DELTAS IN TIMES OF CLIMATE CHANGE II
DD 11.3 Decision support and risk assessment in Asian deltas
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Integration of bio-physical and livelihood dynamics for analysis of poverty in coastal Bangladesh

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Presentation overview

- The ESPA Deltas project

- Integration (aim & concept)

- Example results

- Summary

The ESPA Deltas project (http://www.espadeltas.net/)
(2012-16)

Overarching aim:
to provide the Bangladeshi policy makers with knowledge and tools that enable them to evaluate the effects of Ecosystem Services and policy decisions on people's livelihoods
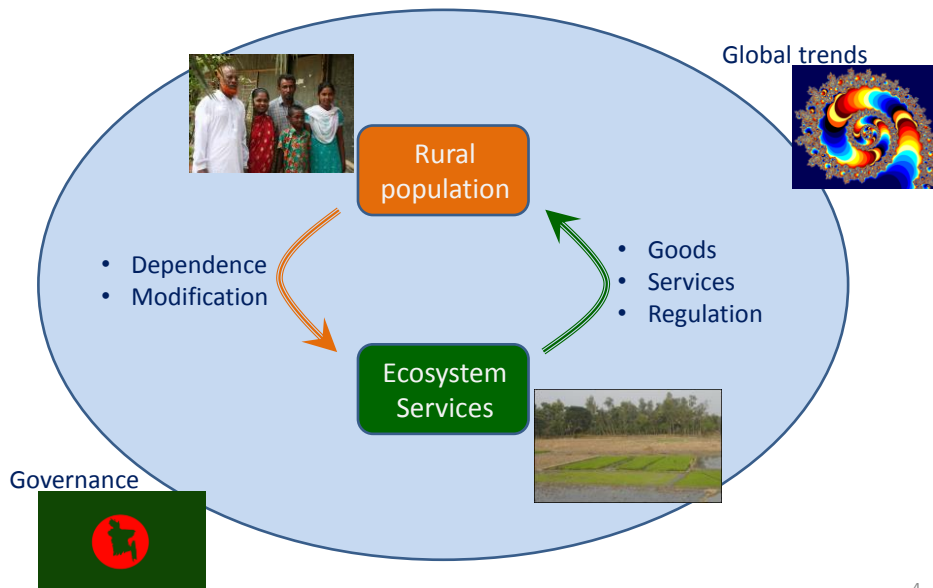
Consortium:
UK (7), Bangladesh (11), India (4)
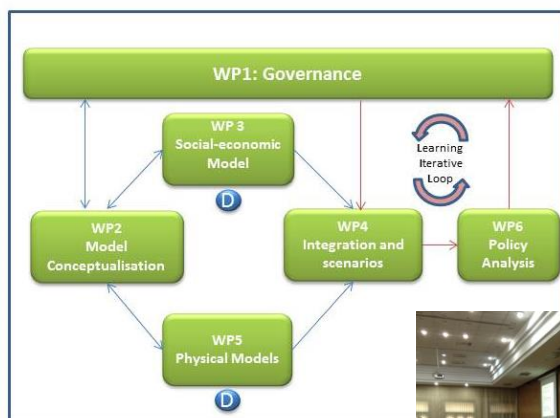Lead partner: University of Southampton

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The ESPA Deltas project (http://www.espadeltas.net/)
(2012-16)

