ganges-Brahmaputra – high and low sea level situations	ORAL - KEY
0925-0950	Akhter, Syed Humayun	**3**	GPS velocities and tectonic kinematics in Bangladesh	ORAL - KEY
0950-1015	Imam, Badrul	**21**	Gas Sand Reservoir in Mio-Pliocene delta sequence in Bangladesh	ORAL - KEY
1015-1040	France-Lanord, Christian	**13**	Suspended sediment variability and erosion geochemical budget of the Brahmaputra-Ganga basin	ORAL - KEY
1040-1100	**Break**			
1100-1115	Banerjee, Manju	**7**	Tracing evolution of Bengal delta India since Neogene period through data base of mangrove ecosystem	ORAL
1115-1130	Sen, Prasanta Kumar	**49**	Rate of sedimentation and evolution of Bengal Delta, India during Holocene through biological data base analysis	ORAL
1130-1145	Islam, Shafi Noor	**22**	The degraded Sundarbans mangrove wetland ecosystems management in the Ganges Delta, Bangladesh	ORAL
1145-1200	Goodbred, Steven	**18**	Piecing together the Bengal Delta: Tracing inputs from the Ganges, Brahmaputra, and other fluvial sources during the late Quaternary	ORAL
1200-1215	Sinha, Rajiv	**52**	Morphodynamics and sedimentary processes in the Ganga delta: exploring facies and magnetic signatures	ORAL
1215-1230	Miah, Giashuddin		APN and other activities in response to Bangladesh Government (tentative)	
1215-1330	**Lunch**			
1330-1355	Khan, Tariq Masood Ali	**26**	Changes in Indus deltaic ecosystem: Sea water intrusion and coastal flooding	ORAL
1355-1420	Paimpillil, Joseph Sebastian	**39**	Ground water flux through porous coastal parallel delta and productivity enrichment in coastal Arabian sea	ORAL

1420-1445	Ramaswamy, V.	**44**	Contribution of terrestrial and marine organic carbon to the Ayeyarwaddy (Irrawady) continental shelf determined from organic carbon, nitrogen and their isotopic signatures	EITHER
1445-1510	Jayawardena, U.de S.	**23**	A study on the formation of deltas in Sri Lanka	EITHER
1510-1530	**Break**			
1530-1545	Schwenk, Tilmann	**60**	Recent seismic surveys of sedimentary records of Himalayan erosion and sea level changes in the Bay of Bengal – First results of SO188 Cruise for a new IODP drilling proposal	ORAL
1545-1600	Galy, Valier	**15**	Efficient organic carbon burial in the Bengal fan sustained by the Himalayan erosional system	ORAL
1600-1615	Gajurel, Ananta P.	**14**	Late Pleistocene delta study in intermontane Kathmandu Basin, Nepal: Climatic implication	ORAL
1615-1630	Singh, Shilpa	**51**	A 13,000 years pollen record of vegetation and sea level changes in Chilika Lake, Mahanadi delta, Orissa, India	ORAL
1630-1645	Anwar, Zahid	**20**	Groundwater quality of Holocene and Plio-Pleistocene aquifers in the lower delta-plain of southern Bangladesh	ORAL
1645-1700	Islam, Md Sultan-Ul		Field Demonstration for Jamuna River Trip	ORAL

Date/Time	**Name**	**Abst No**	**Presentation title**	**Oral/Poster/Either**
January 9 (Wednesday) Jamuna Resort session - theme: East and SouthEast Asia				
830	Saito, Yoshiki	**46**	Delta initiation and Holocene sea-level changes: examples from Southeast and East Asia	ORAL - KEY
855	Zong, Yongqiang	**73**	Postglacial evolution of the Pearl River delta, China	ORAL - KEY
920	Vinh, Vu Duy	**61**	An initial estimation on the effects of Hoa Binh Dam on the coastal sedimentary environment in Red River Delta	ORAL
935	Kim, Seong-Pil	**28**	Sedimentary characters and their significance of the Holocene evolution of the Nakdong River delta in the inner continental shelf of Korea	EITHER

950	Yi, Sangheon	**69**	Vegetation dynamics in response to climate changes from the Pan-Yellow Sea since the Last Glacial Maximum	ORAL
1005	**BREAK**			
1025	Wang, Zhanghua	**64**	Holocene depocenter shift in the middle-lower Changjiang River basins and coastal area in response to sea level change	EITHER
1040	Uehara, Katsuto	**58**	Monsoon-induced seasonality in sediment-resuspension potentials at the Yellow and East China seas	EITHER
1055	Liu, Jian	**30**	Geochemical characteristics and provenance discrimination of the Holocene subaqueous clinoform off the Shandong Peninsula in the Yellow Sea	ORAL
1110	Wang, Fu	**63**	Accumulation rates of Huanghua Harbour during the last 50 years traced by 137Cs	ORAL
1125	Chen, Zhongyuan	**11**	Bedforms of the mid- and lower Yangtze River channel, China: Monsoonal discharge control	ORAL
1200	**LUNCH & POSTERS**			
1400	Qiao, Shuqing	**43**	Metals in suspended sediments from the Changjiang (Yangtze River) and Huanghe (Yellow River) to the sea, and their comparison	ORAL
1415	Zhou, Jianjun	**72**	Pyritization of trace metals in anoxic Yangtze Estuary sediments	ORAL
1430	Yang, Shouye	**67**	Sr-Nd isotopic compositions and the sediment source–to-sink pattern of the Changjiang (Yangtze) River	ORAL
1445	Bhushan, Ravi	**10**	Sediments provenance in Bay of Bengal using Sr and Nd isotopes	ORAL
1500	**BREAK & POSTERS**			
1600	Ongkosongo, Otto S.R.	**38**	Diversity of Java deltas, Indonesia	ORAL
1615	Jones, Brian	**24**	Mineralogyof monsoonal deltaic sediments in the Gulf of Carpentaria, Australia	ORAL
1630	Mishra, Diwakar	**33**	Lithofacies depositional model and sequence stratigraphy of Gamdau Member (Kimmeridgian) Wagad, Kachchh basin, India	NO CHOICE

