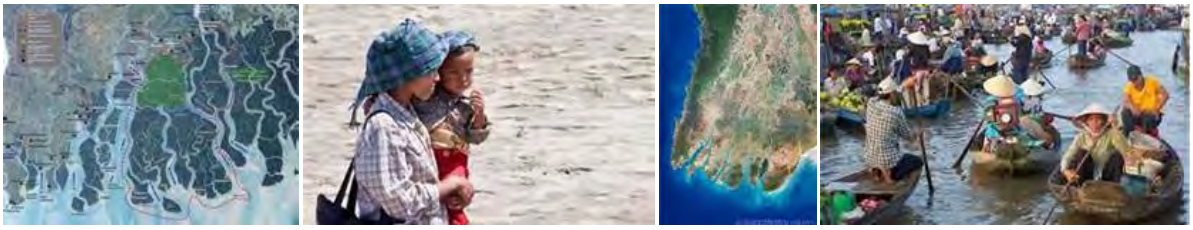


Annexes to Report on Regional Training Workshop

Challenges and Approaches in Delta Planning and Management

Sharing experiences from SE Asian Deltas and the Rhine-Meuse Delta

21-25 October 2013

Myanmar Maritime University (MMU), Thanlyin (close to Yangon), Myanmar

Organised by UNESCO-IHE, Wageningen UR, Ministry of Transport (the focal Ministry of the National Water Resources Committee in Myanmar), Myanmar Maritime University and ICEWE- WRTC group

In collaboration with Partner institutes, Delta Alliance and Asian-Dutch delta projects.

Co-funded by the Dutch Ministry of Infrastructure and the Environment, the Dutch Ministry of Economic Affairs and the DGIS UNESCO-IHE Programmatic Funding (DUPC).

Table of Contents

Annex 1. Programme

Regional training workshop, 21-25 October Myanmar

DELTA PLANNING AND MANAGEMENT

CHALLENGES, APPROACHES AND EXPERIENCES FROM ASIAN DELTAS AND THE RHINE-MEUSE DELTA

Myanmar Maritime University, Thilawa, Thanlyin (near Yangoon), Myanmar

	MONDAY **21 October 2013** **Welcome, introduction training workshop and deltas represented** **(Facilitation Wim Douven, Khin Ni Ni Thein)**	**TUESDAY** **22 October 2013** **Delta planning** **(Day facilitation Malik Fida Abdullah Khan)**	**WEDNESDAY** **23 October 2013** **Solution strategies, actor analysis** **(Day facilitation Ho Long Phi)**	**THURSDAY** **24 October 2013** **Solution strategies, field trip** **(Day facilitation MMU)**	**FRIDAY** **25 October 2013** **Delta integration and learning** **(Day facilitation Henk Wösten)**
08.30–09.00	Registration	Recap previous day (participant)	Recap previous day (participant)	Recap previous day (participant)	Recap previous day (participant)
09.00-10.00	MC, Myanmar Maritime University, English Department Opening Speech by Mr. Htun Lwin Oo, Secretary of the National Water Resources Committee and DG of DWIR, Ministry of Transport Welcoming Remarks by Ms. Carola Baller, Head of Myanmar Office, Embassy of the Kingdom of the Netherlands Keynote on “Issues and challenges of Ayeyawady Delta” by Mr. Zaw Win, Former Deputy Director General, Irrigation Department, Ministry of Agriculture and Irrigation. Exchange of Souvenirs Group photo	Integrated delta planning. Wim Douven	Workshop delta issues (continued)	Cross-cutting issues (II) Flood defences in Vietnam. Cong. Salinity management in agriculture in deltas. Catharien Terwisscha.	Plenary feed-back from delta themes

10.00-11.00	**Coffee / tea time** --- Introduction participants and programme. Wim Douven. Henk Wösten, Ho Long Phi, Malik Fida Abdullah Khan	Scenario development: Biophysical and socio-economic. Henk Wösten	Workshop delta strategies Parallel groups by theme: • Upstream delta • Urban delta • Coastal delta	Cross-cutting issues (III) Private sector and delta development. Repr. private sector.	Discussion outcomes and possible issues at delta scale. Reflection on MOTA analysis (Leon Hermans)
11.00-11.30		*Break*	*Break*	*Break*	*Break*
11.30-12.30	Keynote Adaptive Approach for Long term Delta Plan 2100 and Innovation for addressing Water Management Issues in Bangladesh. Engr. Md. Waji Ullah	Workshop scenarios construction	Workshop delta strategies (continued)	Workshop delta strategies (continued)	Discussion cross-delta sharing and learning
12.30-13.30	*Lunch*	*Lunch*	*Lunch*	*Lunch*	*Lunch*
13.30-15.30	Issues and challenges Mekong delta. Participant. Issues and challenges Indonesian delta. Participant. Issues and challenges deltas in general and / or Netherlands.	Workshop scenarios construction (continued) Cross-cutting issues (I) Lessons learnt from Netherlands and Vietnam Delta Plan for formulation of Bangladesh Delta Plan 2100. Malik Fida Abdullah Khan.	Actor analysis delta planning processes (MOTA). Ho Long Phi, Leon Hermans	Field trip to Thilawa Special Economic Zone	**Wrap-up and closing** Wrap-up discussion. Discussion Forum / Community of Practice for knowledge networking. Evaluation training workshop. **Closing**
15.30-16.00	*Break*	*Break*	*Break*		*Break*
16.00-17.00	Stock taking and intercomparison of delta issues and challenges. Group activity facilitated by Catharien Terwisscha.	Workshop delta issues Parallel groups by theme: • Upstream delta • Urban delta • Coastal delta	Actor analysis delta planning (continued)		
17.00-17.15	Clarification and discussion	Clarification and discussion	Clarification and discussion		-
Evening	Diner at the Orchid Hotel	Free	Free	Free	Farewell diner

Annex 2. Participants

Regional training workshop, 21-25 October Myanmar

DELTA PLANNING AND MANAGEMENT

CHALLENGES, APPROACHES AND EXPERIENCES FROM ASIAN DELTAS AND THE RHINE-MEUSE DELTA

Myanmar Maritime University, Thanlyin (near Yangoon)

Sr. No.	Name	Designation	Organization	Email/Phone	Country	Signature
1	Md Abdus Sattar	Lecturer	PSTU	abdus.sattar@pstu.ac.bd, sattarsau@gmail.com	Bangladesh	
2	T.M. Rashidul Kabir	Sub-Divisional Engineer	Joint Rivers Commission, Bangladesh	ranawre@gmail.com, 00 88 01552400671	Bangladesh	
3	Saiful Alam	PSO	WARPO	saiful31481@yahoo.com	Bangladesh	

Regional training workshop, 21-25 October Myanmar

DELTA PLANNING AND MANAGEMENT

CHALLENGES, APPROACHES AND EXPERIENCES FROM ASIAN DELTAS AND THE RHINE-MEUSE DELTA

Myanmar Maritime University, Thanlyin (near Yangoon)

4	Fikri Abdurrachman	Planning Division, Ciliwung Cisadane RBO	Ministry of Public Works	fikri1977@yahoo.com	Indonesia	
5	Shaakeel Hasan	Freelance Researcher		h.shaakeel@gmail.com	Bangladesh	
6	Pham Thu Huong	Lecturer	WRU	huongpht@wru.vn	Vietnam	

Regional training workshop, 21-25 October Myanmar

DELTA PLANNING AND MANAGEMENT

CHALLENGES, APPROACHES AND EXPERIENCES FROM ASIAN DELTAS AND THE RHINE-MEUSE DELTA

Myanmar Maritime University, Thanlyin (near Yangoon)

7	Ky Quang Vinh	Director	Climate change Coordination office, Cantho City	kqvinh@ctu.edu.vn	Vietnam	
8	Nguyen Van Kien	Ph.D	ReRO_Angin y University-Vietnam	nvkien@agu.edu.vn	Vietnam	
9	To Quang Toan	Researcher	SIWRR	toan_siwrr@yahoo.com	Toan_siwrr@gmail.com	

Regional training workshop, 21-25 October Myanmar

DELTA PLANNING AND MANAGEMENT

CHALLENGES, APPROACHES AND EXPERIENCES FROM ASIAN DELTAS AND THE RHINE-MEUSE DELTA

Myanmar Maritime University, Thanlyin (near Yangoon)

10	U Phyo Myint	DY-Director	ID	phyomyint.1661@gmail.com	Myanmar	
11	Marlar Soe	Assistant Director	DMH	dawmarlarsoe@gmail.com	Myanmar	
12	Khin Kyu Kyu	Prof&Head of River & Coastal Engineering Dept	MMU	khinkyu.mmu@gmail.com	Myanmar	

Regional training workshop, 21-25 October Myanmar

DELTA PLANNING AND MANAGEMENT

CHALLENGES, APPROACHES AND EXPERIENCES FROM ASIAN DELTAS AND THE RHINE-MEUSE DELTA

Myanmar Maritime University, Thanlyin (near Yangoon)

13	U Khin Zaw	Director	WRUD	khinzaw6378@gmail.com	Myanmar	
14	U Toe Aung Lin	AD	DWIR	kotoegyi.dwir@gmail.com	Myanmar	
15	U Toe Toe Aung	SO	Forest Department	toeaung02@gmail.com 09-4319-7285	Myanmar	

Regional training workshop, 21-25 October Myanmar

DELTA PLANNING AND MANAGEMENT

CHALLENGES, APPROACHES AND EXPERIENCES FROM ASIAN DELTAS AND THE RHINE-MEUSE DELTA

Myanmar Maritime University, Thanlyin (near Yangoon)

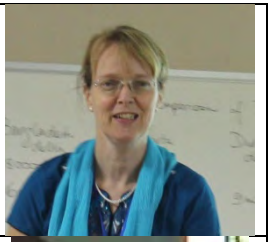
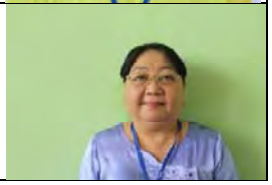
16	Michiel Jeroen Slotema	Policy Advisor Water	Netherlands Embassy Dhaka	michiel.slotema@minbuza.nl	Bangladesh	
17	Dr.Mai Van Cong	Flood risk advisor Deputy head of Coastal Eng.	WRU	maivancong@wru.vn	Vietnam	
18	Dr. Sunil Kamble	Asst.Prof.in Zoology.	S.S.V.S.S. Kolhapur/NDIA	Sunilkanmble107@gmail.com	India	

Regional training workshop, 21-25 October Myanmar

DELTA PLANNING AND MANAGEMENT

CHALLENGES, APPROACHES AND EXPERIENCES FROM ASIAN DELTAS AND THE RHINE-MEUSE DELTA

Myanmar Maritime University, Thanlyin (near Yangoon)