Global trends

Rural population

- Dependence
- Modification

- Goods
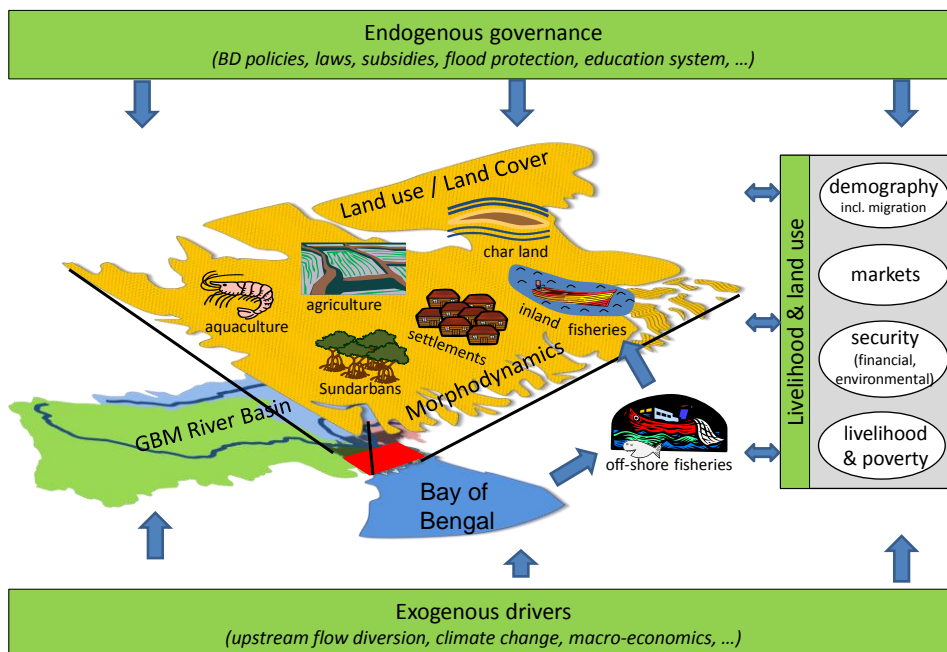- Services
- Regulation

Ecosystem Services

Governance

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Iterative learning with stakeholders

Feedback from stakeholders May 2014

Scales and project elements

Project elements

espa Deltas
ecosystem services for poverty alleviation

Climate
HadRM3/PRECIS

Supporting Services

Sea level, SLP, SST, winds

Temp, rainfall   PE, etc.

Bay Bengal:
GCOMS

Upstream Basin:
GWAVA / INCA
MODFLOW
HydroTrend

Surge level

Water, sediment, nutrients

Delta Plain
FVCOM,
Delft3D
MODFLOW

Agriculture
CROPWAT

Aquaculture

Mangrove

water, salinity, sediment

Regulating Services

**Morphology
Land Cover
Land Use**

Coastal Fisheries
Size- & Species-based models

Provisioning Services

Primary productivity, T,S,O$_2$, currents

Inland Fisheries

Knowledge integration
Scenario development & quantification

Laws, policies:
Gaps, Conflicts,
Implementation efficiencies

Stakeholder engagement:
Key issues, Scenarios

Governance research

Qualitative household survey (ES vs. livelihoods)

Cultural Services

Quantitative household survey (consumption, assets, employment, migration, health, poverty, …)

Statistical Associative model (land use, environment, socio-economy, census)