1645	Liu, Yanguang	**32**	Geochemical and grain-size characteristics of tephra deposits in the northern Okinawa Trough during the late 42ka	EITHER
1700	**BUSINESS MEETING AND PROJECT DISCUSSION**			

January 10 (Thursday) Jamuna Resort session - theme HAZARDS

830	Woodroffe, Colin	**65**	Deltaic-estuarine plains of the Indo-Pacific region and their vulnerability to climate change	ORAL - KEY
855	Gupta, Avijit	**19**	Recovery from the Tsunami of 26 December 2004, Aceh Coast, Sumatra	ORAL - KEY
920	Purkait, Barendra	**42**	Arsenic contaminated groundwater - A geohazard to human population in the upper deltaic plain of West Bengal, India	ORAL
935	Nguyen, Van Lap	**37**	Arsenic contamination in groundwater in the upper delta plain of Mekong River Delta, Vietnam	ORAL
950	**BREAK**			
1010	Fan, Daidu	**12**	Reconstruction of past typhoon activities from sedimentary record in the Yangtze Delta, China	ORAL
1025	Nanayama, Futoshi	**36**	Mud deposition on the meso-tidal beach induced by Typhoon Durian on 4-5th December 2006 in RungDuong beach, Vietnam	ORAL
1040	Bhattacharyya, Somenath	**9**	Delta building process and the changing facades of Sundarbans, India – a temporal analysis through remote sensing and GIS technique	ORAL
1055	**PROJECT AND FIELD TRIP DISCUSSION**			
1130	**PREPARE FOR DEPARTURE AND CHECK OUT**			

JAMUNA SESSION

Goh, Sunny Eng Giap	**17**	2D-modeling on the infiltration of surface-derived organic carbon into groundwater by using SUTRA version 2D3D.1	ORAL
Sujan, Md. Ali	**6**	Determination of aquifer properties and groundwater potentialities using hydrogeological and geoelectrical techniques	ORAL
Khandelwal, Asha	**27**	Indian mangroves in Late Quaternary: a palynological appraisal	ORAL
Nair, K Shadananan	**35**	Human and climate change impacts on the deltas of Southwest India	ORAL

Mohanti, Manmohan	**34**	Sediment and geochemical flux through deltaic pathways on the Bay of Bengal coast, India: An overview	ORAL
Reshad Md. Ekram Ali	**5**	Depositional models in the estuaries of Ganges Brahmaputra (GB) delta, Bangladesh	NO CHOICE
Roy, Partha Jit	**45**	Intra-facies of the Ganges- Brahmaputra Delta and Meghna Estuary in South Central Bangladesh	NO CHOICE
Bi Naishuang	**68**	Centurial high resolution records of the sediment grain-size variation in the subaqueous Changjiang (Yangtze River) delta and their influential factors	POSTER
Abdalla, Mohamed Abaker	**1**	Lacustrine Deltas in Muglad Basin: Morphology, Types and Significance in oil Exploration in Sudan	POSTER
Zhao, Baocheng	**71**	Marine sediment records and relative sea level change during late Pleistocene in the Changjiang delta area and adjacent continental shelf	POSTER
Song, Xiaohong	**53**	Distributions of TSM, POC and PN in the Changjiang estuary area in autumn after the river closure at Three Gorges	POSTER
Ta, Thi Kim Oanh	**54**	Temporal and spatial evolution of depositional facies and architecture in Mekong River Delta during Holocene, south Vietnam	POSTER
Liu, Shengfa	**31**	The strata and environment evolution of Late Quaternary in Chengdao area and modern Yellow River Delta coast	POSTER
Bergmann, Katrin	**8**	Late glacial sea level variations and subsidence of the outer shelf off Bangladesh	POSTER
Schwenk, Tilmann	**56**	The build-up of the submarine Ganges-Brahmaputra delta revealed from high-resolution multichannel seismic and sediment echosounding data	POSTER
Yamaguchi, Naofumi	**66**	Flume experiments on asymmetrical ripple patterns formed under shoaling waves: implications for shallow-marine depositional processes	POSTER
Saitoh, Yu	**47**	Geochemical and isotopic study of groundwater in the Saijo city, western Japan	POSTER
Wang, Fu	**62**	Current study of modern accumulation rates on circum Bohai Sea region	POSTER
Galy, Valier	**16**	Particulate organic carbon transport from the Himalaya to the Ganga-Brahmaputra Delta	POSTER
Yin, Daowei	**70**	Discussion of the Yangtze sediment flux into the sea and its calibration	POSTER
Tamura, Toru	**55**	Erosional and depositional profiles of mesotidal wave-influenced beach along the Mekong River delta	POSTER