19	MS. Catharina Terwisscha van Scheltinga	Director Wageni Project Office Dhaka	Wagenion UR/Altera	Catharine.terwisscha@com.nl	Netherlans/Bangladesh	
20	Dr. Leon Hermans	Ass. Professor	TU DELFT	l.m.hermans@tudelft.nl	Netherlands	
21	Dr. Phyo Naing Zay	Assistant Researcher	WRTC	phyo.mc@gmail.com	Myanmar	
22	Ms. Khin Khin Cho	Civil Engineer	NEPS	kkcho1951@gmail.com	Myanmar	

Regional training workshop, 21-25 October Myanmar

DELTA PLANNING AND MANAGEMENT

CHALLENGES, APPROACHES AND EXPERIENCES FROM ASIAN DELTAS AND THE RHINE-MEUSE DELTA

Myanmar Maritime University, Thanlyin (near Yangoon)

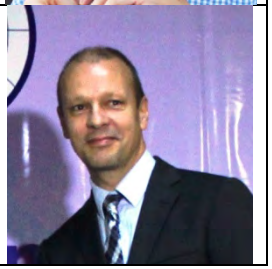
23	Mr. MD. WAJI ULLAH	Executive Director	Center for Environmental and Geographic Information System(CEGIS)	mkhan@cegisbd.com		
24	Mr. Malik Fida Abdullah Khan	Director	Climate Change Study Division (CEGIS)	mkhan@cegisbd.com, montee1966@gmail.com	Bangladesh	
25	Mr. HO LONG PHI	Director	WACC	phi_hl@yahoo.com	Vietnam	

Regional training workshop, 21-25 October Myanmar

DELTA PLANNING AND MANAGEMENT

CHALLENGES, APPROACHES AND EXPERIENCES FROM ASIAN DELTAS AND THE RHINE-MEUSE DELTA

Myanmar Maritime University, Thanlyin (near Yangoon)

26	Henk Wosten	Sc	Wageningen University	henkwosten@gmail.com	Netherlands	
27	Dr. Wim Douven	Associate professor river basin management	UNESCO-IHE	w.douven@unesco-ihe.org	Netherlands	

Annex 3. Introduction to the workshop and flow of the working sessions

Introduction programme (Wim Douven, Henk Wosten, Ho Long Phi, Fida Malik Khan)
Flow of working sessions (Wim Douven, Henk Wosten, Ho Long Phi, Fida Malik Khan)

Introduction to the training workshop

Wim Douven, Ho Long Phi, Malik Fida, Ni Ni Thein, Henk Wösten

Challenges and Approaches in River Delta Planning

21-25 October 2013, Thanlyin , Myanmar

Ho Chi Minh City, October 2012

Why this training workshop?

- Do we face similar, different challenges?
- What are our experiences in addressing these challenges?
- What can we learn from each other?
- What can we learn from new concepts and approaches?
- What are gaps in knowledge and experiences?
- How could we address these gaps?

Workshop programme

Day 1. Welcome and introduction, introduction deltas represented

Day 2. Delta planning approaches, incl. scenarios

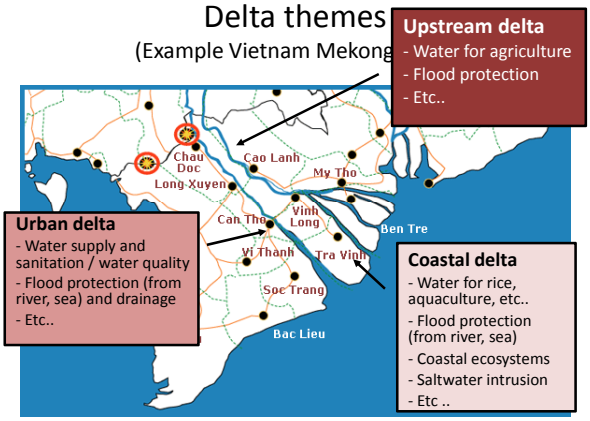
Day 3. Solution strategies, actor analysis

Day 4. Solution strategies, field visit

Day 5. Synergizing, conclusions, way forward

Delta themes

(Example Vietnam Mekong)



Workshop approach

- Open, interactive, flexible
- Mix of methods
- Workshop as forum; you are encouraged to present your project, your experiences
- Each morning a participant will recap the main issues' discussed the previous day ; input to workshop report

Logistics

Transport from Orchid hotel to the MMU campus

Field trip

Allowance and reimbursement expenses made

Any other issues …

Contact: Prof. Ni Ni, Maung Maung and other staff

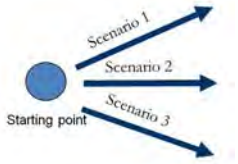
Enjoy the training workshop

Questions?

Flow Myanmar training workshop

Scenarios

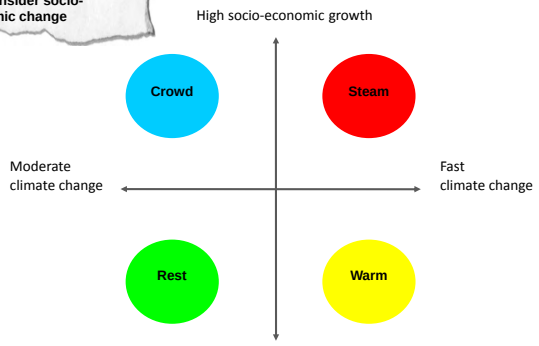
- When facing deep uncertainty, decision makers can consider multiple plausible outcomes.
- Scenarios present a set of different, plausible future conditions (or 'states of the world').



When developing scenarios for water / delta management: do not focus on climate change only, but also consider socio-economic change

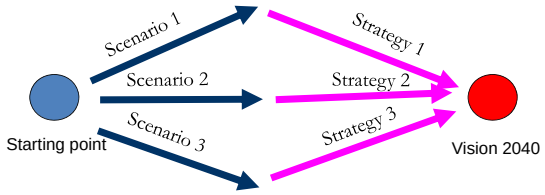
Deltares

Deltascenarios



Scenarios
Divergent futures based on current trends

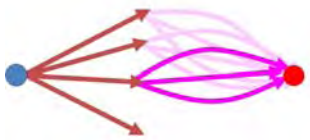
Strategies
Convergent activities to achieve the vision



Monitoring by indicators

Robust or resilient strategies

- Identify strategies that will work reasonably well across a wide range of alternative futures.

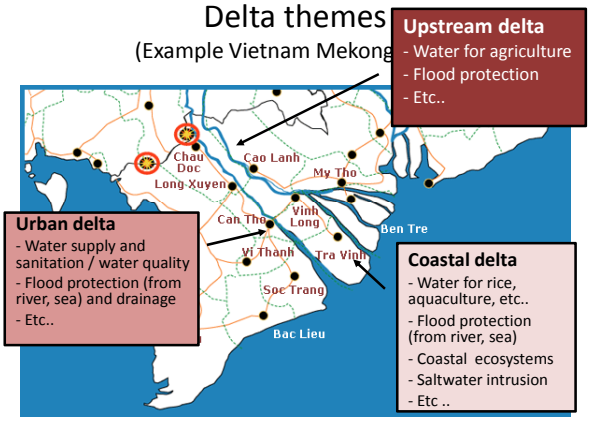


Criteria to evaluate strategies

- **Effectiveness**: to what extent does the measure address the problem (from not at all to very much)
- **Economic effects**: what are the investment/ operational/transaction/social costs (as a function of GDP?, from very high to very low)
- **Side-effects**: which other positive or negative effects other than reduced the problem and economic impacts does the measure have? (from primarily very negative to primarily very positive)
- **Flexibility**: to what extent can the measure be adjusted/complemented/reversed when resulting to be inadequate or inappropriate (from very rigid to very flexible)
- **Acceptance**: how feasible is the implementation of the measure taking into account issues such as public acceptance? (from not to very acceptable)

Delta themes

(Example Vietnam Mekong)



Assignment Tuesday: Scenario development

1. four scenarios
   1. Axis 1 High – low economic growth
   2. Axis 2 Moderate – Fast Climate Change
2. Develop Story lines for each of the four scenarios
3. Describe the most important water related issues for each of the four scenarios
4. 1 group GBM delta, Bangladesh
5. 1 group Indonesian delta – select <u>one delta</u>
6. 1 group Ayeyarwady delta

Second Assignment Tuesday

1. Chose one scenario and identify three key water issues relevant in all deltas represented in your group (you can focus on an area; coastal, urban, upstream).
2. Analyse the causes of the three issues
3. Identify for one of the selected issues solution strategies. Describe the strategies in terms of concept behind strategy, and type of measures included.
4. Assess / evaluate the strategies (criteria can be used as guidance)

<u>Make differences and similarities between deltas explicit.</u>

Assignment Wednesday

Stakeholder analysis : MOTA

Assignment Thursday

1. Develop a roadmap for the implementation of your preferred strategy (e.g. what measures within 10 YR, 50 YR, beyond 50YR)
2. Who should be involved in developing this roadmap? And how?
3. (How to monitor the roadmap? What could be tipping points, how would you know?)

Input: presentations, MOTA session, discussions, ..

Friday

Discussion points group work presentations ..

- What are differences in approaches? Why?
- Time horizon
- Planning focus
- Type of measures
- Phasing of measures (also in light flexibility)
- Stakeholder involvement
- Monitoring
- Implementation issues

Cross-delta sharing and learning

- What can we learn from each other ?
- What are gaps in knowledge and experiences ?
- What do you see as opportunities for cooperation and learning ?
- How could we organise this ?

Evaluation training workshop

- Was the training workshop according to your expectations ?
- Were the subjects relevant and new ?
- Was the workshop design appropriate (flow, mix of methods, theory versus practice, load, ..) ?
- Were there sufficient possibilities for interaction and for participants to share experiences ?
- What are lessons for a Delta Planning training workshop next year ?

