WG III Modeling and scenarios modeling

BASIC QUESTION: what can we do usefully with models?

- Do models need to be global scale?
- Or process-models at specific local, detailed scale?

Stepwise approach:

1) best attempt at global scale identification of delta vulnerability
2) some up/downscaling in between….
3) zoom-in to identify more detailed problems in specific delta problems. Proof-of – concept cases.

GIS Modeling

We need a 'tool' or decision-tree to identify vulnerability of deltas: which deltas are vulnerable? GIS approach seems suitable for this first step. In this step we would assign single values to an entire delta system (even if we are aware of lateral differences in the vulnerability of the delta system).

Missing pieces in the decision tree:

1) subsidence modeling or subsidence data
2) sediment storage in the delta is not monitored or easy to model.
3) engineering feedback to delta dynamics as a 'process' appears unknown. Is the first-order proxy or index: if there is infrastructure → high likelihood of bypass of sediment through the delta.
4) On the side of ecosystem health of there are probably good indicators: e.g. sea grass, coral reefs and fisheries.
5) Modeling of human interactions needs to be specified:

Do we want to do the classification qualitative? If not, how do we weigh the different factors in the decision tree? Multivariate regression of the different parameters? We may need to assess different vulnerabilities.

Vulnerability to decrease of land area, Vulnerability to extreme events, vulnerability of ecology, vulnerability to loss of dynamic equilibrium (i.e. do we exceed thresholds). Progradation rates for longer-term.

Look back in history, similar to the effort to old maps in Google Earth. This may get the idea across of the inherent dynamics in the delta and the long history of men affecting the systems.

GIS Scenario Modeling

We would want to look at the future scenarios for sea level and climate change, and human development scenarios. Both in average values as well as in extreme events. For example typhoons.

Another take to on the future scenarios could be: model adaptive scenarios of humans, What happens if humans take action? What if they decide to populate the worlds coastline with mangroves? Scenarios of increase of pollutant coming into the delta system, these would be filtered or stored and affects ecosystems as well as humans. Certain types of tide-dominated deltas are more vulnerable.

We envisioned **a dynamic GIS**? System, what if users could play with the changing the pieces in the decision. 'Policy makers tool': spreadsheet approach to mapping and decisions? Tim Nyerges, Geography department, Univ of Washington did this with stake-holders to assess ecosystem values. Bob Costanza takes a similar approach with STELLA. This is of special interest to the human dimensionalist too.
SIM city gaming for deltas. Could we engage them?

Challenging pieces in the modeling of specific delta systems

- do scenarios of 'human poking' with detailed hydrodynamic models. Levee, flood mitigations structures.
- hydrodynamic model upscaled to a entire delta system.
- modeling ecosystem shifting that would go with the changing sediment transport dynamics, the interaction between the sediment transport and vegetation is still not fully understood, it appears chaotic. Sedimentation rates are dependent on very specific/complex interactions between the different controls; as an example, mangroves behave differently whan attached by waves at high tide.
- 'stake-holder approach' or dynamic GIS need to be tested in the same specific cases.
- hindcasting to prove that the model work!!
-eco-tourism and recreational use effects need to be taken into account. Should we select systems that do incorporate this aspect when we are picking case-studies? Perhaps it is good to study a 'success-story'??