		coast, southern Vietnam	
Ullah, Muhammad Shahid	**59**	Depositional and diagenetic characterization of reservoir facies in Bokabil Formation in the Dakhin Nhila Structure, Teknaf, Bangladesh	POSTER
Alam, A. K. M. Khorshed	**4**	Neotectonic evidences in the North-Central part of the Bengal Delta, Bangladesh	POSTER
Islam, Md Sultan-Ul	**40**	Drainage and geomorphic characteristics of the Lower Ganges-Brahmaputra Delta, Bangladesh	POSTER
Khan, Sirajur Rahman	**25**	Holocene geology and natural hazards of the lower Ganges-Brahmaputra Delta in Bangladesh	POSTER
Islam, Md Badrul	**50**	Bank erosion hazard of the Jamuna River near Sirajgonj Town	POSTER
Patabendi, Prabhath	**41**	Survival of river deltas in Sri Lanka – A case study	ORAL
Sarkar, Santosh Kumar	**48**	Distribution, source and status of heavy metals and persistent organic pollutants in sediments of Sunderban mangrove wetland, Northeastern coast of Bay of Bengal	ORAL
Abuzeid, Abuzeid Abdalla	**20**	Sequence stratigraphy of the Aptian-Eearly Albian Abu Gabra Formation (Reservior), in the north west Muglad Rift Basin, Sudan	ORAL

International Conference on DELTAS (Shanghai-Qingdao Venue):

Morphodynamics, Strata Architecture & Environmental Assessment

With field excursions to the Yangtze and Yellow River Delta Coasts and Chinese Grand Canal

Dates:

October 26–November 2, 2008

Shanghai venue: In conjunction to EMECS-8 International Conference:
http://www.emecs-8.ecnu.edu.cn

Local Host:

East China Normal University

Ocean University of China
Qingdao Institute of Marine Geology, CGS
First Institute of Oceanography, SOA

Sponsors:

The Asia-Pacific Network for Global Change Research

IGCP – 475

JSPS AA Science Platform

East China Normal University

Ocean University of China

Qingdao Institute of Marine Geology, CGS

First Institute of Oceanography, SOA

IGG, Geological Survey of Japan/AIST

LOICZ-East Asia Node: Yantai Institute of Coastal Zone Research for Sustainable Development, CAS

Organizers:

APN Megadeltas of Asia: http://www.megadelta.ecnu.edu.cn
IGCP-475 DeltaMAP: http://unit.aist.go.jp/igg/rg/cug-rg/ADP.html
JSPS AA Science Platform Mega-delta watching in Asia

—— Call for Abstracts ——

—— Registration application form ——

Background:

After so many times of combined IGCP-475/APN Asia megadelta workshops and conferences, the coming round will be the turn of China (Shanghai–Qingdao Venue, October 26–November 2, 2008). As you all know, IGCP-475/APN project have successfully organized four conferences, i.e. 1) Bangkok-Ayutthaya venue, January 15–20, 2004 in conjunction with 5th International Conference on Asian Marine Geology partially; 2) Ho Chi Minh City venue, January 9–16, 2005; 3) Brunei-venue, January 13–19, 2006, and 4) Dhaka venue, January 6–13, 2008. Totally, there have been nearly 450 participants from more than 25 countries attended the conferences, representing almost all Asia deltas: Hanjiang River, Yellow (Huanghe) River, Yangtze (Changjiang) River, Pearl (Zhujiang) River, Song Hong (Red), Mekong, Chao Phraya, Ayeyarwady (Irrawaddy), Ganges-Brahmaputra (B-G), and Indus. In addition, many colleagues from the Oceania-Pacific regions and other world types of delta were also actively involved. Conference theme covers: delta formation, Holocene sea level patterns, climate changes, sediment source to sink, environmental hazard and assessment and human impact, etc. We highly appreciate all participants who have made such great contributions in terms of numerous innovative presentations to share each other during the conferences. Also noted is the knowledge exchange among physical, social scientists, government officers, administrators, and policy-makers, etc. Through this forum, an effective enhancement of knowledge gap has been filled up towards the better delta-coast management for societal sustainable development. In this way, we are strengthening further effectiveness of delta coast capacity networks that has been established since 2003.

River deltas are one of the most significant coastal morphological features and depositional systems. Most of the sediment delivered to the oceans by rivers has been deposited in the coastal zones, where it has built numerous deltas. These delta systems are significant not only for helping sedimentary and marine geologists understand modern processes and ancient rocks, but also for their human populations, port and city infrastructures, and natural and living resources. The Asian coast has many large and distinct river deltas, which have abundant resources and products and sustain a huge human population. These delta systems receive approximately 70% of the worldwide sediment discharge from the land to the oceans and collectively compose the largest depocenter on Earth. On the other hand, these deltaic environments are vulnerable to numerous and frequent geo-hazards, such as tsunamis, typhoon storms, monsoon floods, droughts, and sea-level rise, and recently they have been subject to anthropogenic impacts from engineering projects, urbanization, and land-use changes.

The IGCP-APN-JSPS delta conference will take place on October 26–November 2, 2008, Shanghai–Qingdao. The conference in Shanghai venue will be held in conjunction with the 8th **EMECS International Conference**. Since the EMECS-8 is more global-change related, therefore our delta participants will share with EMECS plenary morning session and then we will start our afternoon thematic session (seeing details at: http://www.emecs-8.ecnu.edu.cn). The Yangtze and Yellow River deltas are distinctive sedimentary bodies of top ten world largest river deltas. To understand these two deltas' formation while enhancing the comparison to others is essential for the conference. We are sincerely inviting you with your invaluable thoughts to the forum, which will make great contribution to our community, especially to young scientists.