Annex 4. Training material

'Introduction training workshop and deltas represented' (Day 1; Monday 21 October)

Day 1 - Adaptive planning approach and innovations for development of delta areas - Engr. Md. Waji Ullah
Day 1 - National Capital Integrated Coastal Development - Fikri Abdurrachman
Day 1 - Success Story of Lowland Management and CCA in the Mekong delta - To Quang Toan
Day 1 - Delta planning in the Netherlands - Leon Hermans / Marcel Marchand

ADAPTIVE PLANNING APPROACH AND INNOVATIONS FOR DEVELOPMENT OF DELTA AREAS

Engr. Md. Waji Ullah
Executive Director
Center for Environmental and Geographic Information Services

CEGIS
Center for Environmental and Geographic Information Services

Workshop on Delta Planning and Management
MMU, Thanlyin, Myanmar
October 21 to 25, 2013

Presentation Contents

Presentation Objectives

- Conceptualizing adaptive planning approach, discussing different features of planning and undermining benefits
- Disseminate knowledge, building interest and awareness on adaptive planning in international expert community
- Sharing ideas and experiences as well as different issues, challenges and scenarios in Bangladesh
- Briefing out planning innovations, exchanging new ideas, foresee and share expected benefits of adaptive planning
- Expecting feedback from the experts, planners, managers and professionals

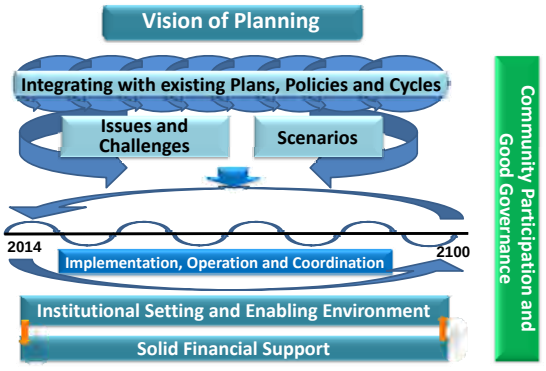
Need for Adaptive Planning in Delta Areas

- There are **Ten important deltas** in the world, comprising minimum **260 million people**

Globally, Delta Countries face some common **problems** and **challenges**

- A **holistic** and **adaptive** process based '**no regret**' plan is therefore needed, to **address** and **deal with the challenges** and **scenarios** for achieving **sustainable development** in delta areas

Adaptive Planning Concept



Drivers and Perspective

Drivers

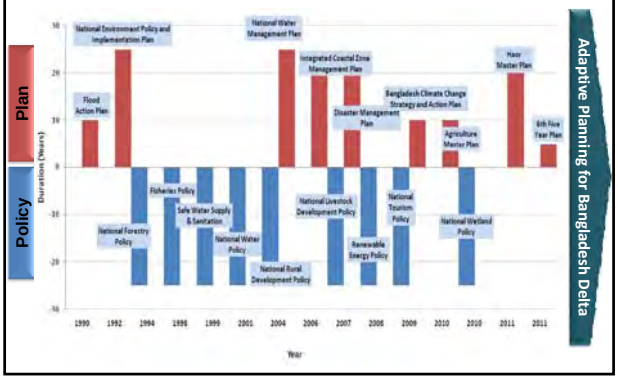
- Globalization and Macro-economic development
- Population Pressure
- Pressure on Land Use
- Climate Change and Hazards
- Dynamic Morphology of Delta
- Poverty and Socio-Political Stress
- Livelihood security
- Water, Food and Energy Security

Integrated, Iterative and Interactive Long Term Rolling Delta Plan

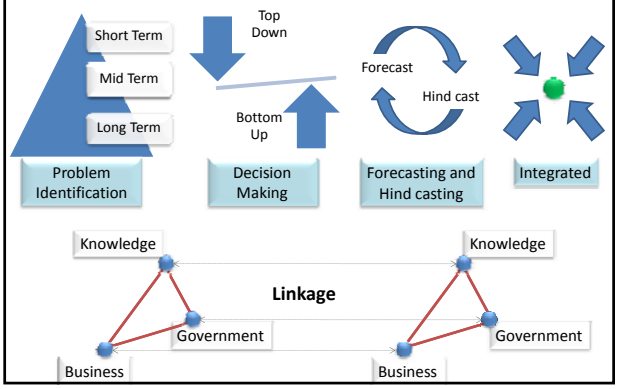
Future Perspective

- Secured Water, Food and Energy
- Sustainable Socio-Economy
- Safety from Climate Change and Disasters
- Population as Human Resources

Linking and Inclusion with Existing Policies and Plans



Process of Adaptive Planning

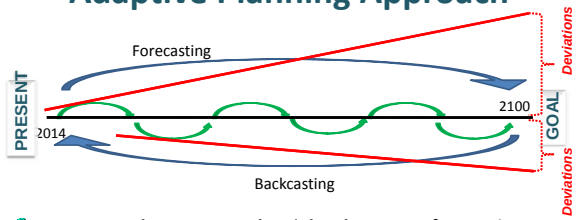


Water in the CORE…

Adaptive Planning Functions

Socio-Political Support	**Support an enabling socio-political environment** for plan formulation and implementation
Knowledge and Experiences	**Develop** and **Manage** a **common, inclusive** and **widely shared information , knowledge** and **experience base**
Institutional Development and Governance	**Development of Institutional structure and ensure good governance** for formulation and implementation of plan
Public Private Participation	**Encourage private and public entrepreneurship** and **donor innovations** for **financial** and **involuntary support** to the implementation strategy
Implementation, cooperation and coordination	**Effective implementation of plan,** supported by regular **updation, multi-sectoral cooperation** and **coordination**
More to Follow…	?

Adaptive Planning Approach

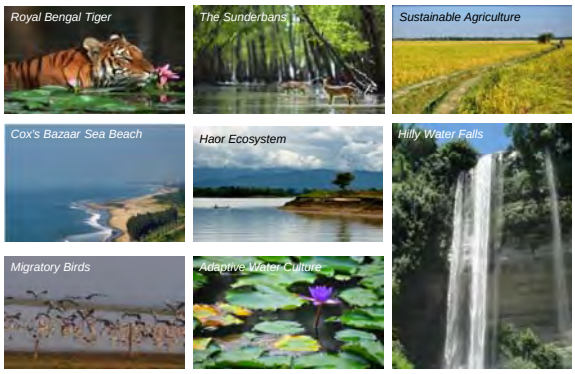


- Setting up a **long term goal** and **development of scenario**
- **Forecasting** to the desirable goal and **Back casting** to present to define feasible steps
- **Stepwise development** and **implementation** of plan, **adjustment** of **deviations** to achieve desired result
- **Monitoring** policy **results**, **steps** and **effects**, **adapting implementation** if needed

Country Profile of Bangladesh Delta

- **Area:** 147,570 sq. km
- **Population:** 144 million
- **Population Density:** 976 persons per sq. km
- **Average Height:** 10m above sea level.
- **Main Rivers:** The Padma, the Jamuna & the Meghna
- **Climate:** Sub-tropical
- **Temperature:** 7.22 - 22.77 ^{0}C (winter) & 23.88 - 38.5 ^{0}C (summer)
- **Average Rainfall:** Annually 1429 to 4338 mm

Pictorial Synopsis of Bangladesh Delta



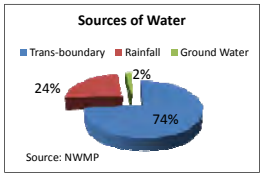
Regional Issues

Major River Basins of Asia

- **9 million km^2** total basin area
- Provides water to **1.3 billion people**, one-fifth of the world's population

Regional Issues

Source of Water

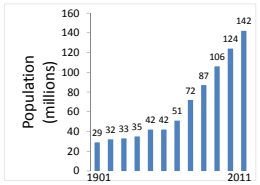


Hydrological Region	No of Rivers	(%) of Trans Boundary flow
North West	17	7
North East	20	6
South West	5	0.1
South East	9	1
Eastern Hill	3	0.5
River and Estuary	2	86
North Central	1	
South Central	-	

National Issues

Demographic

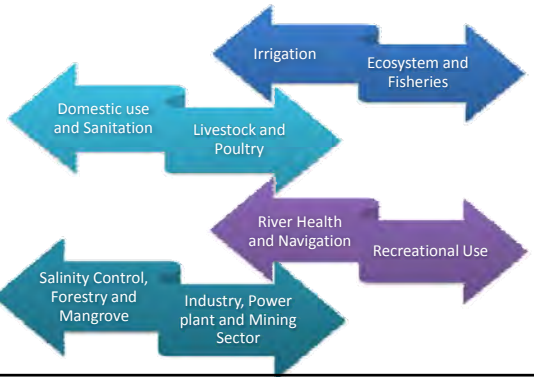
Population Stress



Population Density

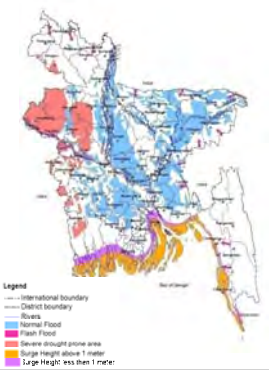
National Issues

Competitive Water Use



National Issues

Flood and Disasters



Flash Flood

Monsoon Flood

Urban Flood

Tidal Flood

National Issues

Storm Surge and Cyclones


Cyclone 1991


Sidr 2007


Aila 2009

National Issues

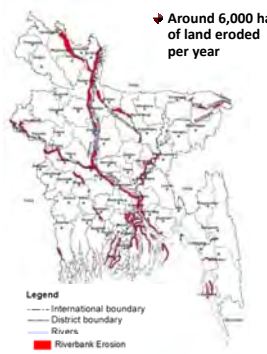
Bank Erosion and Shifting of Rivers


Infrastructural Damage


Household Loss


Loss of Assets


Displacement

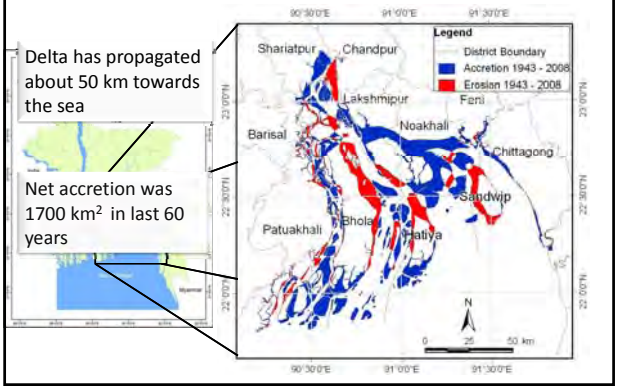


National Issues

Morphological Dynamics and Sedimentation Management

Delta has propagated about 50 km towards the sea

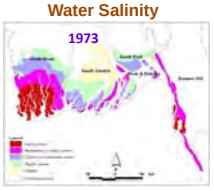
Net accretion was 1700 km^2 in last 60 years

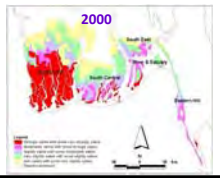


National Issues

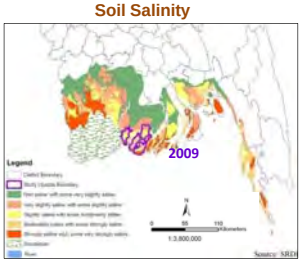
Salinity Intrusion

Water Salinity





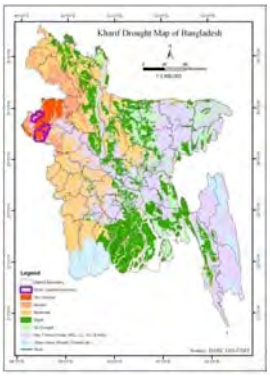
Soil Salinity



Salinity intrusion is increasing over the years, largely threatening drinking water resources and severely affecting production in coastal areas

National Issues

Drought





Drought influences agriculture and production and other services as well as social customs.

