Catalyzing action towards sustainability of deltaic systems

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http://delta.umn.edu/
Deltas comprise intricate mazes of river channels, estuarine waterways, and vast, often flooded landscapes. Many important protected areas are located within deltas.

Deltas cover 1% of Earth, are home to over half a billion people, and contain biodiverse ecosystems supplying critical goods and services around the world.

Deltas are under threat from a range of natural and anthropogenic activities. Globally > 40% of river discharge and 26% of sediment are intercepted by large reservoirs.

There is an urgent need for a better understanding of the physical, ecological and socio-economic characteristics of deltas as vulnerable systems undergoing change.
The Belmont Forum funded DELTAS project includes specialists from 25 institutions around the world, and focuses on:

1) **Investigating cascades of stressors.** How do climate change, pressure on resources, and engineering/infrastructure development make people, biodiversity, and delta ecosystems vulnerable?

2) **Measuring the metrics of change.** How is delta vulnerability to be measured?

3) **Identifying and defining threshold behavior.** How do delta areas absorb extreme events? What are the hydrological and ecological thresholds underlying the integrity of a delta region?

4) **Analyzing from local to regional scales.** What are the relevant local and regional hydrological, biophysical and social stressors for a particular delta system, how do these interact, and how do they vary spatially and over time?

5) **Achieving actionable scenario building.** How can one reduce future risk to delta ecosystems while attaining sustainable development?
Research Framework and Objectives

Delta-SRES

Develop a theoretical framework for assessing delta vulnerability and the possibility for transitions to undesired biophysical or socio-economic states under various scenarios of change.

Delta-RADS

Develop an open-access, science-based, integrative modeling framework, the Delta Risk Assessment and Decision Support (RADS) Tool.

Delta-DAT

Consolidate data on biophysical, social, and economic parameters into an international repository of integrated data sets and make these readily available for use by the larger community.

Delta-ACT

Implement the products of Delta-SRES, Delta-RADS and Delta-DAT in three major Deltas.

Delta-GDVI

Develop Global Delta Vulnerability Indices, capturing current/projected physical-social-economic status of deltas globally.

Stakeholder participation & consultation

Iterative Learning

Governance
Economical
Social
Biophysical

Consolidation of data on biophysical, social, and economic parameters into an international repository of integrated data sets and make these readily available for use by the larger community.

Then extend to other deltas.
1) Delta network analysis and vulnerability to change
Developed a rigorous framework for analysis of delta network topology and
dynamics; and used this framework for building vulnerability maps.

2) Delta model development - from physics to decision support tools
- Controlled laboratory experiments
- Developing Online Resources - modeling examples focused on three DELTAS case-studies
- Spatial correlations between inundation and precipitation

St. Anthony Falls Laboratory University of Minnesota

http://csdms.colorado.edu/wiki/Labs_WMT_Ganges_Sediment_Supply
3) Historical trends in demographic and bio-physical parameters
   - Demographic census data
   - Shoreline Changes (Mekong)
   - Sundarban erosion (Ganges)
   - Land use and population expansion (Ganges and Amazon)

4) Descriptions of coupled human-landscape interactions in low-lying delta settings
4) Global indices
Anthropogenic Stress and Coastal hazard intensity indices

5) Stakeholder Involvement
- Local consultations in the three demonstration deltas at the sub-delta scale Mekong: 2-3 April 2014
- Ganges: 3-4 September 2014
- Amazon: early 2015
Stakeholder Involvement

Approach and progress

**Local consultations** in the three demonstration deltas at the sub-delta scale (Mekong: 2-3 April 2014, Ganges: 3-4 September 2014, Amazon: early 2015)

Identification of a **set of indicators as a joint outcome** of the desk-based studies and the 3 local consultations

Collection of **secondary and spatial data** -> assessment

**Feedback** to the delta model