Project Descriptions:

IGCP-475: Deltas in the Monsoon Asia–Pacific Region (DeltaMAP)

International Geoscience Programme (IGCP) Project 475 is to run for five years until 2008. The IGCP has been a joint endeavor of UNESCO (United Nations Educational, Scientific and Cultural Organization) and IUGS (International Union of Geological Sciences) since 1972. The general objectives of IGCP-475 DeltaMAP are to significantly improve our understanding of Asian river deltas by **1)** synthesizing recent research results; **2)** bridging the traditional gaps between terrestrial, coastal, and marine research; and **3)** identifying the major needs and goals of future research. Furthermore, in pursuing these goals, we expect significant advances in fundamental research on monsoon-driven sediment-dispersal systems.

APN Mega-deltas of Asia: Monsoon Circulation in relation to Deltaic-Coastal Hazards and Future Mitigation–Millennial to Seasonal Dimensions

This APN (The Asia-Pacific Network for Global Change Research)-funded project is a continuation of our previous APN program, *Mega-deltas of Asia: Conceptual Model and its Application to Future Delta Vulnerability*, completed successfully in 2003-2004. The new project will focus on monsoon circulation in relation to hazard mitigation on deltaic-coastal regions. Specifically, the study will coordinate regional climatological databases with the process-response model developed in our previous mega-delta project. The main objectives are: 1) to organize the current knowledgebase on monsoon circulation affecting the region's megadeltas. This will be based on the integration of large databases existing for various delta systems; 2) to understand the role of monsoonal impact on delta-coastal landform change. This will particularly focus on: a) hydromorphological observation and modeling, in order to establish a high resolution database at millennial to seasonal dimension; b) comparison among all mega-deltas to identify similarity and distinctions in monsoon circulation; c) geohazard assessment and future mitigation, closely linked with policy-modification and coastal conservation; and 3) to upgrade the regional capacity for geo-hazard assessment and the design of sustainable-development scenarios for all the mega-delta systems, particularly given ongoing and predicted changes to the earthscape from natural and human influences.

JSPS AA Science Platform: Mega-delta watching in Asia: networking and capacity building:

For the purpose of networking and capacity building of researchers on mega-deltas in Asia, a 3-year project will start from April 2008, supported by JSPS AA Science Platform program. Through collaborative study and seminars, particularly among participating core institutes in Japan, China, Vietnam and Thailand, monitoring methods and analyses of the annual to decadal changes of deltas are focused in this project.

Conference venue:

Shanghai venue: Shanghai Everbright Convention & Exhibition Centre International Hotel (No. 88, Caobao Rd., Shanghai: http://www.ebhotel.com). Pick-up service will be provided for all and details will be provided later.

Qingdao venue: Academic Exchange Center, Ocean University of China (5 Yushan Rd, Qingdao)

Conference Schedule, October 26–November 2, 2008

- October 26 (Sun): arrival & registration

- October 27 (Mon): opening ceremony/plenary session and delta session (afternoon), and banquet (evening)
- October 28 (Tue): One day excursion to the Yangtze delta (South flank) and Grand Canal
- October 29 (Wed): driving to Qingdao with excursions to the Yangtze delta (North Flank) and abandoned Yellow River delta
- October 30 (Thu): One day session at Ocean University of China
- October 31 (Fri): half-day session at Ocean University of China and driving to Dongying city (Yellow River Delta).
- November 1 (Sat): One day excursion to the modern Yellow River delta
- November 2 (Sun): driving back to Qingdao and departure (One can depart from Qingdao directly or take domestic air flight to Shanghai or Beijing for your international departure. Local organizers will help you to book airticket upon request.)

An optional tour to Laoshan Mt and Qingdao Beer Brewery might be arranged in the afternoon on November 2 on request (to be announced, fee US$ ~30–50 including dinner).

Official Language

English is official language of the conference.

Call for Abstracts

Abstracts should be e-mailed to Dr. Yoshiki Saito at: yoshiki.saito@aist.go.jp and Dr. Zhongyuan Chen, at Z.Chen@ecnu.edu.cn by **July 15, 2007**. Abstract format: MS Word file; title, authors, affiliation(s), e-mail address of corresponding author, main text (A4, 1 page including figures, less than 500 words). All abstracts will be published in an abstract volume that will be distributed to all participants. Abstract template is available from web site.

Field Excursions

Field excursions will include visits to the depositional and reclaimed Yangtze deltaic coasts, and abandoned and modern Yellow River deltaic coasts, including cheniers of the Yangtze Delta, and Grand Canal.

One-day excursion on October 28, we will visit the south flank of the Yangtze delta, where most of wetlands have been reclaimed with modern narrow tidal flats and cheniers (shelly mound) formed 3–6 ka, and Grand Canal in Suzhou. Extensive reclamation was done in tidal flats of the south flank of the Yangtze Delta, including the Pudong international airport. We will visit the frontal artificial coast and reclaimed land. The exciting view is about the Ancient Chinese Grand Cannel that was dug in Sui Dynasty (581–618 AD). The Grand Canal of China is the world's oldest and longest canal, far surpassing the next two grand canals of the world: Suez and Panama Canal. The building of the canal began in 486 BC during the Wu Kingdom. It was extended during the Qi Kingdom, and later by Emperor Yangdi of Sui Dynasty during six years of furious construction from 605–610 AD. The canal is now connecting between Beijing, northern China and Hangzhou, southeast China, across about 1800 km long, serving as the major boat-shipping artery on the eastern China coast.

On the way to Qingdao on October 29 by bus, all participants will be driven to see wide tidal flats and wetland of the north flank of the Yangtze Delta, where depositional tidal flats are developed, and abandoned Yellow River delta at northern Jiangsu coast, where there appear abandoned river courses and erosional deltaic coasts. The abandoned Yellow River delta was active during 1128-1855 and formed a cuspate delta at the Yellow Sea coast. After the river-course shift to the Bohai Sea in 1855, severe shoreline erosion with more than 10 km retreat occurred.