National Issues

Socio-Economic Livelihood Concern


Poor Communication and Networking


Gender discrimination


Livelihood Insecurity


Limited access to resources


Un-Employment


Health and Sanitation


Low Level of Education


Low Income


Power and Energy crisis

National Issues

Environmental Issues and Security

Food Security

Water Security

Industrial Pollution

Environmental Degradation

Air Pollution

Water Contamination

National Issues

Natural Resources Degradation

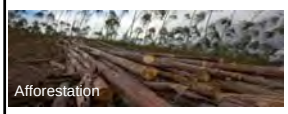
River Dying

Governance and Allocation of Water

Groundwater Scarcity

Ecosystem Exploitation

Energy Management



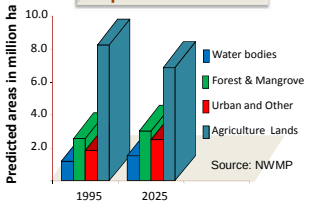
Afforestation

Pressure on Land

Challenges and Scenarios

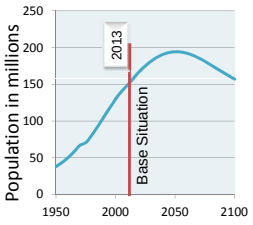
Land Use and Population scenarios

Rapid Urbanization



- Agricultural lands will decrease from 59% to 48%
- Urban area will increase from 11% to 15% in 2025
- Water bodies and Forest areas would increase

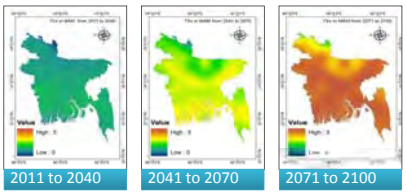
Population Scenario



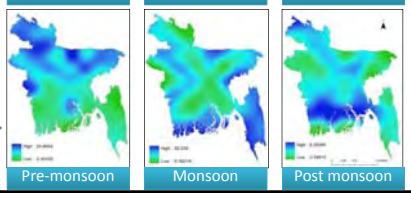
Challenges and Scenarios

Climate Change

Temperature Increase

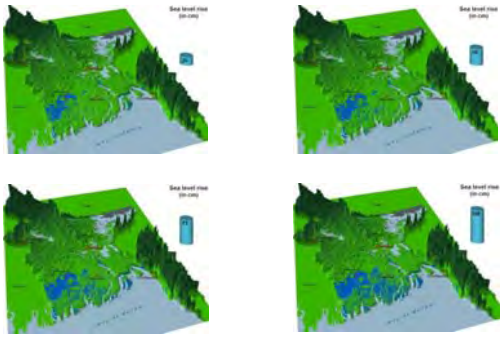


Temporal and Spatial Distribution of Rainfall



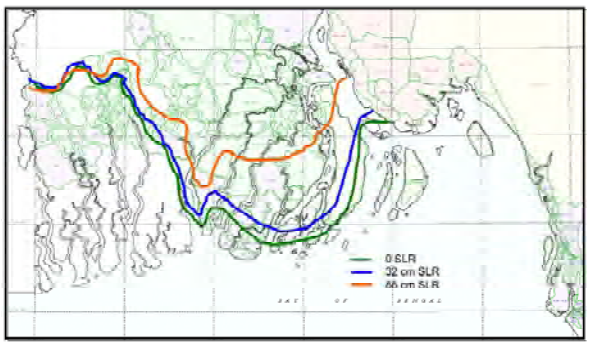
Challenges and Scenarios

Sea Level Rise (SLR)



Challenges and Scenarios

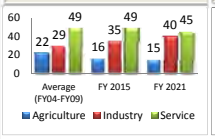
SLR induced Salinity Intrusion



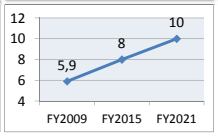
Challenges and Scenarios

Economic Development

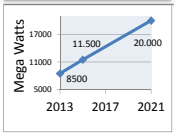
Sectoral Share of GDP (%)



GDP Growth rate (%)

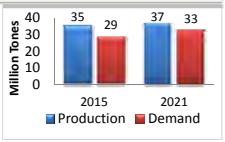


Power Scenario



Source: Outline Perspective Plan of Bangladesh (2010-2021)

Rice Demand-Supply Scenario



Massive Economic Growth

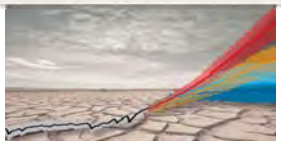
Intensive Development

Challenges and Scenarios

Upstream Downstream Situation

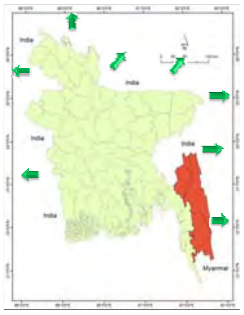
Cross-Boundary Interventions

Climate Change Prediction Uncertainties



- Increase water use in upstream causes **Flow Reduction** at downstream locations
- Upstream environmental dynamics resulting in **Pollution** in the downstream
- Upstream **Development** complicating the downstream development scenario

Delta Planning Domain



Regional bounding are also considered in planning domain

Innovations

- Geo-Informatics, Space and Information Technology
- Modeling and Software Application
- Touch-table Climate Atlas (TCA)
- 3-I (Interactive, Integrated and Iterative) Planning Concept
- Ensure 3-C (Coordination, Cooperation and Collaboration)
- Institutional and Capacity Development
- Ways of Resource Optimization
- Indigenous Green Adaptation Concept
- Many More…

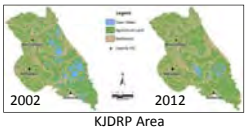
Geo-Informatics, Space and Information Technology

Visualizing and interpreting planning results, spatial analysis of sectoral issues

Proposed Tourism development

Proposed Pear Culture Site

Monitoring and Evaluation of project performance, assessing changes in land use and water logging



KJDRP Area

Water management and Infrastructural planning, design of drainage and irrigation system

Layout of Irrigation Canals

Location Mapping of Structures

Geo-Informatics, Space and Information Technology

Erosion monitoring, hardware and software solutions, development of erosion prediction tools for plan formulation and implementation

Vulnerable area identification, risk and uncertainty analyses, flood and disaster mapping

Community Risk Assessment

Earthquake Hazard Map

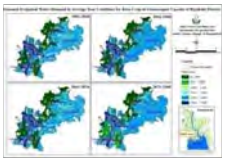
Developing web based database and information system

NWRD

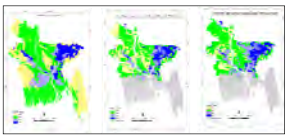
ICRD

Modeling and Software Application

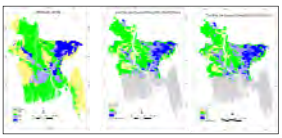
Advanced application of Models for Scenario development, assessment of resources and crop demand, Soil-moisture determination, resources optimization and management etc.



DRAS Model



Flood Prediction (A2 Scenario)



Flood Prediction (B1 Scenario)

Touch-table Climate Atlas (TCA)

TCA approach (Combination of software, hardware and stakeholder) provides an integrated perspective by clustering and visualizing sectoral planning information in user friendly and policy relevant maps.

3-I (**Interactive**, Integrated and Iterative) Planning Concept

Stakeholder Consultation

Information Gathering

Knowledge Dissemination

Gender Mainstreaming

3-I (Interactive, **Integrated** and **Iterative**) Planning Concept

Integrated Planning

Iterative Planning

- **Clustering** and **Blending** of knowledge from different sectors and spatial unit
- Investigating the **cross cutting issues** and problems
- Scale up and Scale down planning

Ensure 3-C (Coordination, Cooperation and Collaboration)

Good Governance is needed at all stages to ensure sustainable development, proper functioning of the plan and accomplish foreseen benefits.

Institutional and Capacity Development

- Development of need based Institutional Framework
- Training programs for developing individual capacity as well as institutions responsible for resources management.
- With increased self-development of relevant institutions and stakeholders, sustainable solutions would be easy to achieve

Training on Integrated Water Resources Management

Ways of Resources Optimization


Resources Quality improvement


Environmental Flow Restoration


Consumptive Water use


Ecosystem management


Land optimization


Land Use Zoning


Eco-friendly Agriculture


Conserve Capture Fisheries


Food Habit Adjustment


Energy Optimization


Forest Management


Wetland Conservation

Indigenous Green Adaptation Concept


Eco-Friendly Development in Sundarbans


Social Afforestation


Environment Friendly Submersible Interventions


Tidal River Management **(TRM)** in delta areas

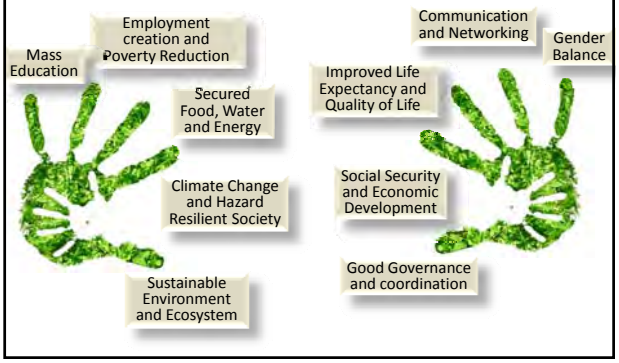

Managing hill Agriculture and Water


Green Development

Implementation and Operation Modalities

- Stepwise Successive Implementation
- Continual Monitoring and Evaluation
- Governance and Public Private support
- Feedback from stakeholders, experts and researchers
- Multi-sectoral co-ordination (both horizontal and vertical)
- Gap identification and updating of plan

Adaptive Delta Planning Benefits



Expected Regional Benefits

Benefits Measuring Indicators

National

- GDP
- Employment and Poverty
- Education
- Food and Power
- Water Quality and Quantity
- Quality of Life
- Livelihood Security
- Communication
- Health and Hygiene

Regional

- Water Sharing
- Economic Growth
- Business and Communication
- Common Share of Knowledge and Information
- Power and Energy distribution
- Regional Conflict and Political Situation
- Coordination in Development

Way Forward

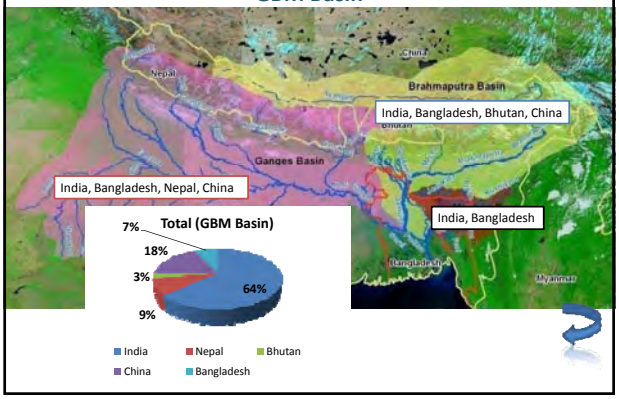
- Adaptive planning accommodates fast changing future conditions and uncertainties, reducing climate change impacts, vulnerability and disasters; paving ways for further economic growth
- Conserve and optimize natural resources and extend support in diversified and resilient environmental services to ensure enhanced livelihood and social security
- Ensure gender mainstreaming and infrastructural support; reduce trade barriers, accelerate balanced development, explore public private partnership, and participatory contribution from all involving parties