Population projections

Economic analysis & modelling

Quantitative Physical/Ecological Models

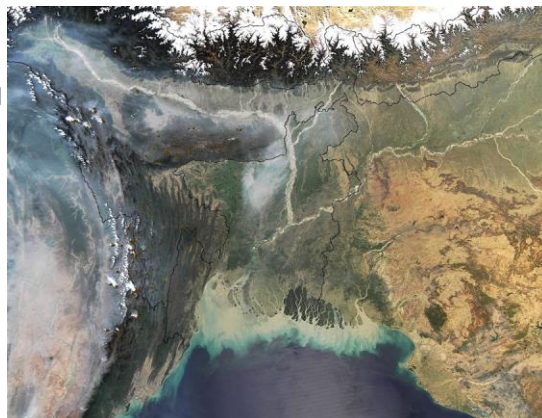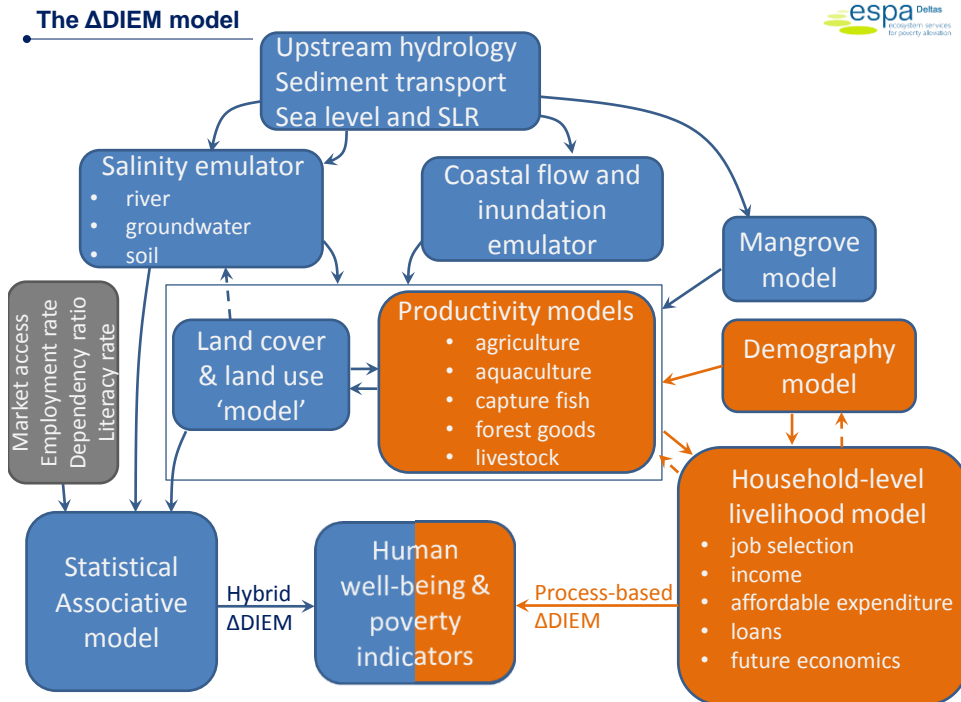**Demographics, economics & poverty**

The ΔDIEM model

espa Deltas

Delta Dynamic Integrated Emulator Model - ΔDIEM

➢ **a holistic tool** to capture the trends and emergent properties of a system:
  • bio-physical environment (upstream, coastal/marine and local environments),
  • social behaviour and livelihood
  • governance drivers

➢ **a metamodel** that enables the efficient, coupled running of diverse models in a harmonised and systematic way

➢ **model elements** operating at different spatial and temporal scales:
  • statistical relationships,
  • deterministic models,
  • probabilistic emulators,
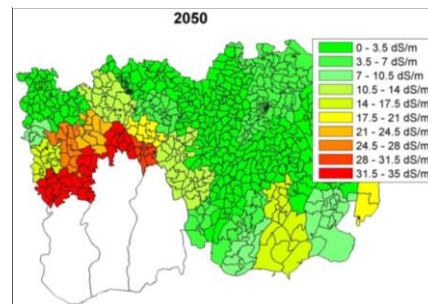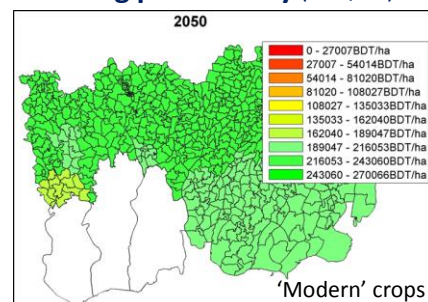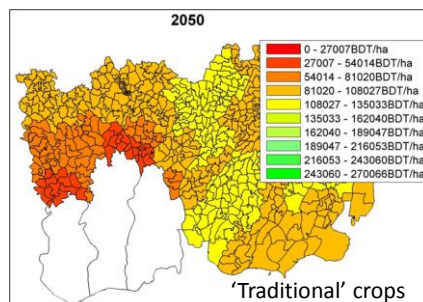 • agent-based type model