Upon completion of thematic session in Qingdao, another field trip will be arranged for all participants to visit the modern Yellow River delta coast formed after 1855. You will be taken to see the fast delta progradation and erosion, distributary migration, long coastal dykes, extended wetlands and potential environmental hazards. As the Shengli Oil Field (the second largest one in China) is located at the modern delta, you can see thousands of pumping machines on the delta plain and oil platforms in the offshore area in the Bohai Sea.

Weather and Currency

The weather in late October–early November is pleasant, sunny and little rain. Temperature usually ranges between about 18–25°C day time, but <15 °C night time. The currency in China is RMB (1 US$ = ca. 7.0 RMB as of March, 2008). Foreign currency is best exchanged at the airport upon arrive, but can also be changed at local banks.

Health Requirements

Please consult travel agents in your own country to obtain up-to-date information on recommended immunizations and other health precautions.

Travel Arrangements

Shanghai has two international airports: Pudong International airport and Hongqiao International airport. Please check your arrival information. Most participants will arrive and depart through Pudong International airport. Qingdao has the Liuting International airport. There are many flights to most of the major Chinese cities (Shanghai, Beijing, and Hong Kong) and international flights to Korea and Japan.

Visas

Please check with your local information about China trip. Please request us for issuing you invitation letter, usually PDF invitation issued by local organizer is valid for visa application, but the conference organizer will be always happy to send you through mail upon request.

Insurance

All participants to China conference will have been responsible for their own insurance. Of note, the conference organizer will take care the insurance only for the field excursion transportation by bus.

Accommodations

All accommodations are included in the registration fee. All participants will be housed in the East China Normal University Campus hotel, or other hotels nearby the main conference venue.

East China Normal University campus hotel: Tel: 86-21-62601058; Fax: 86-21-62224417

While in Qingdao, all participants will be housed at the Dongfang Hotel, near the Ocean University of China (10 minutes to the venue center by walk).

Dongfang Hotel: Phone +86-532-82865888, Fax +86-532-82862741, website: http//www.hotel-dongfang.com

Registration

Full Registration fee is

US$ 600 (for international) or RMB 4200 (for Chinese) for double occupancy room

US$ 700 (for international) or RMB 4900 (for Chinese) for single occupancy.

This fee covers abstract volume, field excursions, accommodations, and lunches and dinners, from October 27 evening dinner–November 2 lunch. On-site registration will take place at the campus hotel on October, 26, 2008, with **CASH only**. Registration will also be available at the conference venue on October 27, 2008 (08:30–09:00). For those who want to attend the Qingdao venue (scientific session & local participants only), please contact the local host Dr. Wang Houjie <hjwang@mail.ouc.edu.cn> of the Ocean University of China.

Financial aids

As usual, IGCP-475 funds will be available to partially support a limited number of speakers from developing countries including host country. Preference will be given to young scientists who present a paper at the conference. Such funds will be provided cash-in-hand to receipts during the conference. Applications for such funding, including the abstracts of the proposed paper and your short CV, should be submitted to Yoshiki Saito <yoshiki.saito@aist.go.jp>, **by June 30, 2008**.

NOTE: This support will cover the full package Registration Fee (double occupancy). Also note that *additional funds for air travel are not possible* due to the limited funding available through IGCP programs. However, some countries have a national IGCP fund to support attendance by their scientists and graduate students at IGCP conferences. Potential delegates should ascertain whether their national IGCP Committee distributes travel grants.

In addition, APN funds and local funds will invite (fully or partially) more than 15 scientists representing all unique Asian megadeltas, and other pacific regions. Local administrators and policy-makers will be also invited during the conference. For querying details, please email Dr. Zhongyuan Chen at <Z.Chen@ecnu.edu.cn>, **by June 30, 2008**.

Key dates:

June 30, 2008; Application of financial support

July 15, 2008; Registration form and abstract submission (Please send both to Yoshiki Saito, at: yoshiki.saito@aist.go.jp and Zhongyuan Chen, at: Z.Chen@ecnu.edu.cn)

October 26, 2008; On-site registration at the campus hotel (14:00–18:00), in **Cash Only**

Conference results

In addition to conference abstract proceedings, special issue will be organized in International Journal, e.g., ECSS (Estuarine, Coastal and Shelf Sciences). Relevant information will be detailed before or during the conference.

Organizers/Sponsors

UNESCO/IUGS, IGCP-475, DeltaMAP (5th Annual Meeting): http://unit.aist.go.jp/igg/rg/cug-rg/ADP.html

The Asia-Pacific Network for Global Change Research: Megadeltas of Asia project (2nd meeting): http://www.megadelta.ecnu.edu.cn

JSPS AA Science Platform: Mega-delta watching in Asia (1st meeting)

East China Normal University: http://www.ecnu.edu.cn

Ocean University of China: http://www.ouc.edu.cn

Qingdao Institute of Marine Geology, CGS: http://www.qimg.cgs.gov.cn

First Institute of Oceanography, SOA: http://www.fio.org.cn

IGG, Geological Survey of Japan/AIST: http://unit.aist.go.jp/igg/en/index.html

LOICZ-East Asia Node: Yantai Institute of Coastal Zone Research for Sustainable Development