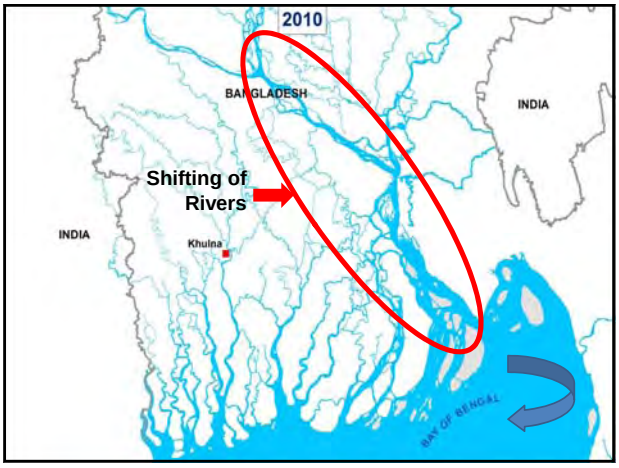
Vision

Ensure sustainable development of Delta Areas through **Long-term**, **Participatory**, **Integrative** and **Adaptive** Planning

Regional Issues

GBM Basin





The Government of Indonesia

Ministry of Public Work

National Capital Integrated Coastal Development

NCICD

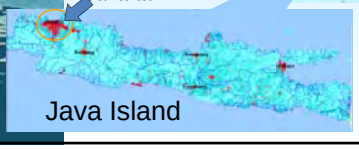
Fikri Abdurrachman
Yangon, 20 October 2013

Map of Indonesia

Indonesia :

- Population is about 229 millions
- Varied rainfall distribution from 800 – 4,000 mm/yr
- Rainfall is concentrated in 5 (five) months,

Jakarta

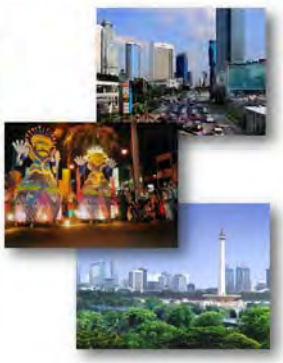


Java Island

Jakarta at glance

JAKARTA:

- Geographical Status : Capital City of Indonesia
- Population : ± 12 millions (daytime)
  ± 9,7 millions (nighttime)
- Total Area : 662 km²
- Consist of 5 Cities & 1 Regency



the issue of Water Resource Management in Jakarta

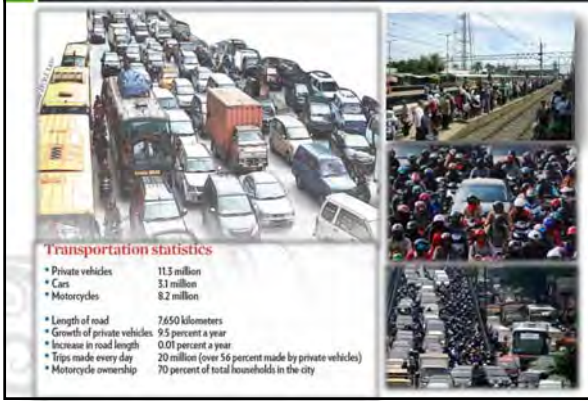
High Population Density

- OVER POPULATED AND VERY RAPID GROWTH

- LAND ACQUISITION PROBLEM

Jakarta, Indonesia

High activity of people

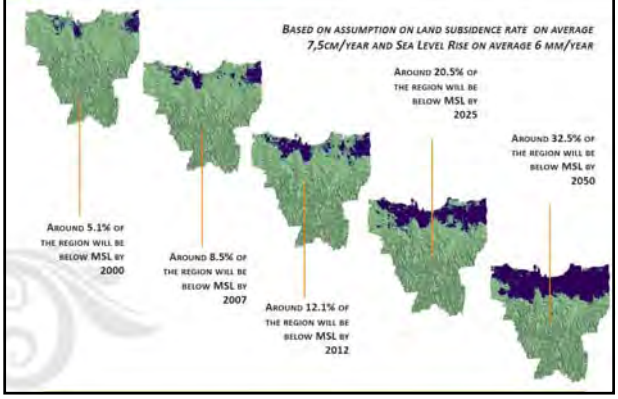


Transportation statistics

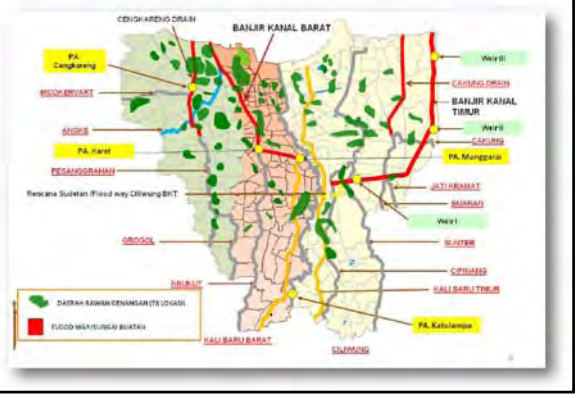
• Private vehicles	11.3 million
• Cars	3.1 million
• Motorcycles	8.2 million
• Length of road	7,650 kilometers
• Growth of private vehicles	9.5 percent a year
• Increase in road length	0.01 percent a year
• Trips made every day	20 million (over 56 percent made by private vehicles)
• Motorcycle ownership	70 percent of total households in the city

Tidal flooding

Land subsidence

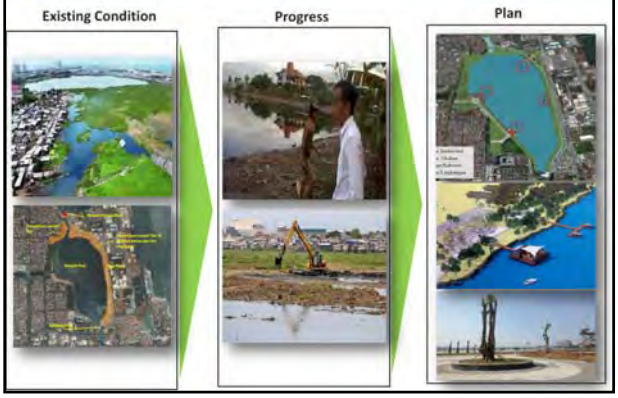


Jakarta as a delta city



Waduk Pluit

New breaktrough to overcome these problems

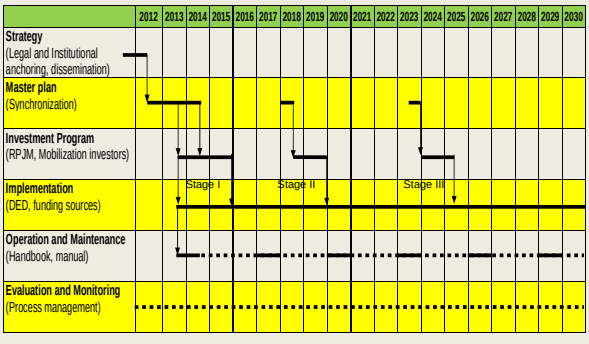


Structural measures

Non structural measures

National Capital Integrated Coastal Development (NCICD) Concept

Time Line



Stage 1
(2013-2015)

Main works

- Rivers, canal and retention ponds dregging;
- New 36 km sea dike on the existing coast line, 4 m above MSL;
- Dike on downstream of 13 rivers, 3m above MSL
- Pump capacity added up to 100 m3/dt

19

Stage 2
(2015 - 2020)

Main works

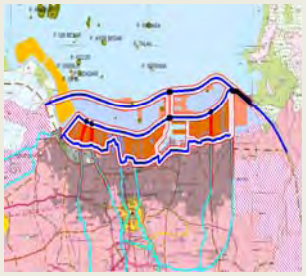
- 50,5 km sea wall (also fuction as a road and railway), 3 km from the coast line, + 6,5 m above MSL
- Dike heightening on downstream of 13 rivers, total 100 km
- Addition of 750 Ha Retention pond and pump capacity added up to 330 m3/dt
- 150 Ha land acquisition, and relocation of 30.000 people.

20

Stage 3
(2020 - 2030)

Main works

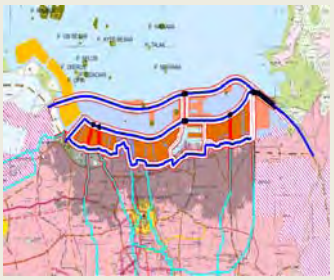
- New 66,5 km sea wall (also fuction as a road and railway) on 6 km from the coast line (permanent protection)
- Retention pond up to 10.000 ha
- Addition of pump capacity up to 500 m3/s.



21

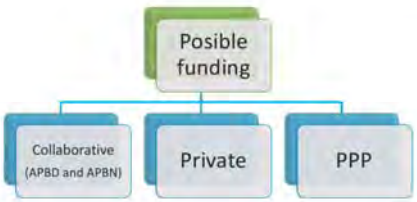
Structural measures for NCICD

- Sea wall
- Polders
- River dike
- Road construction
- Bridges
- Drinking water supply
- Sanitation
- Reclamation



Development concept of NCICD reclamation area

Posible funding



Conclusion

- Jakarta faced many problems regarding water resources issues, such as flood, raw water supply, land subsidence, and sea level rise
- NCICD offers an integrated solution that does not only provide protection from tidal flooding, but also function as raw water reservoir and creates opportunities for investment in toll roads, Railway, deep sea port, land reclamation, and urban redevelopment of north Jakarta
- There are plenty of issues regarding the implementation of NCICD, that require stakeholders participation (community, Government and private sectors)

Success Story of Lowland Management in the Mekong delta and Planing for Water Resources Management for Sustainable Agricultural Cultivation Adapting to Climate Change and Sea Level Rise

Vietnam Academy for Water Resources
Southern Institute of Water Resources Research
By To Quang Toan
Toan_siwrr@yahoo.com

Contents

- Success story of lowland management in the Mekong delta
- Future threat: upstream development and CC&SLR
- Water resources condition change and possible impact
  - Salinity intrusion condition
  - Flooding and inundation condition change
  - Possible impacts
- Vietnam strategy for food security
- Water resources development adapting to CC&SLR

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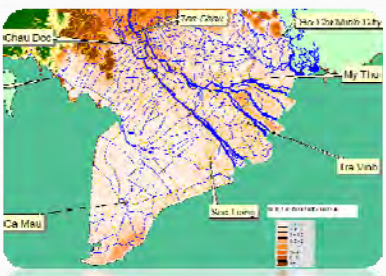
The Mekong Delta

- Total area: 3.9 million ha
- Population: 18 million people
- Cultivated area: > 2 million ha of rice, up to 7crops per 2years

The Mekong Delta

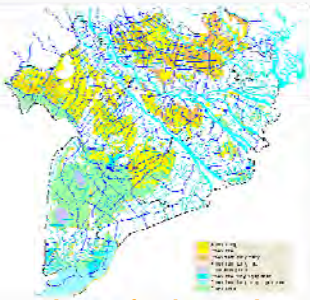
- Very flat plain and low land area
- An average of 1m+MSL



