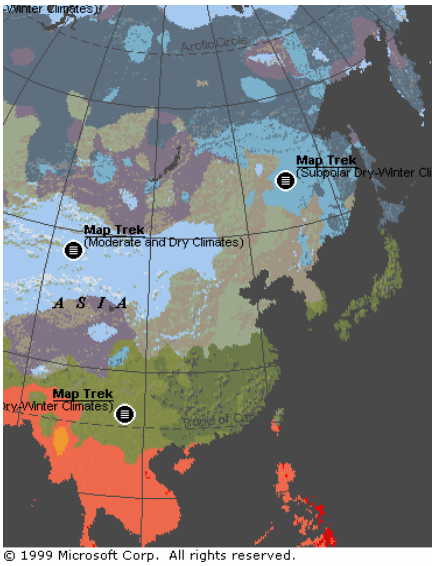
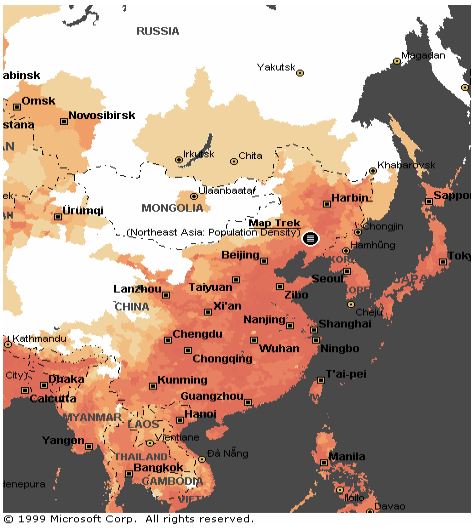
East Asia BASINS

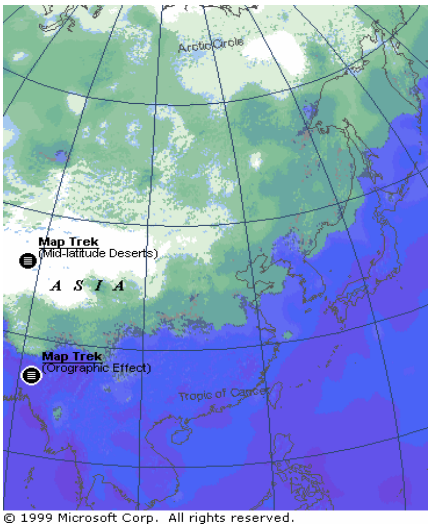
香 港 浸 會 大 學
HONG KONG BAPTIST UNIVERSITY

26 – 28 February 2001

East Asian Global Change Workshop on river catchment – coastal sea interaction & critical thresholds







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INTERIM REPORT

LOICZ EAST ASIA BASINS workshop
Hong Kong, Baptist University, 26-28 February 2001

Acknowledgements

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Major Sponsors
Asia Pacific Network (APN)
Global Change System for Analysis, Research and Training (START)

LOICZ is indebted to Prof. Ming H. Wong and his team namely Ms. Doris Ng and Ms. Angela Wong from Hong Kong Baptist University in dealing with the local organizational requirements needed for the successful meeting and the substantial scientific contribution they made to the progress of the workshop

LOICZ is also grateful for the very valuable scientific and synthesizing work which was conducted during the 1st East Asian LOICZ Meeting held in Quingdao, China, October 1999, namely coordinated by Prof. Dunxin Hu. This meeting set the scientific stage for the current East Asia BASINS approach and also enabled the support of the Chinese LOICZ Committee.

We thank especially all participants who ensured the vitality of the highly interactive meeting.

Hartwig Kremer
Deputy Executive Officer
LOICZ IPO – March 2001

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Supporting Agencies

The workshop as part of the global LOICZ BASINS effort received financial and in kind support form:

- The Asia Pacific Network for Global Change – APN, Kobe, Japan, US $ 6,000
- The Global Change System for Analysis, Research and Training, START, US $ 2,500
- The Hong Kong Baptist University, Institute for Natural Resources and Waste Management

This support is continuing a collaboration which over last years has contributed considerably to the fulfillment of the LOICZ commitment to provide a first global assessment and synthesis on global change in coastal zones. As in these earlier measures, e.g. the 4th LOICZ Open Science Meeting, Bahia Blanca, Argentina, 1999 (with South American BASINS associated) as well as in AfriBASINS 1, Nairobi 2000, one major objective of the current meeting was to generate a better understanding of the human dimensions of coastal change.

In this context the support enables to develop and apply interdisciplinary approaches considering the biogeochemical aspects in combination with the socio economic ones and applies a full catchment scale as the entity affecting the coastal zone as part of the water cascade. The Hong Kong workshop therefore benefited considerably from these and other earlier exercise and reached the most advanced state within the global LOICZ BASINS experiment. To carry this further and follow up with advanced modeling development and training in form of interregional transfer and exchange as well as appropriate results delivery to the potential regional users are objectives that match those of the funding agencies. We therefore hope that this workshop will have provided another regional piece of the picture needed in global river catchment – coastal sea interaction under global and human pressure.

List of participating countries and participants

- **China**
- **Germany (Resource)**
- **Japan**
- **Korea**
- **Netherlands (Resource)**
- **Norway (Resource)**
- **Russia**
- **Taiwan**
- **USA (Resource)**
- **Vietnam**

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LOICZ BASINS Background and Approach

Coasts worldwide are subject to many pressures which are expected to continue or increase in the future. Despite decreasing inputs of "classical" contaminants like heavy metals, nutrients and PCB's, they are still of concern in a number of areas and will remain important. Past and planned physical changes in rivers (e.g. damming) influence the natural flow of water, nutrients and sediments to the coast. New classes of chemicals have entered the priority lists of international organizations and will require coastal zone impact and monitoring studies. In addition the increase in economic activities from tourism, fisheries, urbanization and the generally expected increase in traffic will offer challenges for the coastal zone managers and regulators. The management issues and their solutions require an integrated approach of the natural and socio-economic sciences. Numerous studies (often mono-disciplinary) have been conducted to deal directly with these issues but could benefit from more integrated assessment.