Local Organizing Committee
Prof. Zuosheng Yang, Ocean University of China
Prof. Zhongyuan Chen, East China Normal University
Dr. Ping Yin, Qingdao Institute of Marine Geology, CGS
Dr. Xuefa Shi, Key Laboratory of Marine Sedimentology & Environmental Geology, First Institute of Oceanography, SOA

IGCP-475 DeltaMAP leaders:
Co-Leaders:
Steven Goodbred, Jr.: Vanderbilt University, Earth & Environmental Sciences, Nashville, TN 37235-1805, USA; steven.goodbred@vanderbilt.edu
Yoshiki Saito: IGG, Geological Survey of Japan, AIST, Tsukuba, Japan; yoshiki.saito@aist.go.jp

APN Mega-Deltas of Asia leaders:
PI: Zhongyuan Chen;
East China Normal University, Shanghai 200062, China. z.chen@ecnu.edu.cn
Co-PIs:
Yoshiki Saito
Steven Goodbred Jr
Md. Badrul Islam: Department of Geology and Mining, University of Rajshahi, Bangladesh; hellobadrul@hotmail.com
Tran Duc Thanh: Institute of Marine Environment and Resources (IMER), VAST, 246 Danang Street, Haiphong City, Vietnam; thanhtd@imer.ac.vn

JSPS AA Science Plarform: Mega-delta watching in Asia
Chief Coordinator: Yoshiki Saito
China Coordinator: Zuosheng Yang
Vietnam Coordinator: Tran Duc Thanh
Thailand Coordinator: Jarupongsakul Thanawat

Registration Form

Please return this form by e-mail in the body of the message or with attachment to Yoshiki Saito at: <yoshiki.saito@aist.go.jp>, and Zhongyuan Chen at: Z.Chen@ecnu.edu.cn.

Deadline: July 15, 2008 (firm)

International Conference on DELTAS:
5th Annual Meeting of IGCP-475 *DeltaMAP*
2nd Asia Pacific Networks – Asia megadeltas
1st JSPS AA Science Platform Mega-delta watching in Asia

Surname_____ Given Name_____

Prefix (select one) Prof./Dr./Mr./Mrs./Miss * Male [ ] Female [ ]

Affiliation _____

Address _____

_____

Tel:_____ Fax: _____

E-mail: _____

Presentation:

Type of presentation: [ ] Oral [ ] Poster [ ] Either

Title of poster or oral presentation:

_____

Abstract enclosed* Yes [ ] No [ ]

Do you intend to submit a manuscript for inclusion in conference proceedings? Yes [ ] No [ ]

Passport information for required for visa support letter:

Name on passport: _____

Passport Number: _____

Country of Issue: _____

Date of Birth: _____

Date of Issue: _____

Date of Expiry: _____

(Provide passport information for spouse also, if participating.)

Registration
Full package (single occupancy room) US$ 700 [ ]
Full package (double occupancy room) US$ 600 [ ]
Spouse package US$ 400 [ ]

- For participants wishing to share a room with twin beds with another conference participant, please name your roommate, if known [name:_____], or are you willing to have your roommate assigned by the organizers? Yes [ ] No [ ]
- Check-in date: October_____ , Check-out date: November _____
- Special requests (dietary restrictions, wheelchair access, etc.): _____

Participant list, presentation of APN workshop, Oct. 26 – Nov. 2, 2008, Shanghai – Qingdao venue

Meeting venue - Shanghai Everbright Convention & Exhibition Centre International Hotel
Meeting Hall - Guangda 7 **Program v 9**

October 27, 2008

		Presenter	Country	Presentation title
Chair: Dr. Yoshiki Saito				
13:45	- 13:50			opening address
13:50	- 14:15	Colin D. WOODROFFE	Australia	Vulnerability assessment of deltas of the Asian monsoonal region
14:15	- 14:40	Zhanghua WANG	China	Holocene Yangtze Delta Evolution: Retrospective and Perspective
14:40	- 15:05	Hermann R. Kudrass	Germany	Cyclonic versus tidal mobilization and sedimentation in the submarine Ganges-Brahmaputra delta, Bangladesh
15:05	- 15:20	NGUYEN Van Lap	Vietnam	Coastal landform change in relation to monsoonal activity in Mekong River Delta, Vietnam
15:20	- 15:35	Pramot Sojisuporn	Thailand	Coastal Erosion in the Chao Praya River Delta
15:35	- 15:50	Ramesh Ramachandran	India	Nutrient transport from the Ganges (Hoogly) estuary
15:50	- 16:15	Coffee Break		
Chair: Prof. H. R. Kudrass				
16:15	- 16:30	Avijit Gupta	UK	Use of high-resolution satellite images for studying alluvial valleys and deltas of large rivers
16:30	- 16:45	Ashraf M. Dewan	Bangladesh	Quantifying the morphological changes of the Ganges in Bangladesh using geospatial data
16:45	- 17:00	Daidu FAN	China	Impacts of Last Glacial-Interglacial Cycle on Sediment Yield and Delivery in Yangtze Drainage Basin to the East China Sea
17:00	- 17:15	Takao YAMASHITA	Japan	Water Circulation Simulation in Yangtze River-East China Sea System: Effects of Three Gorges Dam

17:15 - 17:30	Asha Khandelwal	India	Holocene evolution of mangrove vegetation at Chandrapur, Chilka Lake, Orissa, India in relation to pollution and anthropogenic impact
17:30 - 17:45	Zhen LI	China	Modern mangrove pollen representation and a 9,000-year record ecological changes from the northwestern coast area of the South China Sea
17:45 - 18:00	Shilpa Singh	India	Comparative analysis of palynoassemblages of sediment profiles (CH-I & CH-51) from two different regimes of Chilika Lake, Orissa, India
18:30 - 20:30	Welcome dinner in Everbright convention center		