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The ΔDIEM model

A preliminary story of farming

➢ **Salinity** less important than **management**, but this can change (SLR & upstream flow reduction)

➢ **Crop productivity** slightly increases due to CO_2 increase

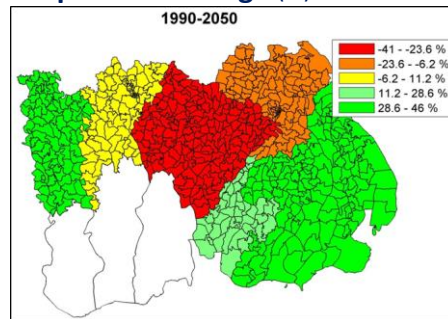➢ Vegetables are more **profitable** than traditional rice farming

Soil salinity (dS/m)
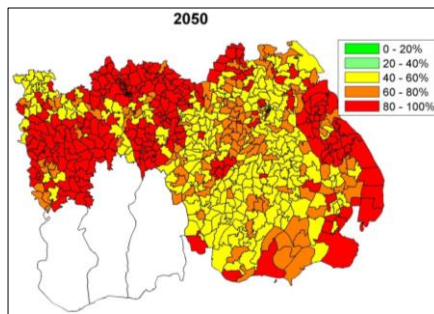

Farming profitability (BDT/ha)

A preliminary story of farming

➢ **Significant outmigration**

➢ A few bad years can be **detrimental** for small land owners and landless

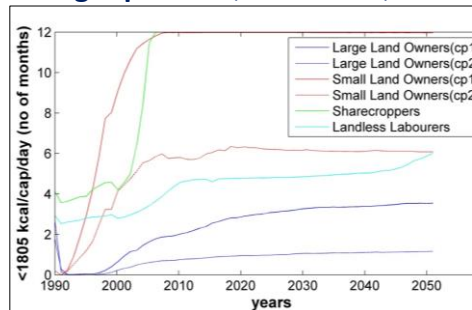➢ Even large land owners can experience **food insecurity**.

Population change (%)

1990-2050

Color	Range
Red	-41 - -23.6 %
Orange	-23.6 - -6.2 %
Yellow	-6.2 - 11.2 %
Light green	11.2 - 28.6 %
Green	28.6 - 46 %

$1.25 Headcount (consumption, PPP)

2050

Color	Range
Green	0 - 20%
Light green	20 - 40%
Yellow	40 - 60%
Orange	60 - 80%
Red	80 - 100%

Hunger periods (no of months)

Legend:
- Large Land Owners(cp1)
- Large Land Owners(cp2)
- Small Land Owners(cp1)
- Small Land Owners(cp2)
- Sharecroppers
- Landless Labourers

y-axis: <1805 kcal/cap/day (no of months)
x-axis: years

What can we capture? – a few examples

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NOT accurate 'weather' forecasts - rather exploration of trends, likelihoods, robustness

➢ What will be the **extent of inland flooding** following a hypothetical cyclone event?

➢ Where will **salinity limit crop production** (wheat, rice, etc.)?

➢ What will be the effect of changing climate, river regime and salinity on **agriculture, fisheries and aquaculture and thus poverty**?

➢ What happens if there is a **massive decline in GBM river flow** and sediment transport?

➢ Where will livelihoods decline below an acceptable level, potentially driving migration?

➢ To what extent would **subsidies or remittances** offset the poverty increases or losses of livelihood in rural areas?

➢ What would be the effect on farmers and ecosystem services of a rapidly increasing trend in **global commodity prices** (eg rice)?

Summary

➢ A generic, holistic approach

➢ To understand the importance of the environment on livelihood, poverty and health

➢ Key outputs:
   ➢ in-depth research reports/papers
   ➢ integrative tool & papers

➢ On-going research

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Thank you for your attention!

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