DEM of Mekong delta

The Mekong Delta

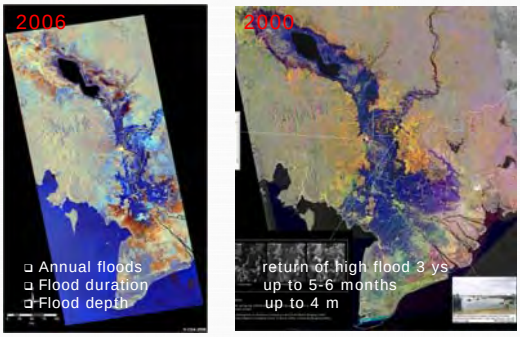
- 1.6 million ha of acid sulphate soils



Soil Map of Mekong Delta

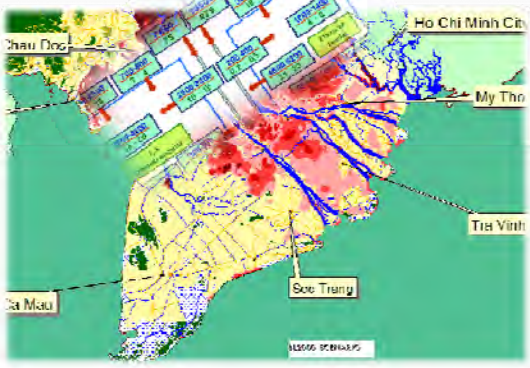
The Mekong Delta

Annual flood in the Mekong Delta



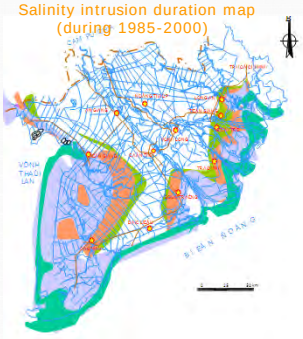
Monthly flood extend map in baseline2000

Distribution of flood flow in 2000

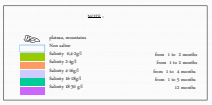


The Mekong Delta

Salinity intrusion duration map (during 1985-2000)



- 1.7 mil. ha affected by salinity of 4g/l
- 2.1 mil. ha affected by salinity of 1g/l



Water-related problems in Mekong Delta

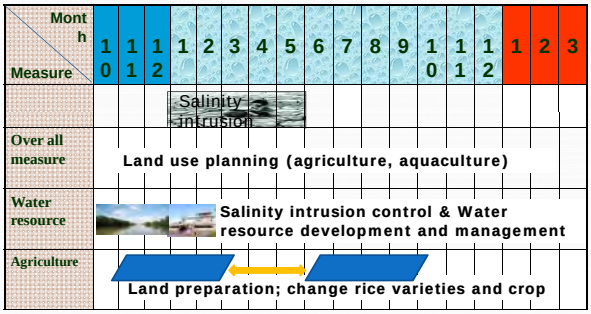
Isues \ Month	1	2	3	4	5	6	7	8	9	10	11	12
Flood												
Salinity intrusion												
Acid sulfate soil and acid water												
Drought												
Bank Erosion												
Sediment												
Pollusion												

Addition threat: upstream development, CC&SLR →

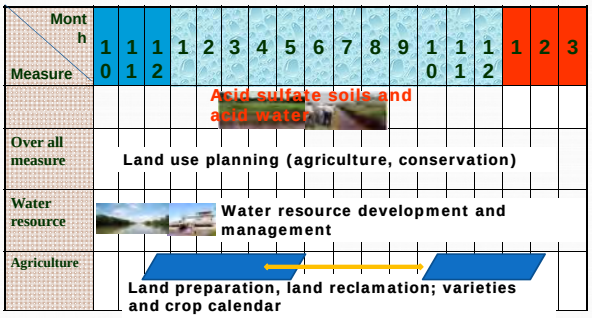
Successful measures in Mekong Delta

Measure \ Month	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
											Flood							
Over all measure											Adaptive living with flood							
Agriculture											Change rice varieties and crop calendar							
Water resource											Embankment and flood water control							

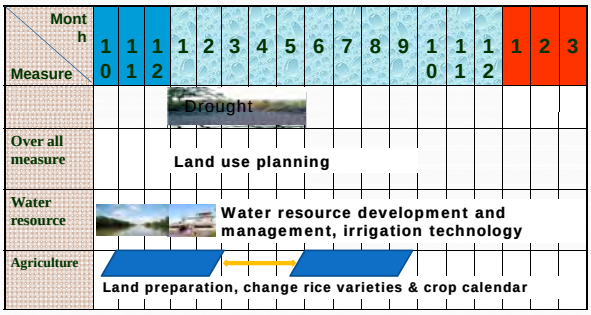
Successful measures in Mekong Delta



Successful measures in Mekong Delta



Successful measures in Mekong Delta



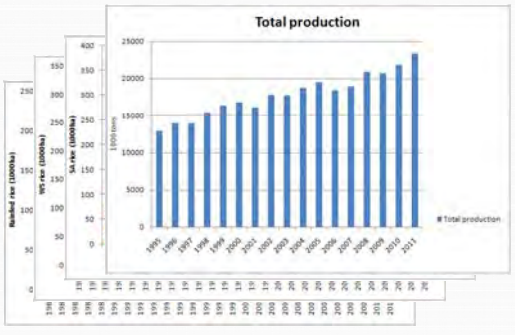
Key figures of in the Mekong Delta

- Area: 12% of Vietnam
- Population: 21.5% of Vietnam

Contribute

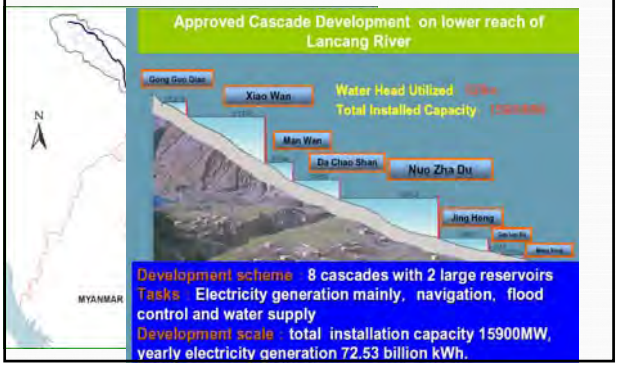
- 50% of food production, 90% of exported rice come from Mekong delta
- 70% of fruit production
- >60% of the aquaculture production (catch 44%, culture 75%)and 80% national expoted value from aquaculture from MD

Land use and production change from 1985-2011



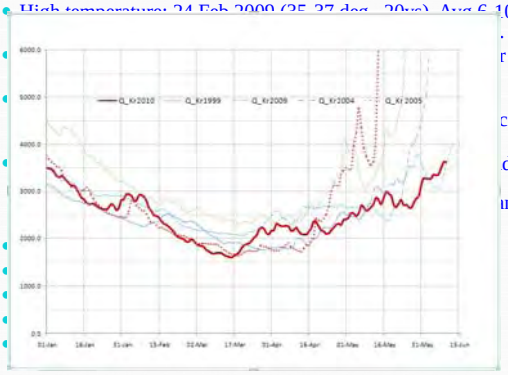
Contents

Upstream Mekong river development



Unusual climate condition in the South of Vietnam

- High temperature: 24 Feb 2009 (35-37 deg., 20yr), Avg 6-10

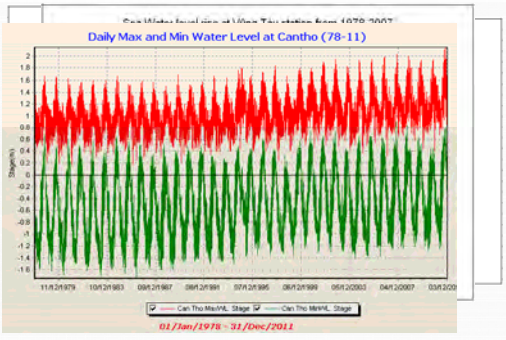


Mekong delta flood 2011

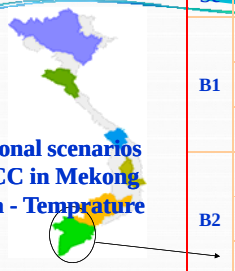
Pakhar Storm 1st April 2012

Sources: www.nld.com.vn

Climate change in the Mekong delta



National scenarios for CC in Mekong delta - Temprature



Sc	Times	2050	2070	2100
B1	XII-II	0,8	0,9	1,0
	VI-VIII	1,1	1,3	1,4
	Avg	0,9	1,1	1,2
B2	XII-II	0,8	1,1	1,5
	VI-VIII	1,1	1,6	2,2
	Avg	1,0	1,4	1,9
A2	XII-II	0,8	1,2	1,9
	VI-VIII	1,1	1,7	2,8
	Avg	0,9	1,4	2,4

Sources: based on 2009 National CC scenario

National scenarios for CC in Mekong delta - Rainfall

Sc	Times	2050	2070	2100
B1	XII-II	-7,6	-9,3	-10.0
	III-V	-8.0	-9,8	-10,5
	VI-VIII	2,1	2,5	2,7
	IX-XI	5,8	7,1	7,7
	Avg	1,8	2,1	2,2
B2	XII-II	-8.0	-11,3	-15,3
	III-V	-8,4	-11,9	-16.0
	VI-VIII	2,2	3,1	4,2
	IX-XI	6,1	8,6	11,7
	Avg	1,7	2,3	2,5
A2	XII-II	-7,6	-11,8	-19,4
	III-V	-8.0	-12,4	-20,4
	VI-VIII	2,1	3,2	5,3
	IX-XI	5,8	9,1	14,8
	Avg	1,8	2,5	2,9

Sources: based on 2009 National CC scenario

Vietnam National scenarios for Climate change and SLR

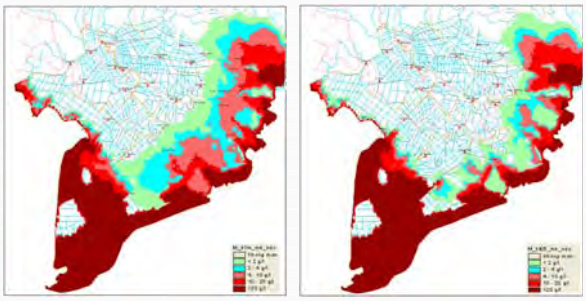
Sea water level rise in comparison with the period 1980-1999

Kịch bản	Decades in the 21 century								
	2020	2030	2040	2050	2060	2070	2080	2090	2100
Low (B1)	8-9	11-13	17-19	22-26	28-34	34-42	40-50	46-59	51-66
Medium B2	8-9	12-14	17-20	23-27	30-35	37-44	44-54	51-64	59-75
High (A1F1	8-9	13-14	19-21	26-30	35-41	45-53	56-68	68-83	79-99