This necessary integration of the results of past studies requires a framework for analysis. For the integration we have chosen the DPSIR framework since it allows for combining results from the natural and social sciences as well feedback from and to policy/management options. As already stated the pressures are manifold, hence we have to narrow them down within the LOICZ context, which deals with changes in biogeochemical cycles as major indicators. Hence, LOICZ-BASINS deals with the impact of human society on the material transport such as water, sediments, nutrients, heavy metals and man-made chemicals to the coast. It assess their coastal impact and tries to provide feasible management options going with an analysis of success and failure of past regulatory measures. Since the changes in fluxes are mostly land or river catchment based we will treat the catchment-coastal sea as one unit – a water continuum. Furthermore, applying this scale to coastal change phenomena means that beyond activities from agriculture, fisheries, urban development, industry, transport, tourism also morphological changes (e.g. damming) have to be taken into account in as far as they affect the fluxes.

In particular the following parameters will be assessed:

- material flow of water, sediments, nutrients and priority substances (past, current and future trends);
- socio-economic drivers which have changed or will change the material flows;
- indicators for the impact on coastal zone functioning and to derive from them
- a "critical load" for the coastal zone.

This critical load concept can be used (as has been done for atmospheric pollution abatement) for a cost-benefit analysis of management options. Scenario building is an integral part of this analysis.

The LOICZ-BASINS approach faces three major challenges:

1) to determine the time delay between changes in land-based material flows (due to socio-economic activities, morphological changes or regulatory measures) and their impact on the coastal zone system.
2) to generate an improved understanding of the complexities of the coastal sea environments and to derive from this complex environment the "critical loads".
3) to consider the multiplicity of interests and stakeholders affected. In particular, there may be local, regional, national, and multi-national governmental bodies with conflicting interests.

Large catchments seem to be obvious examples to be addressed within a global LOICZ synthesising effort (e.g. Yangtze). However, a major portion of the flows to the coastal seas are generated in small to medium size catchments with high socio-economic activities. These areas are also of priority interest to the global BASINS effort. The same in fact applies to island dominated regions such as the South Pacific or the Caribbean where frequently a whole island is a catchment affecting the coastal zone and influences are generated by both, anthropogenic drivers as well as global forcing.

As mentioned earlier numerous studies have been conducted, which can contribute to LOICZ-BASINS. Through regional workshops on a global scale these studies are identified and synthesized. In addition the workshops identify the pertinent regional issues and follow-up workshops assist in preparing research proposals for local and regional funding agencies. To date successful workshops have been held in Europe, Latin America and Africa. For 2001 workshops and studies are planned for East Asia and Australasia / Oceania. Follow-up workshops aiming at finalising a first regional synthesis and at formulating research proposals take place in 2001 in Latin America and Africa. In 2001 the EUROCAT project funded by the European Union, which deals with the interaction between its major catchments and coastal seas, will start and contribute to LOICZ-BASINS.

Through the global workshops BASINS offers a common framework for analysis, assessment and synthesis of coastal zone and management issues. This common framework not only assists the regional synthesis efforts but sets the stage for project development and facilitates the networking needed and the acquisition of funding. At the same time it will allow LOICZ to address its global issues. In this respect are important the contribution of BASINS to the LOICZ synthesis book and its interaction with other focal areas. In particular BASINS is expected to provide an index system allowing to categorise the links between catchment changes and response observed in the coastal zone to the typology up-scaling effort considering global river run off and coastal biogeochemistry (joint project of LOICZ and BAHC).

In the following pages the standardized design developed through the various regional BASINS workshops and applied to achieve the objectives outlined is described. The East Asia BASINS meeting reported here follows these guidelines and key questions.

Framework for LOICZ Synthesis and Project Development

Since BASINS workshops have to have a regional focus assessment and analysis follow a hierarchical sequence of scales to finally allow a full regional picture to be generated – these scales increase from:

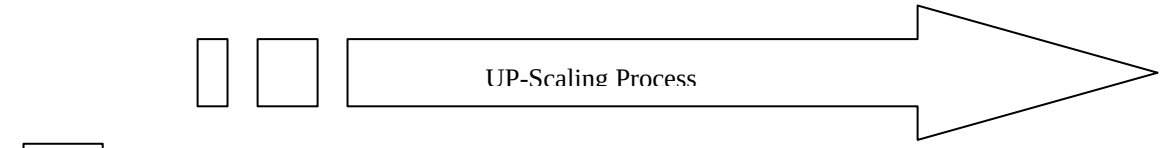
1. local catchments via
2. sub regional or provincial scales up to
3. regional scale which could mean country by country (e.g. in the case of China) or international if a subcontinent is concerned.

In order to facilitate and guide the evaluation of existing information items should ideally be addressed in a standardized way – for which the **D**river/**P**ressure/**S**tate/**I**mpact/**R**esponse scheme, DPSIR, has proved to be an appropriate descriptive framework. Steps to be taken are:

a) to set up a **list of Issues** of coastal change and **related Drivers** in the catchment (plenary-task)

b) to try to characterize the various issues of change by either **relative information** (if there is no hard figures) or **concrete results** coming from investigations or archived data;

The general BASINS lay out may be best expressed by a sequence of tables it is expected to deliver - a scheme of which is shown below. All major assessment tables will follow more or less this scheme, which is expected to facilitate interregional comparison within the global BASINS effort – although the entries to the tables are different as shown:



DRIVERS in sequence of importance

DRIVERS	**Local catchment (allowing within and between catchment comparison)**		**Sub regional (i.e. by country or considering open versus enclosed seas)**		**Region**
Damming					
Water Abstraction..etc					
(fill along the categories and priorities given for example by the OSPAR Quality Status Report 2000*****)					

***** = see comments on this driver identification and ranking on the following pages

Table Input
Categorization of DRIVERS affecting the catchments/coastal sea interaction e.g. by importance and executed along the scales mentioned; (this can be done in form of a qualitative index-system – subject to the quality and quantity of available information.

Data on natural, versus current material flows (considering historic data as well as global change versus anthropogenic forcing = residual production of material flows) of:

- Water
- Sediments
- N, P, C, (Si)
- Contaminants

Trend information on expected changes in the DPSIR scenarios investigated and upscaling to a regional picture (how will Drivers change and will this affect the loads to the coastal Sea?) – this provides the temporal scale to the regional assessment and ideally sets the stage for scenario analysis with dynamic input.