APN/IGCP475/JSPS The Fifth International Conference on Deltas - Qingdao venue
Meeting venue - Academic Exchange Center of the Ocean University of China
October 30, 2008 (Thursday)

0815 - 0825	Opening Address		
0825 - 0840	Group Photos		
0840 - 0910	Chuck NITTROUER	USA	Seabed signatures of gravity flows on subaqueous deltas: Recent observations
0910 - 0930	Jingpu LIU	China	Flux and Fate of Asian River-derived Sediments in the Western Pacific Marginal Seas
0930 - 0945	Gareth DAVIES	Australia	Channel Planform Morphology of Macrotidal Deltaic- Estuarine Systems in Northern Australia and Southern Asia
0945 - 1000	Jian LIU	China	The post-glacial sedimentary characters and environmental evolutions in the muddy area off the Yangtze River estuary
1000 - 1015	Shouye YANG	China	Paleoflood investigations in the lower Changjiang valley using sedimentological and geochemical methods
1015 - 1030	SeungSoo CHUN	Korea	Short-term Sedimentation and Preservation in the Deltaic to Estuarine Intertidal-flat Setting, Ganghwa Island, Korea
1030 - 1100	Coffee Break		
1100 - 1200	Short summary of posters (2 minutes each)		
1200 - 1300	Lunch		
1300 - 1500	Poster presentation		

1500 - 1515	Giashuddin Miah	Bangladesh	Anthropogenic activities and their impacts on natural resources and livelihoods of the coastal region of Bangladesh
1515 - 1530	Shafi Noor Islam	Bangladesh	The Settlement Displacement and Changes of Agricultural Cropping Pattern: An Overview on Char-Land of Padma River Basin in the Ganges Delta
1530 - 1545	Tilmann Schwenk	Germany	The architecture of the submarine Ganges-Brahmaputra delta – results from high-resolution seismic and sediment echosounder surveys
1545 - 1600	Manju Banerjee	India	Plant remains in the deltaic deposits of Indian subcontinent as environmental assessment indicators during Holocene
1600 - 1615	Prasanta Kumar Sen	India	Record of geomorphological changes in Bengal Basin, India during Holocene through correlation of biostratigraphic zones
1615 - 1630	Coffee break		
1630 - 1645	Barendra Purkait	India	Use of grain size distribution patterns and textural parameters to distinguish different sedimentary environments in a deltaic plain, India
1645 - 1700	Venkat Ramaswamy	India	Nature of organic matter on the Ayeyarwady continental shelf and Gulf of Martaban
1700 - 1715	Asif Inam	Pakistan	The initiation, development and degradation of Indus Delta through time
1730 - 1745	Mohamed Abaker Abdalla	Sudan	Facies depositional environment of Muglad Rift Basin with emphasis of geometry of Sedimentary bodied determined from subsurface
1745 - 1800	Toshiyuki KITAZAWA	Japan	Storm-influenced tiny delta

Conference dinner at the Academic Exchange Center

October 31, 2008 (Friday)

0830 - 0845	Brian JONES	Australia	Delta morphological processes in the Gulf of Carpentaria, Australia
0845 - 0900	Toru TAMURA	Japan	Initiation of the Mekong River delta at 8 ka: evidence from the sedimentary succession in the Cambodian lowland

0900 - 0915	Ulrike PROSKE	Germany	Recent settlement and soil formation altering the late Holocene sedimentological and vegetation record in the northern Mekong Delta, Vietnam
0915 - 0930	Keishi HORAGUCHI	Japan	Seasonal and annual geomorphologic changes of mesotidal beach at Ba Dong, Mekong River delta, Vietnam
0930 - 0945	TRAN Duc Thanh	Virtnam	Coastal Accretion and Erosion in Red River Delta and Influence of Monsoon.
0945 - 1010	Coffee Break		
1010 - 1040	Zuosheng YANG & Yoshiki SAITO	China & Japan	The evolution of the Huaghe (Yellow River) Delta: Phase change and the coastal processes
1040 - 1055	Houjie WANG	China	The Huanghe (Yellow River) sediment gravity flow to the sea: Process, mechanism and model
1055 - 1110	Katsuto UEHARA	Japan	Wave climatology around the Huanghe Delta estimated from a numerical model
1110 - 1125	Shuqing QIAO	China	Distribution and dispersion of suspended matter in the Yellow River estuary
1125 - 1140	Field excursion guide		
1140 - 1200	Discussion on future activities		

Poster session

1	Sultan-Ul-Islam	Bangladesh	Architectural Elements and Facies Analysis of Oligocene Tidal Sequence of Renji Formation, Bengal Basin, Bangladesh
2	Badrul Islam	Bangladesh	Geomorphic Evolution of Lower Ganges-Brahmaputra Delta, Bangladesh.
3	A. K. M. Khorshed Alam	Bangladesh	Neotectonics of the Jadukata fan, Bangladesh
4	Luisa Palamenghi	Germany	Multi-scale Seismostratigraphic Analysis of the Submarine Ganges-Brahmaputra Prodelta Front
5	Hema malini BANDARU	India	Storm-induced landform changes along the delta front coasts – Examples from the east coast of India
6	Nageswara Rao KAKANI	India	Imprints of Basement Tectonics on the Morphologies of the Krishna-Godavari Deltas, India
7	Mahdi RAZAZ	Japan	Numerical Experiments of Cohesive