Sources: based on 2011 National CC scenario

Contents

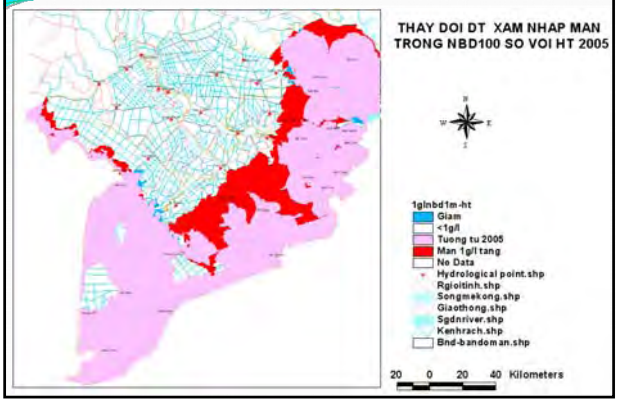
Change of salinity intrusion by concentration in simulated scenarios



Length of salinity intrusion with 4g/l along the rivers

Scenarios	Mekong River (by Tieu River mouth)		Bassac River (Dinh An River mouth)	
	Leng (km)	Increase in comparison with BL2005 (km)	Leng (km)	Increase in comparison with BL2005 (km)
BL05	40.3	0.0	40.0	0.0
SLR30	45.0	4.7	45.6	5.6
SLR50	49.9	9.6	51.0	11.0
SLR75	54.4	14.1	58.3	18.3
SLR1m	60.6	20.3	67.3	27.3

Change of salinity extent in 1g/l



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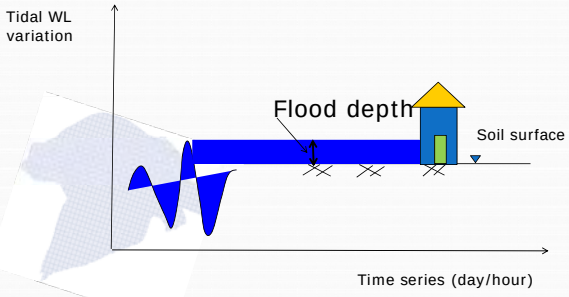
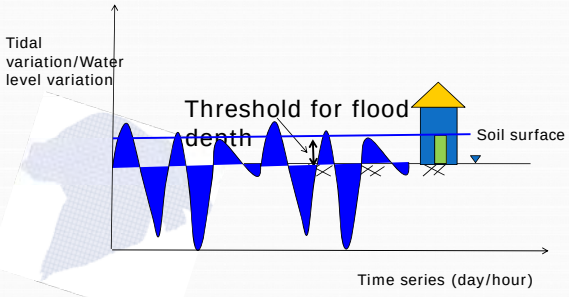
- Water resources development adapting to CC&SLR

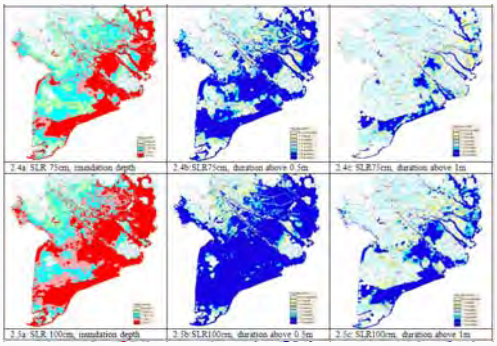
For flood/inundation depth map



For flood/inundation duration map

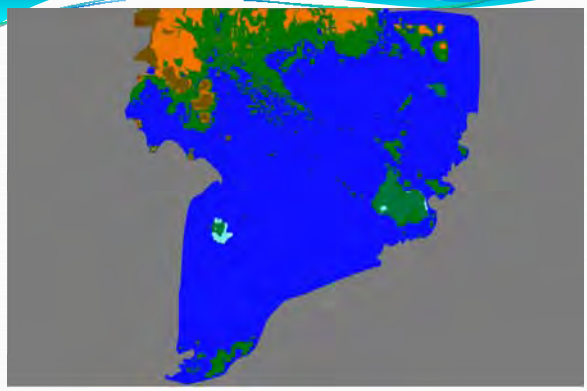


Tidal inundation change in SLR scenarios

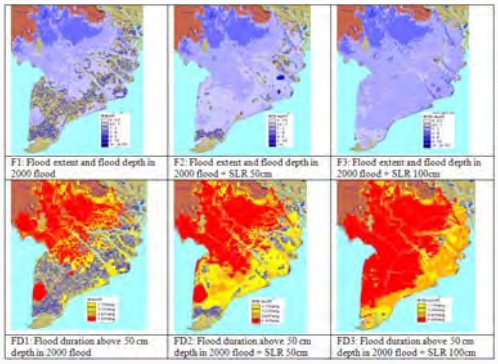


Tidal inundation change in area (ha)

No	Scenario	% inundated period above 0.5m	
		<50% of times	>50% of times
5	NBD1m	19	62
4	NBD75	29	38
3	NBD50	27	17
2	NBD30	22	7
1	HT05	12	



Flood changes in case of Mekong river flood as year 2000 + SLR



Contents

Possible impact of Climate change and Sea level rise to the Mekong delta

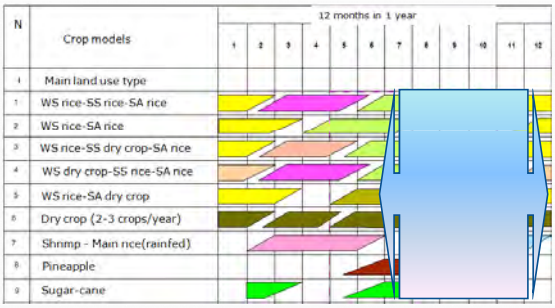
- With the pre-simulated results on the impact of CC&SLR to the Mekong delta it may be concluded that ***there will be a large change to the natural conditions*** *(soils - inundated area, water resources, floods, salinity intrusion, water quality…),* ***to the ecology conditions*** *(plants, animals and microorganism, insects…) and* ***affected to infrastructural, socio-economic and sustainable development in the Mekong delta****.*

Possible impact to biodiversity (e.g Cape Camau Park)

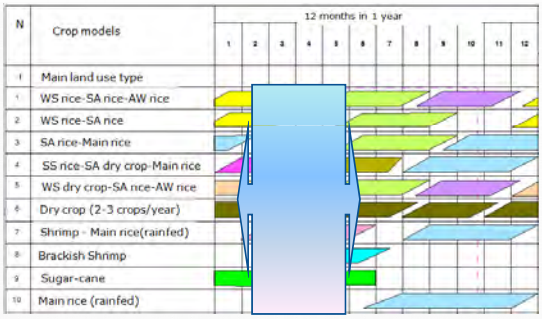
The living environmental condition for reptiles and crustaceans is shallow and temporary daily inundation.

The earned foods for births and other animals are also come from the similar conditions.

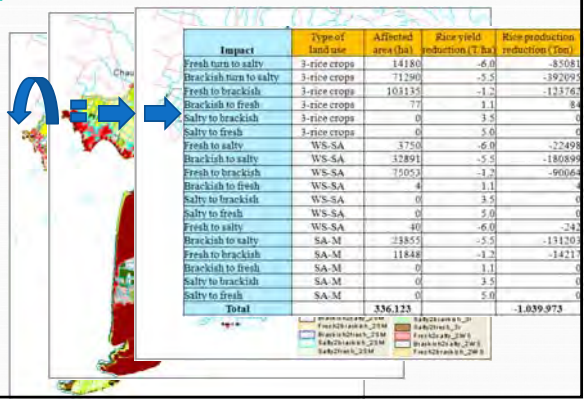
Posible impact to agriculture in flood season



Posible impact to agriculture in dry season



Evaluation the impact of SLR to Rice cultivation area



Impact	Type of land use	Affected area (ha)	Rice yield reduction (T/ha)	Rice production reduction (Ton)
Fresh turn to salty	3-rice crops	14180	-6.0	-85081
Brackish turn to salty	3-rice crops	71290	-5.5	-392095
Fresh to brackish	3-rice crops	103135	-1.2	-123762
Brackish to fresh	3-rice crops	77	1.1	84
Salty to brackish	3-rice crops	0	3.5	0
Salty to fresh	3-rice crops	0	5.0	0
Fresh to salty	WS-SA	3750	-6.0	-22498
Brackish to salty	WS-SA	32891	-5.5	-180899
Fresh to brackish	WS-SA	75053	-1.2	-90064
Brackish to fresh	WS-SA	4	1.1	4
Salty to brackish	WS-SA	0	3.5	0
Salty to fresh	WS-SA	0	5.0	0
Fresh to salty	WS-SA	40	-6.0	-242
Brackish to salty	SA-M	23855	-5.5	-131203
Fresh to brackish	SA-M	11848	-1.2	-14217
Brackish to fresh	SA-M	0	1.1	0
Salty to brackish	SA-M	0	3.5	0
Salty to fresh	SA-M	0	5.0	0
Total		**336.123**		**-1.039.973**

Rice yield reduction and rice production reduction

Impact	Type of land use	Affected area (ha)	Rice yield reduction (T/ha)	Rice production reduction (Ton)
Fresh turn to salty	3-rice crops	14180	-6.0	-85081
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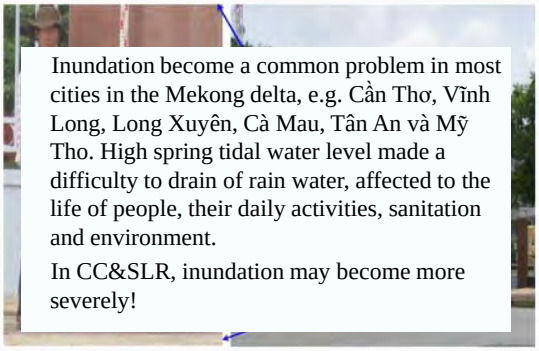
Total		**336.123**		**-1.039.973**

Inundation in cities:



Inundation become a common problem in most cities in the Mekong delta, e.g. Cần Thơ, Vĩnh Long, Long Xuyên, Cà Mau, Tân An và Mỹ Tho. High spring tidal water level made a difficulty to drain of rain water, affected to the life of people, their daily activities, sanitation and environment.

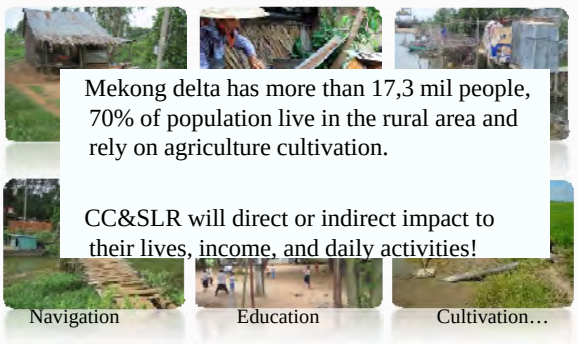
In CC&SLR, inundation may become more severely!

Impact to infrastructure, navigation and water supply

The Mekong delta has more than 40,000 km of roads and tens of thousand bridges.

In CC&SLR, roads may be submerged, unstable, erosion; navigation by waterway will reduce!

Impact to rural areas



Mekong delta has more than 17,3 mil people, 70% of population live in the rural area and rely on agriculture cultivation.

CC&SLR will direct or indirect impact to their lives, income, and daily activities!