Critical thresholds to be derived from: ecological (State/Impact relationship), political and managerial information (Response)

* Examples for such a ranking of DRIVERS (along DPSIR) and up scaling of information in the synthesis of a LOICZ BASINS study:

- = the currently published OSPAR quality status report (OSPAR 2000, http://www.ospar.com) lists human pressures on the coastal sea in a ranking order with 4 classes according to their relative impact on the regional ecosystem - including sustainable use. Pressures are attributed to various drivers or pressure classes.
- the table below picks out a few examples compiled more or less closely along the OSPAR volume "North Sea – Region II" chapter 6 p.113 but has some additions and changes to match the BASINS concept. It mostly concentrates on issues which link to land based activities:

Impact priority	**Priority Classes of Human Pressures**	**Driver Sectoral; land- or catchment- or sea based,**
A (highest impact)	Input of Organic Contaminants – land based	Various Economic sectors
	Inputs of Nutrients – land based	Various sectors, Urbanisation, (Waste water, Agriculture)
B (upper intermediate impact)	Input of oil and PAH – land/sea based	Oil industry/Shipping
	Input of other hazardous substances – land/sea based	Industry/Shipping/various sectors
C (lower intermediate impact)	Input of nutrients and organic material and antibiotics etc.	Mariculture
	Mineral extraction – land/ sea based	Engineering, Mining
	Inputs of radio nuclides from land	Energy and other sectors
D (lowest impact)	Input of waste/litter	Recreation, Tourism
	Cables under water	Various sectors

The examples listed in the OSPAR report show a sequence of relevance that applies to the North Sea. The 4 categories impact index is qualitative but provides a first entry into a typology of pressures and would be available for further parameterization in an advanced upscaling effort. BASINS will set up such a category list of issues in the coastal region of concern and try to investigate the related riverine material transports, the pressures and drivers on a catchment scale. Subsequent upscaling will involve the local, sub-regional and regional scale. This assessment finally provides a regional picture of coastal sea / river catchment interaction. Even such a simple categorization can provide a good overview of the current status and gaps of scientific understanding on the various scales – thus providing the sound scientific underpinning for any proposal to be drafted as a follow up activity.

Activities conducted and key questions of the Hong Kong East Asia BASINS workshop:
In gathering the regional information for assessment and upscaling along the outlines above the East Asia BASINS workshop followed a sequence of key questions dealing with:

a) **coastal Issues/Impacts** - key questions:
- WHAT ARE THE MAJOR IMPACTS (COASTAL ISSUES) ON THE COASTAL ZONE
- HOW CLOSE ARE THEY TO A CRITICAL THRESHOLD OF SYSTEM FUNCTIONING

b) to set up a list of **max 10 major Driver/Pressure** settings generating the coastal Impact/Issues following the key questions:
- WHAT ARE THE MAJOR (MAX. 10) DRIVER/PRESSURE SETTINGS ON CATCHMENT LEVEL CAUSING COASTAL CHANGE and
- CAN WE IDENTIFY SPATIAL SCALES ON WHICH CERTAIN DRIVER/PRESSURE SETTINGS DOMINATE COASTAL ISSUES (RELATIVE CLASSES IN BASINS OF DIFFERENT SIZE FOR EXAMPLE)

c) the smallest spatial scale assessment and to develop the catchment based **link between coastal issues/impacts** and **catchment based** pressures and drivers along the key questions:
- WHAT ARE THE MAJOR PRESSURE/DRIVER SETTINGS ON CATCHMENT LEVEL CAUSING COASTAL IMPACT OBSERVED and WHAT ARE THE FUTURE TRENDS

d) the medium spatial scale assessment and to develop the **link between coastal issues/impacts** and **sub regional** (or e.g. country) based pressures and drivers along the key questions
- WHAT ARE THE MAJOR PRESSURE/DRIVER SETTINGS ON SUBREGIONAL OR COUNTRY LEVEL CAUSING COASTAL IMPACT OBSERVED and WHAT ARE THE FUTURE TRENDS

e) the full regional (upscaled) assessment and to develop the **link between coastal issues/impacts** on r**egionally** (continental) based pressures and driver settings along key question
- WHAT ARE THE MAJOR PRESSURE/DRIVER SETTINGS ON REGIONAL OR CONTINENTAL LEVEL CAUSING COASTAL IMPACT OBSERVED and WHAT ARE THE EXPECTED TRENDS FOR THE FUTURE

f) the assessment of scientific and/or management **response** on the various scales and to develop an overview of past, ongoing or planned monitoring programs and scientific investigations as well as (subject to availability) management interventions – (environmental quality standards, legislation, river commissions etc.). The key questions is
- WHAT IS THE CURRENT STATUS OF RESPONSE TAKEN ON SCIENTIFIC OR POLICY/MANAGEMENT LEVELS AGAINST THE MAJOR COASTAL ISSUES IN THE REGION.

g) the assessment of major **regional hot spots** and **gaps** in understanding which seek further investigation in an holistic multidisciplinary scientific project; from there to derive a project proposal design for submission to funding agencies. Emphasis should be on the human dimensions of catchment – coastal sea interaction considering the co-evolution of natural and societal systems (i.e. involving natural and socio-economic sciences). The key question is:
- WHAT ARE THE MAJOR GAPS IN OUR CURRENT UNDERSTANDING OF RIVER CATCHMENT - COASTAL SEA INTERACTION AND WHICH HOT SPOTS SHOULD BE ADDRESSED IN A FUTURE INTEGRATED SCIENTIFIC EFFORT (NATURAL AND SOCIO ECONOMIC DISCIPLINES)

Outcome

The regional assessment conducted in Hong Kong provided a comprehensive overview of the current understanding of catchment – coastal sea interaction in East Asia. Divided by subregions (Southern, Central and Northern East Asia) the working groups provided a set of indices and qualitative typological classes of drivers and change. Those will be applicable for regional and global comparison of DPSIR scenarios. This is a crucial need for the first global LOICZ assessment book – 2002 and has been confirmed at the meeting by the invited expert form the LOICZ typology core group. Furthermore a first approximation of distances of coastal state changes to related thresholds for system functioning were developed.

