Sedimentation in DELTAS:

The State of DELTAS in Times of Climate Change: Challenges and Opportunities in Data Collection and Delta Modeling

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Belmont Forum DELTAS Project

DELTAS initiative coordinates and enhances the development of a science-based framework for delta sustainability and risk assessment

Conceptual model allows tight integration of data, models and feedback loops
Data Challenges

Data is needed, but not collected, or cannot be collected.....

Data can be collected, but there is no baseline to look for change or trends............

Data is not quality controlled or documented....

Deltas are a complex system, we need data from a large variety of disciplines:
Bio-physical, ecological, socio-economical, policy data.......

Deltas are intimately connected to their river basins, need data far upstream........

Data may be politically sensitive between different countries with different needs for resources.......
GIS Modeling

- Searching for **associative relationships** amongst:
  - land use/land cover,
  - environmental quality and
  - Poverty (based on Census data)

- considers spatial dependence and spatial heterogeneity

- uses a variety of techniques:
  - Spatial autocorrelation techniques
  - Multivariate logistic regression models
  - Bayesian Geoadditive Semiparametric (BGS) logistic regression model

*From: Lazar et al, 2014, CSDMS meeting presentation*

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BF-DELTAS modeling infrastructure

The CSDMS Web Modeling Tool

- Model (Sedflux2D)

- Parameters (Sedflux2D)

- Sedflux2D v2.1 (10.1594.IEDA.160161)

  Basin-filling stratigraphic model.Sedflux2D simulates long-term marine sediment transport and accumulation into a 2D longitudinal basin over time scales of tens of thousands of years. It simulates the dynamics of strata formation of continental margins and includes turbidity currents and debris flows.

  [http://csdms.colorado.edu/wiki/Model_help:Sedflux](http://csdms.colorado.edu/wiki/Model_help:Sedflux)

  Model developer: Eric Hutton

Data sharing through Irods, combined with CSDMS Web-based Modeling Tool

This example shows a stand-alone model.
Data and Model Coupling

Integration between WMT and wiki

The CSDMS Web Modeling Tool

Model ("Plume")

Parameters (Plume)

Plume (10.1594/IEDA/100152)

Plume simulates the sediment transport and deposition of several grain size classes from a river mouth entering a marine basin by creating a turbulent jet. The model forms a hypsograph plume. The model allows for plume deflection due to systematic currents or Coriolis force.

http://csdms.colorado.edu/wiki/Model-Plume

Model developer: Eric Hutton
Example of Wave-dominated Delta Simulations

Simulation set 2 allows process-response relationships to be explored.
Learning Objective: Describe-Predict certain responses based on specific process parameters

Ashton et al., 2013, Computers & Geosciences 53: 21-29
**Data & Model Opportunities**

- Identify Data & Models that are critically needed to inform policy for a variety of users and disciplines
- Open-source: Data & Models need to be made available to researchers and public worldwide
- Metadata: Data & Models need to be documented labeled with strict standard names to ensure inter-operability
- Cyberinfrastructure: Data & Models need to be shared in a user-friendly, flexible modeling infrastructure

**Opportunities for Education**

- Model and data integration creates awareness of gaps in understanding
- Technological base for web-sharing and interaction is now much more accessible to all users

- [http://csdms.colorado.edu/wiki/Labs_WMT_River_Sediment_Supply](http://csdms.colorado.edu/wiki/Labs_WMT_River_Sediment_Supply)
- [http://csdms.colorado.edu/wiki/Labs_WMT_Ganges_Sediment_Supply](http://csdms.colorado.edu/wiki/Labs_WMT_Ganges_Sediment_Supply)