			Sediment Transport in Yangtze Estuary
8	Hansoo LEE	Japan	Regional Environment Simulator in IDEC, Hiroshima University (HU)
9	Till HANEBUTH	Germany	What environmental parameter has controlled early human settlement and salt production in the north-eastern Mekong Delta around 3 kyr BP?
10	VU Duy Vinh	Vietnam	Numerical modelling of influence of monsoon on hydrodynamics and suspended sediment transport in Hai Phong –Ha Long coastal area
11	U. de S. Jayawardena	Sri Lanka	The effects of the use of DELTA zones for various industries and development projects in Sri Lanka
12	Jing CHEN	China	Heavy mineral distribution and its provenance implication in Late Cenozoic sediments in western and eastern area of the Yangtze Delta
13	Qianli SUN	China	The discrepant signals of climate recorded by Holocene sediments of the North and East China monsoonal regions: A perspective from major elements characteristics
14	Zuo XUE	China	A Preliminary Study of Sedimentation in the Mekong Subaqueous Delta, South Vietnam
15	Liangyong ZHOU	China	Morphology and internal architecture of a banner bank off Chengshan headland, Shandong Peninsula
16	Xiaoxia SUN	China	Weathering indicators of sediments of the Huanghe (Yellow river), Changjiang (Yangtze River) and Zhujiang (Pearl River) to the sea, their comparison and influential factors
17	Tomoyuki SATO	Japan	Two changes of delta front; a case study of the Yahagi delta, Central Japan
18	Satoshi TANAKA	Japan	Depositional process and feature of the alluvial basin of the Echigo Plain of Niigata, Central Japan
19	Naishuang BI	China	Suspended sediment dispersion off the Huanghe (Yellow River) Delta in the period of the river low water discharge

20	Bangqi HU	China	Impact of the Three Gorges Dam on the sediment reduction from the upper Changjiang (Yangtze River) and its downstream channel-delta erosion
21	Fu WANG	China	Spatial distribution characteristic of sedimentation rates on the Tianjin supratidal zone
22	Jianjun ZOU	China	Early diagenetic processes of Fe and Mn in Yangtze Estuary
23	Jinxia CHEN	China	Pollen stratigraphy, vegetation and environment of the last deglaciation— A record from North Yellow Sea
24	Kunshan WANG	China	Distribution and assemblage of heavy minerals in the Modern Yangtze River Delta and shelf of East China Sea
25	Sheng-fa LIU	China	Heavy Metal Distribution and its Pollution Appraisal in Sediments of Mud Area from the Inner Shelf of the East China Sea
26	Yanguang LIU	China	Sea surface temperature changes in the southern East Sea/Japan Sea and northern East China Sea during the last 15000 years
27	Ningjing HU	China	Concentrations and Possible Sources of PAHs in Sediments From Bohai Bay and Its Adjacent Area

Funding sources outside the APN

UNESCO/IUGS, IGCP-475, DeltaMAP (4^{th}-5^{th} Annual Meeting): – US$ 15,000
The Committee of Science and Technology, Shanghai, US$ 15,000
CCOP - US$ 1500
IGG, Geological Survey of Japan/AIST – US$ 15,000
JSPS - US$ 3000
East China Normal University - US$ 15,000
First Institute of Oceanography, SOA, China: US$ 12,000

Glossary of Terms

AMS – Accelerated Mass Spectrum
Anthropogenic forcings
Asia Megadelta
Anthropogenic
Building capacity networks
Char-land
Coastal vulnerability assessments
Coastline progradation
Climate changes
Climate optimum
Cultural break
Discharge fluctuations
Drainage basin
Flood hazard
Hazard prevention and mitigation
Human impact
LGM – latest glacial maximum
Mega-thermal epoch
Mid-Holocene
Millennium to seasonal time scale
Morphological aggradation
Monsoonal precipitation
Population relocation
Radiocarbon dating
Rice cultivation
Sea level fluctuations
Sediment flux and sediment load
Settlement migration
Sea level rise
Subsidence
Transgression
The Neolithic
The Holocene
Underground water withdraw
Water diversion

The report is to be submitted **one month before the end of the term of the Contract/one month before the date the APN Secretariat Director signed the Contract** in the following formats:

1. By airmail to the address below:
   a. **Soft Copy – 5 CD-ROMS**, appropriately labeled and covered using the design and information on the cover page of the Report Template
   b. **Hard Copy – 2 bound copies** appropriately labeled and covered using the design and information on the cover page of the Report Template

   Dr. Linda Stevenson
   APN Scientific Officer
   APN Secretariat
   IHD Centre Building, 5F
   1-5-1 Wakinohama Kaigan Dori
   Chuo-Ku, Kobe 651-0073 JAPAN

2. By e-mail and addressed to Dr. Stevenson (lstevenson@apn-gcr.org) and Kristine Garcia (kgarcia@apn-gcr.org).
   Kindly note that our server can also receive attachments of up to 8MB file size. In case that the final project report file size exceeds 8MB please try any of the following options:

   a. For a file size of more than 8MB but less than 10MB please send the report to our Gmail account at apngcr@gmail.com and notify us in our APN account so we could check for it immediately.
   b. For a larger file size please try the following:
      - Upload on your institution's ftp server and provide to us the download details (i.e. IP address, login details, etc)
      - Send through any of the free file hosting available in the internet. Please note that these free file hosting save your files for a limited number of days so it is very important to notify us immediately. Some of these are the following:
        - http://www.filefactory.com/
        - http://www.mediafire.com/
        - http://www.yousendit.com/

3. **A separate CD** containing other project outputs (i.e. publications, photos, etc)