The DPSIR was applied as the framework for the description of catchment/coast systems when analyzing the knowledge we have about biogeochemical characteristics of the major East Asian coastal zones (indicating one aspect of system State). The information compiled in this process will ultimately be developed further to an "**Expert-Classification**" of the regional systems and their change under various forcing. This is developed based on the results that were produced by the participants and the literature reviewed (see list of contributed papers) and the set up will be considering features such as:

- Coastal Geomorphology
- Coastal Habitats/Biodiversity
- Climate influence
- People relationships (Demography)
- Catchment size and seasonal run off features
- Land Use and Cover characteristics

In practice this will be achieved for the final report (LOICZ Reports & Studies Volume) by distilling the respective information from the tables produced in the working groups and which summarize the regional features and typological indices (see Appendix 1). The tables reflect the results of the plenary discussions and groups in the sequence of the key questions listed earlier.

Through the various scales in higher detail by combining people in project-teams who match the scale division applied (e.g. those experts working on the same catchment, country, climatic region, deal with socio-economic modeling such as Input/output modeling, etc.)

Products from East Asia BASINS

(as approved in the closing plenary discussion)

- A multiauthor LOICZ R&S Volume providing the first regional picture designed along the DPSIR framework is currently in preparation and supposed to be out before the IGBP Global Change Science Congress in Amsterdam early July. This report will provide the main information pool for the East Asian BASINS synthesis as part of the first global LOICZ synthesis book to be provided to the scientific community by the end of 2002;
- to consider the further development of the extended executive summaries submitted so far (see contributes papers Appendix 2) to full scientific publication for joint publication in the peer reviewed journal "Regional Environmental Change" – SPRINGER publishers. This should go as a special issue and focus in particular on the interdisciplinary aspects of the human dimensions of catchment coastal sea interaction and how they interfere with human and environmental health and welfare;

- Finally a first indication of information needs and data gaps as well as sites with bad trend expectations “hot spots” was compiled. These hot spots will form a preselection of sites to be addressed in the development and design of proposals for holistic future work. The meeting agreed that earlier work conducted along this lines such as the SARCS/WOTRO/LOICZ project in South East Asia as well as the currently started European BASINS project EUROCAT will provide a sound template facilitating the regional approach for East Asia. The meeting agreed further that formal and/or operational links to ongoing international efforts such as the ICAM (Integrated Coastal Area Management) and GOOS (Global Ocean Observation System) by IOC/UNESCO might provide a good link to global application and users.

Implementation of proposed projects could follow:

- a thematic, across the region approach e.g. driver oriented across the region
- or picking up the spots or classes of most prominent difference between natural and anthropogenic change signals and combine them to one project or project cluster

In summary:
The identified gaps in the synthesis and the hot spots and hot issues with related trend analysis will form the basis for proposal development – while the synthesis will serve as the major regional focus 1/4 entry to the first global LOICZ synthesis and assessment book (to be published in 2002)

APPENDIX 1 Assessment tables (preliminary – not to be cited)

Example of assessment tables – EAST ASIA BASINS – Working group on Southern Subregion: (for key questions of the tables please refer to interim report text)

Chairman: Jozef Pacyna, LOICZ
Reporteur: Ming H Wong, Hong Kong
Members: Tran Duc Thanh, Vietnam
Hoang Tri, Vietnam
Chaoyu Wu, China
Angela Wong, Hong Kong

Rivers selected from South of SE ASIA

Vietnam : Red River
Mekong River
Small Rivers (Bang-Ky Cung, Ma, Ca, Gianh-Tri-Huong, Thu Bon, Tra Khuc, Ba and Dong Nai)

China: Pearl River
Hanjiang River
Nandujiang River
Small rivers

South China and Vietnam shared common issues:

1. Both have a long history of agriculturally based economy, with intensive rice and crop production, and fish and shrimp cultures. The landscape of catchment areas has been modified hundreds years ago to suit the purposes, e.g. the dyke pond systems.
2. Both places have undergone a rapid socio-economic development (South China for about 20 years, and Vietnam for about 10 years).
3. Due to urbanization and industrialization along coastal areas, the increased discharge of both domestic and industrial effluent has exerted harmful effects on environmental and human health, e.g. red tides.
4. The use of chemical fertilizers has replaced the traditional use of organic wastes for agriculture and aquaculture and the use of pesticides and antibiotics further aggravated the problem.
5. Deforestation was a problem some 40 years ago, but it does not seem to be a major problem.

<u>Major issues (c) related to coastal zone (not to catchment), and drivers (d) responsible for these issues</u>

1. Erosion (c)
2. Habitat loss and modification (c)
3. Coastal flood (c)
4. Saltwater intrusion (c)
5. Pollution – water quality (nutrients, pesticides, POPs, heavy metals) + Oil related contaminants (c)
6. Biodiversity reduction (c)
7. Exploitation of living resources (d)
8. Aquculture (d)
9. Land reclamation (d)
10. Sediment mining (d)
11. Lack of management (d)
12. HABs (c)
13. Agriculture (d)
14. Damming (d)
15. Deforestation (d)

16. Urbanization (d)
17. Industrialization (d)

Schedule of the workshop

- To discuss the common issues of socio-economic development in Southern China and Southern Vietnam (tropical and subtropical regions)
- To identify the driver similarities and pressures resulted (e.g. damage due to the eutrophication)
- To elaborate the problems and regional effects

Table 1: Major coastal impacts/issues and critical thresholds in East Asian Coastal Zones – Overview and qualitative ranking:

Coastal impact / issue	Local site / Region (contributing river basins)	Critical threshold (for system functioning)	Distance to Critical Threshold (qualitative or quantitative)	Impact category 1 -10	Reference / Datasources
HLM	Pearl River and small rivers Red River, Mekong River and small rivers	Destroy of mangrove (recent loss) HABs Change of ecological function Destroy of mangrove and coral reefs HABs recognized in Vietnamese rivers but little	Increasing HABs (esp in Mekong) Some data on mangrove and coral loss	HLM - 9	No
ERO	Vietnam (local, low rivers such as Mekong and Red Rivers are having problems) China (not for the whole region)	River in low land is very dangerous The government does not have effective plan in controlling erosion. Human activities, natural processes and building dams and dikes	From 3620km upper coastline, 469 km of coastline has been eroded, 100km from PRD and its adjacent areas have been eroded Red River has a total discharge of 114mt/yr Dams in Vietnam trapped discharge of 48mt/yr	ERO - 10	
FLO	Regional Mekong, Red and Pearl	Big flood in 1915 A medium flood in 1994 due to discharge from upper streams. HK is having very big flood as well Flood occurs almost every year in Vietnamese small rivers and Mekong River Little flood in Red River. However, once there is a flood, it is very	Every yr there is a flood Do not know what contribute to flooding The recurrent period of big flood is about 200 yrs Residents in south and center of Vietnam are suffering from floods Only small flood in North of Vietnam	FLO – 9	

		dangerous to low land area due to dyke systems leach to towns			
SWI	More significant in major rivers, because of flat gradient (Red, Pearl, Mekong), regional not local	3 critical indicators of salt water intrusion 1. rice cultivation will be affected when exceeding 0.5 ppt 2. drinking water, salt water intrusion, close to water supply, e.g. Macau salty drinking water, also in Vietnam 3. spawning of prawns and fishes will also be affected		SWI - 7	
POL	Mekong, Red, Pearl	Oil pollution is typical in Mekong and Red (oil from petroleum industries and oil exploitation in offshore) Mekong and Red – PAHs, and pesticides Pearl, Hanjiang and Nandujiang were grossly polluted (oil, PAHs, pestcides)	Increased concentration of the pollutants In China 2 standards, 1 for fresh water, 1 for sea water, more than 30 parameters. Type I the best. Most fall in type II. Open sea always Type I. In term of POPs and heavy metal, can be reflected by uptake of contaminants in living organisms, e.g. oysters at western water of HK, human breast milk, DDT and HCH, 2 to 10 folds higher than European countries and Canada	POL – 8 regional problem	
BIO	Problems in all	Caused by	The no. of species	BIO – 7	

	rivers (major and smalls) of the region	exploitation of living resources, habitat loss and different factors Threshold, indicator – mangrove, seagrass destruction, sedimentation. However, it is difficult to pinpoint the effects on food chain and food web	decreased (birds, aquatic organisms) SE Asia project on seagrass study showed 10 to 20 species loss Destroy of wetland in HK due to urban expansion and land reclamation		
HAB	Regional, coastal water	Very huge in China because a lot of fishes were kill (toxin from HABs). HABs appear and die suddenly which used up oxygen when decomposed by bacteria. Some algae also emit toxins. Worst case in China in 1998, also in HK and Mekong (not serious in Vietnam).	Fish kill is a good indicator. In the case of mariculture in HK, when there is fish kills caused by red tides, HK Government will verify and compensate the loss.	HAB – 9	

HLM - Habitat loss and/ or modification
ERO – Erosion
FLO – Flooding
SWI – Salt water intrusion
POL – Pollution
BIO – Biodiversity reduction
HAB – Harmful Algal Blooms

Table 2 DPSIR matrix characterizing major catchment based drivers/pressures and a qualitative ranking of related state changes impacting the coastal zone versus catchment size class;

State change dimension**:**
3 = major 2 = medium 1 = minor 0 = no impact ? = insufficient information
Time scale: P = progressive (continuous) d = direct (spontaneous)

Driver	**Pressures**	**State change (qualitative index)**				**Impact on thecoastal system**	**Time scale**
		L	**M**	**S**			
Agriculture	• Nutrient runoff • Effluents • Pesticides • Increase of sediment transport	3	3	3		POL Eutrophicatio n ERO	P

	• Agricultural wastes e.g. manure • Intensive agricultural activities along coastal areas • Reclaiming marginal land for agriculture • Loss of good agricultural land due to change of land use					HLM HAB	
Damming	• Nutrient and sediment sequestration • Change of hydrological cycles • Sediment budget alteration	3	3	2		SWI ERO	D
Deforestation	• Siltation • Sediment and nutrient budget • Water shortage (water balance alteration) • Ecological disturbance	3	3	3		HLM ERO FLO SWI BIO	P
Urbanization	• Population growth, • Food and energy demand • Pollutant discharges	1	1	3		POL HLM	P
Industrialization	• Emission (pollution discharges, wastes) • Exploitation of natural resources	1	1	3		POL HLM	P
Aquaculture	• Globalization • Freshwater culture • Pollution sources from excess nutrients in mariculture cages • Disease	3 in Vietnam, 2 in China	2	3		HLM BIO HAB	D (seasonal in China), P in Vietnam
Land Reclamation (coastal land)	• Sediment budget alteration • Change of hydrological cycle • Dredging in HK	1	2	2		SWI	P
Sediment mining	• Sediment budget alteration • Sediment segregation, • Water level alteration	0	0	3		HLM BIO	P
Exploitation of living/mineral/ oil/ sand resources	• Rate of exploitation • Pollution discharge • Coastal erosion (small scale)	0	2	3		HLM BIO	P
Lack of management	• Change of hydrological cycles • Rate of pollution discharge, • Balance of sediment • Increasing coastal use conflict	3	2	1		FLO ERO HLM SWI POL BIO	P / D

Table 3/4/5 The link between coastal issues/impacts and land based drivers in East Asian Coastal Zones – Overview and qualitative ranking on local or catchment /sub regional or country scale:

Impacts	Drivers	**Sub regions 1 - 10**	**category**	**Trend**	**Reference**
HLM	Land reclamation	C P R V M	2 – 3 3 – 8 8 9 6	S	Papers, books,
	Aquaculture / Agriculture	C P R V M	4 9 9 10 9	I	
	Deforestation	C P R V M	2 2 4 8 4	D	
	Urbanization / industrialization	C P R V M	9 9 - 10 6 8 6	I	Database
ERO	Agriculture / auquculture	C P R V M	2 1 1 1 2	S	Database (global)
	Damming	C P R V M	8 2 10 7 5	I S S I S	Database
	Deforestation	C P R V M	4 1 9 9 7	D	Database
	Land reclamation	C P R V M	3 2 9 5 4	S	Papers
	Sediment mining	C P R V M	9 2 2 5 1	S	?
FLO	Deforestation	C P R V	2 2 7 9	D	Database