Navigation Education Cultivation…

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- Success story of lowland management in the Mekong delta
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- **Vietnam strategy for food security**
- Water resources development adapting to CC&SLR

Vietnam's strategy for food security

- Current population of Vietnam is about 87 million people, the population would double increase by the 2100;
- Present rice cultivation area is about 4.1 million ha. Total food production is about 44.5 million ton, about 22 million ton from Mekong Delta. Total exported rice in 2011 is about 7 million ton.
- To ensure national food security, VN's strategy to maintain 3.8 million hectare of agriculture cultivation. In which there is about 1.7 million hectares in the Mekong Delta.

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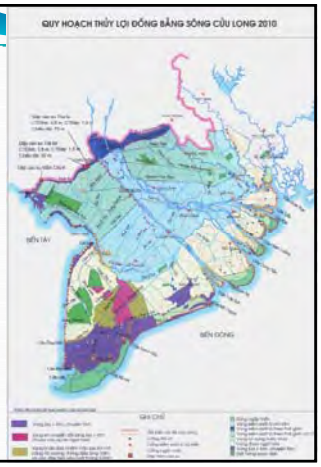
Delivery message

- Pass success on the lowland and water resources development has bring an impression increment of socio-economic development in the Mekong delta in general and agriculture production in particular
- Climate change could create a large impact for the Mekong delta, previous strategy for flood protection and lowland development may not suitable for future condition, it need to be adapted to the new condition
- In similar way, the previous measures for flood control, lowland development need to be adapted with the new condition

Water resources planing in the MD (to 2010)

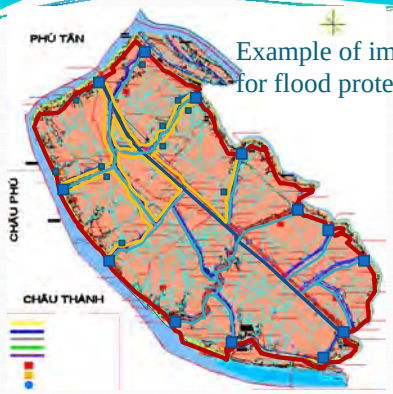
- Full flood protection: South NVT and East BoBo canal, south CaiSan,
- Partial protection: North NVT, South TT-LG, North Cai San
- Bufer area: North TT-LG...



Water management zones in the Mekong delta

Water resourse planning in the Mekong delta to adapt with climate change condition

Example of implementation for flood protection



Thank you!

Role of deferent institution and organization

- University: department and faculty related to the fields.
- Institute: planning, research: support to the government strategy to make decision and consulting to the provinces for landuse and water resource management.
- Government/provinces: made decision for land use plan, water resources plan, water distribution down to the secondary canal level, environmental management.
- Private sector: was encouraged to participate to the water management and lowland management
- Farmers: local water management and maintenance

Delta planning in the Netherlands

Based on earlier presentations by
Marcel Marchand
Deltares

Workshop Delta Planning and Management
Yangon, 21 October 2013

Contents

- What is a Delta?
- Introduction to the Dutch Delta
- Challenges for the future
- The Delta Commission and Delta Programme
- Key elements in Delta Programme

What is a delta?

Short definition:

A delta is land enclosed by river branches near its mouth.

Geosciences uses a more precise definition:

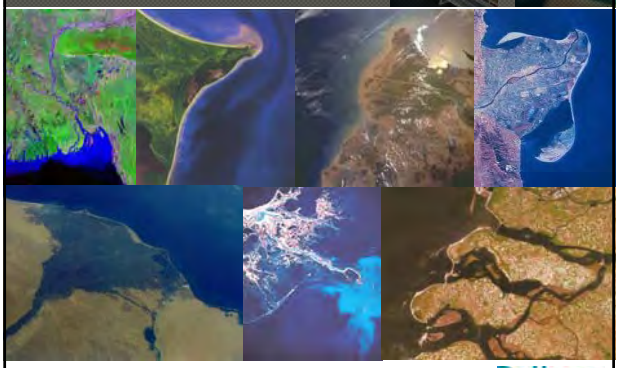
A delta is formed by coastal depositions originating from river sediments (pebbles, sand silt).

From a long geological time perspective (Pleistocene) almost the entire country of the Netherlands could be regarded as a delta of large rivers such as the Rhine, Meuse and Scheldt. Since the Southwest 'Delta' originated in the Holocene from mostly marine depositions, the delta does not conform to the strict geosciences definition (Hemminga, 2004).

Hemminga, M.A. (2004). Bodem en water van het Deltagebied.
Chapter 1 of 'Deltalandschap – Natuur en landschap van Zuidwest Nederland in historisch perspectief.
Edited by M.A. Hemminga, Stichting Het Zeeuwse Landschap, Heinkenszand.

Deltares

Examples of deltas in the world

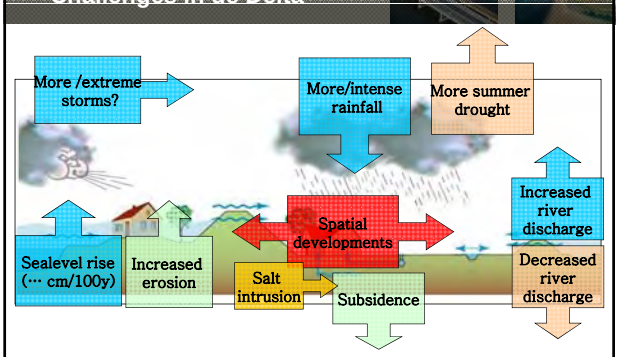


Deltares

Netherlands - delta of four rivers

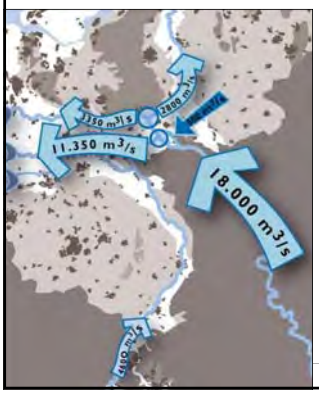
- 28% below sea level
- 60% vulnerable to flooding
- 9 million people
- 65% GDP earned

Challenges in de Delta



Deltares

Changes in river discharge

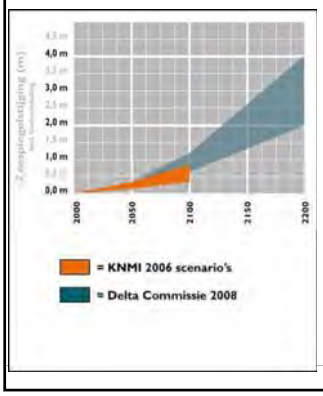


Summer:
1700 m^3/s → 700 m^3/s in 2100
→More droughts

Winter:
16.000 m^3/s → 18.000 m^3/s in 2100
→ Higher flood risk

Deltares

Accelerated sea level rise



Sea level rise:
2050: + 0.4 m
2100: + 0.65 up to + 1.30 m
2200: + 2 up to + 4 m

Deltares

Drivers of change

population growth

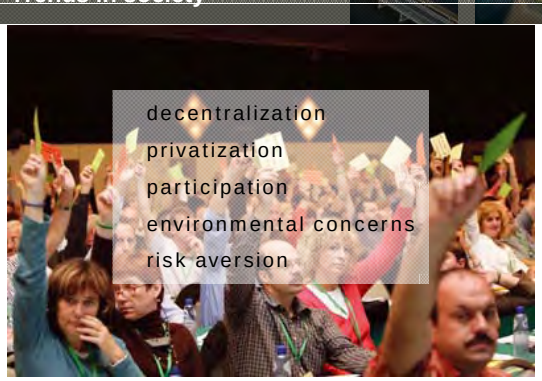
economic development

technological development

climate change

Deltares

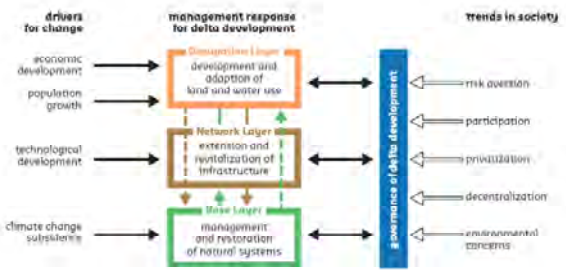
Trends in society



decentralization
privatization
participation
environmental concerns
risk aversion

Deltares

Framework for Assessment



Deltares

Deltacommission (2008)

Advice on protecting the coast and the entire low lying part of the Netherlands against the consequences of climate change on a time scale of 2100 –2200.

Five D's:

- Delta Programme
- Delta Decisions
- Delta Commissioner
- Delta Fund
- Delta Act

Deltares

Measures proposed by the Delta Commission

< 2050:
1,2 tot 1,6 billion euro /yr

2050 – 2100:
0,9 tot 1,5 billion euro /yr

Beach nourishment for coastal land reclamation: 0.1 – 0.3 billion euro/yr

(GNP = 550 billion euro/yr)

Deltares

Delta programme

3 National programs
- **flood protection**
- **fresh water supplies**
- **urban development**

6 Regional programs
- **Coast**
- **Wadden sea**
- **ZW Delta**
- **Rhine/Drecht cities**
- **Lake IJsselmeer**
- **River system**

Deltares

Delta Programme: the process

5 years: 2010-2015

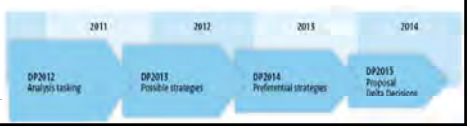
2011/12 Joint factfinding: what are the challenges?

2012/13 What are the strategic options?

2013/14 Societal Cost Benefit Analyses

2014 Preferred strategies + type of measures

2015 Strategic delta decissions



Building blocks for Delta Programme

1. Basic principles: sustainability, flexibility and solidarity
2. Anchoring in legislation and 'depolitization': Delta law and Delta Commissioner
3. Financial arrangements : Delta Fund, PPP constructions
4. Integrated approach
5. Long term approach with short term measures
6. Dealing with uncertainty: scenarios and adaptive delta management
7. Participation with stakeholders
8. Agreed models and tools for analysis: Deltamodel
9. Innovation
10. Clear decisions on major issues: Delta Decisions

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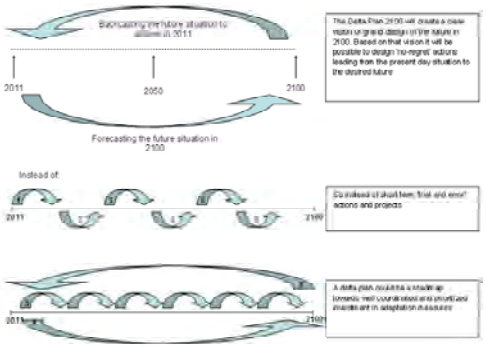
Integrated approach

In various domains
- Spatial: whole system
- Temporal: short-term as well as long term
- Themes: flood risk management, fresh water supply, water quality, agriculture, nature, housing, working, landscape quality
- Approach: content, organisation, financing, process, planning

Room for the River example:

Combine long term vision with short term measures



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