		M	5		
	Land reclamation	C P R V M	7 8 7 2 7	I	Database
	Lack of management	C P R V M	8 8 8 8 8	S S D D D	National regulations
SWI	Agriculture	C P R V M	1 8 8 5 4	S	Reports
	Damming	C P R V M	1 – 2 4 8 7 5	S	Database
	Deforestation	C P R V M	2 2 4 5 2	D	Database
	Sediment mining	C P R V M	4 9 1 2 0	S	?
POL	Agriculture / aquaculture	C P R V M	8 9 7 5 6	I	Database
	Urbanization / Industrialization	C P R V M	8 9 6 5 6	I	Database
	Exploitation of mineral resources	C P R V M	3 6 4 3 5	S	Database
BIO	Agriculture / aquaculture	C P R V M	5 6 6 4 6	I	Database
	Damming	C P R V	4 4 5 4	S	Database

		M	4		
	Deforestation	C P R V M	3 2 4 6 5	D	**Database**
	Urbanization / industrialization	C P R V M	7 9 6 5 6	I	Database
	Exploitation of mineral resources	C P R V M	2 2 8 6 7	I	Database
	Land reclamation	C P R V M	3 5 6 7 6	S	?
HAB	Agriculture / aquaculture	C P R V M	3 9 1 1 2	I	Database
	Urbanization / industrialization	C P R V M	3 9 1 1 2	I	Database
	Lack of management	C P R V M	2 8 9 8 9	I	Database Regulation enforcement

Subregions

C - Small rivers in South China (Hanjiang, Nandujiang)
P - Pearl River
R - Red River
V - Vietnamese small rivers (Bang-Ky Cung, Ma, Ca, Gianh-Tri-Huong, Thu Bon, Tra Khuc, Ba, Dong Nai)
M - Mekong River

1 = No impact 10 = Very serious impact
S = stable I = increasing D = decreasing

Table 6 Scientific and/or Management Response to coastal impact/issues in East Asian Coastal Zones on catchment, sub regional and regional scale

River catchment	**Response catchment scale**		**Response Sub regional / country scale**		**Response Regional scale**	
River	Scientific	Management	Scientific	Management	Scientific	Management
Chinese River – Hanjiang, Nandujiang and small rivers	Monitoring programme e.g. in Zhongshan University, Institute of Hydrology which measures a no. of variables, not necessarily extensive programmes. Some programmes managed by Guandong Environmental Protection Bureau, and also around HK water bodies by HKEPD.	Database exist and available. Legislations available on the catchment basis. Water quality std for coastal area of HK.	Monitoring programme by Sea Management Agency. More than 10 stations. More monitoring in HK (joint monitoring by both HK and Guangdong Governments more recently).	Less initiatives going on, e.g. Xiamen River.		
Pearl River	National level programme (863 project) monitor the whole PRD. SOA has a project with Japanese on S China Sea. HKBU together with Zhongshan University joint project on the uptake and bioaccumula	PEIOS in 867 research project. National Programme and Integrated Observing System on Pearl River Estuary. 20 m of water depth coast managed by Pearl River Coastal Authorities and State Ocean Administration			GEF/UNEP project study sources, fates and effects on 12 priority pollutants.	Fates of POPs.

	tion of heavy metals and PTS by fish (PCB, DDT).	(SOA). River and sea levels below 20m water depth managed by Guangdong City Authorities and Pearl River Water Conservation Committee (PRWCC). Difficult to obtain data, validation and availability.				
Red River	Few stations for monitoring. 1 to 2 stations for catchment studies. No system to monitor change from time to time.	Need monitoring programmes and regulations from authorities to review what is available.	Few stations for monitoring. 1 to 2 stations for catchment studies. No system to monitor change from time to time.	Need monitoring programmes and regulations from authorities to review what is available.		
Mekong R	Few stations for monitoring. 1 to 2 stations for catchment studies. No system to monitor change from time to time. Less than Red river scientific data.	Need monitoring programmes and regulations from authorities to review what is available	Few stations in South than in North.	Enforcement less effective from South to North.		
Vietnam	No	No action at all	No	No action at		

small rivers	continuous research Only measurement campaign Very few monitoring stations	Only regulations in respond to current / outbreak situation	continuous research Only measurement campaign Very few monitoring stations	all Only regulations in respond to current / outbreak situation		

Vietnamese Rivers – Bang-Ky Cung, Ma, Ca, Gianh-Tri-Huong, Thu Bon, Tra Khuc, Ba, Dong Nai

Table 7 Hot spots (point source) of land based coastal impact and gaps in understanding as well as a first overview of issues to be addressed in future research. (Identifying the appropriate scale for the design of a new scientific effort)

River Catchment	**Hot spot catchment scale**		**Hot spot Sub regional / Country scale**		**Hot spot Regional scale**	
River	Key issue, trend and gaps	Scientific approach	Key	S App	Key	S
Pearl	Lack of basic research. Research will support formulation of legislations. Poor enforcement of existing legislations. Sediment dredged from 8 outlets causing red tides.	Find methods to predict red tides and prevent damage in mariculture. Development of models to predict impacts. Analysis and action plan. Biotic model studies related to biomagnification in food web, e.g. use of biomarkers (fish, human breast milk) to study effects. However, no funding for further research work. Thus difficult to get to advanced stage.				
Red River	Low frequency of monitoring. Lack of common parameters/variables on measurement and analysis. Need a set of guidebooks to have common methods in collection of samples, analysis methodology so as to produce accurate results for all stations for comparison. Increase the capacity of training and human resources.	Examination of current status, there is already some studies undergoing Biogeochemical studies, erosion and flood scales, ecological, economic in terms of human dimension.	Same as catchment.	Fix the route of monitoring from Vietnam to China. Same as catchment.		
Mekong	No continuous set of data that based on measurement	Some measures to control flooding and deforestation exist, but not so effective on	Same as catchm	Same as catchment.		

	campaign types. Low frequency of monitoring. Lack of common parameters/variables on measurement and analysis. Need a set of guidebooks to have common methods in collection of samples, method of analysis so as to produce accurate results for all stations for comparison. Increase the capacity of training and human resources.	enforcement from Govt. Set up monitoring network to control flood and erosion. Conflict between development and environment, stakeholder conflicts. Govt focus on economy and food demand (should try to harmonize between environment conservation and economic growth/food demand).	ent.			
Vietnamese small rivers	Not much going on, not much information available. More emphasis should be placed on small rivers at national levels Physical, biological and chemical variables should be studied. Salt intrusion (related to domestic activities and agriculture).	Should bring to same level of study because of same level of interaction. To control flood and erosion (long-term approach).				

Vietnamese Rivers – Bang-Ky Cung, Ma, Ca, Gianh-Tri-Huong, Thu Bon, Tra Khuc, Ba, Dong Nai

APPENDIX 2 Contributed papers

China Beijing
ACCUMULATION OF FINE-GRAINED SEDIMENT AND ORGANIC CARBON IN A SMALL TIDAL BASIN: YUEHU, SHANDONG PENINSULA, CHINA; *Shu Gao[1,2] and Jian-jun Jia[2]* *1 Laboratory of Coast and Island Development, Nanjing University, Nanjing, China; 2 Institute of Oceanology, Chinese Academy of Sciences, Qingdao 266071, China*
NITROGEN POLLUTION OF WATERBODY OF TAIHU LAKE VALLEY IN CHINA; Xing Guangxi, Institute of Soil Science, Chinese Academy of Sciences, NANJING, 210008, China
IMPACTS OF INLAND HUMAN ACTIVITIES ON COASTAL SEAS SURROUNDING CHINA - PAST, PRESENT AND FUTURE (discharge changes of water, sediment, nutrients and other substances from the Yangtze, Yellow and Pearl River) *Dunxin Hu; Institute of Oceanology, Chinese Academy of Sciences, 7 Nanhai Road, Qingdao 266071, PR. China*
RECENT SOCIO-ECONOMIC CHANGES RELATED TO ENVIRONMENTAL QUALITY OF THE PEARL RIVER DELTA *Ming H. Wong, Institute for Natural Resources and Waste Management, Hong Kong Baptist University, Kowloon Tong, Hong Kong SAR, China*
PEARL RIVER ESTUARY UNDER GLOBAL CHANGES AND ITS EXPERIMENTAL OBSERVING SYSTEM (Extended Abstract) *Chaoyu Wu, Center for Coastal Ocean Research, Zhongshan University, Guangzhou GD, China 510275*
DECADAL AND MILLENNIAL TIME SCALE CHANGES OF WATER AND SEDIMENT DISCHARGE OF THE HUANGHE (YELLOW RIVER) CAUSED BY HUMAN ACTIVITIES *Zuosheng Yang [a], Yoshiki Saito [b], Baozhu Liu [b], Jun Zhang [a] and Houjie Wang [b]* *[a] College of Marine Geosciences, Ocean University of Qingdao, 5 Yushan Road, Qingdao 266003, P. R. China* *[b] Marine Geology Department, Geological Survey of Japan, Higashi 1-1-3, sukuba, Ibaraki 305-8567, Japan*
Germany
RELEVANCE OF RIVERINE INPUTS AND RETENTION TO THE CHANGE OF NUTRIENT LOAD INTO THE COASTAL ZONE; *Horst Behrendt, Institute of Freshwater Ecology & Inland Fisheries, Mueggelseedamm 310, D-12587 Berlin, Germany*

Japan

DECADAL AND MILLENNIAL TIME SCALE CHANGES OF WATER AND SEDIMENT DISCHARGE OF THE CHANGJIANG (YANGTZE RIVER) CAUSED BY HUMAN ACTIVITIES;

Yoshiki Saito [a], Zhongyuan Chen [b], Jiufa Li [b], Huanting Shen [b], and Kazuaki Hori [c]
[a] Marine Geology Department, Geological Survey of Japan, Higashi 1-1-3, Tsukuba, Ibaraki 305-8567, Japan. E-mail: yoshi@gsj.go.jp
[b] State Key Laboratory for Estuarine and Coastal Research, East China Normal University, Shanghai, 200062, China
[c] Department of Earth and Planetary Science, University of Tokyo, Hongo 7-3-1, Bunkyou-ku, Tokyo, 113-0033, Japan

EFFECTS OF POLLUTANTS ON MARINE ECOSYSTEM IN THE CHANGJIANG ESTUARY

Masataka WATANABE, Hiroshi KOSHIKAWA*and Mingyuan Zhu***
**National Institute for Environmental Studies, JAPAN*
***First Institute of Oceanography, SOA. P.R.CHINA*

Korea

NORTHEAST ASIAN MARGINAL SEAS: RIVER-DOMINATED OCEAN MARGIN

Hong G.H., Zhang J., Kim S.H., Chung C.S. and Yang S.R.***
Korea Ocean Research and Development Institute, Ansan, P.O. Box 29, Seoul 425-600, Korea
** State Key Laboratory of Estuarine and Coastal Research, East China Normal University, 3663 Zhongshan Road North, Shanghai 200062; and Ocean University of Qingdao, 5 Yushan Road, Qingdao 266003, China*
*** Department of Environmental Engineering, Kwangju University, Kwangju 503-703, Korea*

Russian Federation

IMPACTS OF ANTHROPOGENIC ACTIVITY ON COASTAL ZONE ENVIRONMENT QUALITY OF THE JAPAN SEA;

Anikiev V.V., State Scientific Center " All - Russian Research Institute of Geological, Geophysical and Geochemical Systems ", Moscow, Russia.

1) ENVIRONMENTAL CONDITIONS IN THE RUDNAYA RIVER WATERSHED IN THE RUSSIA FAR EAST;

2) STATE OF FRESHWATER ENVIRONMENT AND CONNECTED WITH IT MARINE AND COASTAL ENVIRONMENT OF JAPAN BASIN;

Kachur Anatoly N., Pacific Geographical Institute Far East Branch Russian Academy of Sciences, 7 Radio Str, Vladivostok, 690041, Russia.

Vietnam

THE IMPACT OF HUMAN ACTIVITIES ON THE VIETNAMESE RIVERS AND COAST

Tran Duc Than [a], Dinh Van Huy [a], Van Lap Nguyen [b], Thi Kim Oanh Ta [b], Masaaki Tateishi [c] and Yoshiki Saito [d]
[a] Haiphong Institute of Oceanology.246 Danang Street, Haiphong City, Vietnam;
[b] Sub-Institute of Geography. 01 Mac Dinh Chi St, Dist. 1, Ho Chi Minh City, Vietnam.
[c] Department of Geology, Niigata University. Niigata 950-2181, Japan.
[d] Geological Survey of Japan. Tsukuba, 305-8567, Japan.

SOCIO-ECONOMIC DRIVERS OF CHANGES IN COASTAL AREAS OF THE RED RIVER DELTA, VIETNAM;

Nguyen Hoang Tri, Center for Natural Res. & Environmental Studies, Vietnam National University, No. 7, Ngo 115, Nguyen Khuyen, Hanoi, Vietnam

APPENDIX 3 Agenda - East Asia BASINS, Hong Kong, 26-28 Feb 2001:

Mon. 26th Feb.

9:00 – 9:30 Registration

9:30 – 10:00 Opening Session:

East Asia LOICZ Committee,	Prof. Shu Gao, Prof. Zusheng Yang
Local Host – Hong Kong Baptist University	Prof. Ming H. Wong;
IGBP/LOICZ, Focus 1 representative and LOICZ IPO	Dr. Hartwig Kremer

10:00 – 10:45 Introduction:

- LOICZ BASINS, background, approach, products and goals
- Upscaling – introduction into typology - Approach and products
- Timelines and Outlook

By: LOICZ/regional LOICZ/local host — Prof Jozef Pacyna, Dr. Horst Beherendt, Dr. Hartwig Kremer, Casey McLaughlin, Prof. Shu Gao, Prof. Ming H. Wong

10:45 – 11:00 *Tea Break (same time each working day)*

11:00 – 12:30 1. Plenary Session on Drivers, Pressures and State/State-Changes:
Presentation of Papers (see list attached)
Discussion and Summary

12:30 – 14:00 *Lunch (same time each working day)*

14:00 – 15:30 2. Plenary Session on Drivers, Pressures and State/State-Changes:
Presentation of Papers (see list attached)
Discussion and Summary

15:30 – 15:50 *Tea Break (same time each working day)*

15:50 – 17:30 3. Plenary Session – Wrap up:
Discussion and Strategy for the next days:

- how to fill the tables and synthesise on various scales (see attachment)
- organisation of break out groups (along division of the coastal zone and catchments for synthesis and upscaling by issues, size, drivers or country?)
- identify chairs and rapporteurs

We kindly ask you if not already done in the groups to find some time to fill in the tables as provided and discussed in plenary and groups during the evening hours for report back tomorrow.

Tue. 27th Feb. Coastal Issues & land based forcing – catchment & larger scales

09:00 – 12:30 Morning and 14:00 – 17:30Afternoon max. 3 Break out groups (Chair & Rapporteur: TBA):

Assessment and synthesis of:

Issues/Impacts based on coastal change in the region of concern (table 1);

maximal 10 major Driver/Pressure settings generating the coastal Impact/Issues (tabel 2)

links between coastal issues/impacts and land based pressures and drivers on catchment, sub regional and full regional scale (along tables 3 - 5 – see attachment)

key questions:

- WHAT ARE THE MAJOR IMPACTS (COASTAL ISSUES) ON THE COASTAL ZONE and do we know anything on
- HOW CLOSE THEY ARE TO A CRITICAL THRESHOLD OF SYSTEM FUNCTIONING?

- WHAT ARE THE MAJOR (MAX. 10) DRIVER/PRESSURE SETTINGS ON CTACHMENT LEVEL CAUSING COASTAL CHANGE?

- CAN WE IDENTIFY SPATIAL SCALES ON WHICH CERTAIN DRIVER/PRESSURE SETTINGS DOMINATE COASTAL ISSUES (RELATIVE CLASSES IN BASINS OF DIFFERENT SIZE FOR EXAMPLE)?

- WHAT ARE THE MAJOR PRESSURE/DRIVER SETTINGS ON CATCHMENT LEVEL CAUSING COASTAL IMPACT OBSERVED and WHAT ARE THE FUTURE TRENDS?

- WHAT ARE THE MAJOR PRESSURE/DRIVER SETTINGS ON SUBREGIONAL OR COUNTRY LEVEL CAUSING COASTAL IMPACT OBSERVED and WHAT ARE THE FUTURE TRENDS?

- WHAT ARE THE MAJOR PRESSURE/DRIVER SETTINGS ON REGIONAL LEVEL CAUSING COASTAL IMPACT OBSERVED and WHAT ARE THE EXPECTED FUTURE TRENDS?

- CAN WE DEVELOP A FIRSTYPOLOGY OF CATCHMENT COASTAL SEA INTERACTION IN EAST ASIA AND WHAT ARE THE INDICES ENTERING THE TYPOLOGICAL COMPARISIN (INPUT IN LOICZVIEW)?

16:30 – 17:30 Plenary Discussion:

- Report back of the working groups;
- Drawing a qualitative or semi-quantitative, typological East Asia Basins picture;
- Introduction into the next day;

20:00 Conference Banquet

Wed. 28th February:

09:00 – 12:00 Morning 3 Break out groups (Chair & Rapporteur: TBA):

short recall of the last day

Assessment of scientific and/or management RESPONSE on the various scales and
of major regional HOT SPOTS and GAPS in understanding, which seek further investigation in an holistic multidisciplinary scientific project - along tables 6 – 7 (see attachment)

key questions:

- WHAT IS THE CURRENT STATUS OF RESPONSE TAKEN ON SCIENTIFIC OR POLICY/MANAGEMENT LEVELS AGAINST THE MAJOR COASTAL ISSUES IN THE REGION.

- WHAT ARE THE MAJOR GAPS IN OUR CURRENT UNDERSTANDING OF RIVER CATCHMENT - COASTAL SEA INTERACTION AND WHICH HOT SPOTS SHOULD BE ADDRESSED IN A FUTURE INTEGRATED SCIENTIFIC EFFORT/PROPOSAL (NATURAL AND SOCIO ECONOMIC DISCIPLINES)

12:00 – 12:30 Plenary – report back from the working groups

Afternoon:

14:00 – 16:30 Afternoon max. 3 Break out groups (Chair & Rapporteur: TBA):

Discussion on sub regional or regional proposal/s:

16:30 – 17:30 Plenary

Report back from the project working groups
Approval of suggestions by the plenary (incl. commitments)
Launch of East Asia BASINS Network

Conclusion
Approval of product delivery timelines
Outlook

Closure of the meeting