Deltas in Depth scientific sessions		
Deltas in Depth 4. Coastal Systems and Wetlands		
DD 4.1 Sustainable management of delta's – a tour around an changing world		
Chair	Dr. Hans Paerl, University of North Carolina at Chapel Hill, USA	
Presentations	•	Prof. John Day, Louisiana State University, Baton Rouge, Louisiana, USA
	•	PhD Paul Kemp, Louisiana State University, USA
	•	PhD Carol Wilson, Vanderbilt University, USA

John Day, the keynote speaker, started his presentation with the notion that sustainable management should be based on system functioning. We should work with delta dynamics as much as possible. On the temporal scale, pulsing events in deltaic systems are very important. A river switches every 1000 years, major river floods occur every 50 to 100 years, major storms happen every 5 to 20 year and a average river flood happens once a year. Professor Day explained that sediment deposition can be very different in different situations. For example, during a flood in the Mississippi delta in 1927, 30 cm of sediment was deposited in 3 months while only 55 cm was deposited over the timeframe 1927 to 2002. According to Professor Day only areas with riverine input will survive the protected sea level rise with a average surface elevation of 7.8 mm/yr. Marine influenced and impounded areas will only elevate on average 2.6 mm/yr and 1.2 mm/yr.

Delta management is energy intensive and very expensive. Professor Day believes that highly engineered, energy intensive approaches such as exist in the Netherlands and the Mississippi Delta will likely not be sustainable. Energy scarcity will limit options for the economy and environmental management. Eco-technology, and more specifically ecological engineering and self-design, are appropriate bases for sustainable management.

In the discussion in turns out that it will be a difficult process to go to former forms of the delta. For example: how would you deal with the huge population? And who is going to pay? Professor Day doesn't have all the answers, but we need to start thinking now. In his opinion sustainable management with ecological engineering will be the only possible long term solution. How do you involve adaptation in current planning? It will be difficult. For example, in New Orleans, 90% of the buildings have been rebuilt below sea level. You might think that after hurricane Katrina people would know better, but that is not the case.

Paul Kemp was the second speaker of this session and he discussed the impacts of changing climate projections on restoration of the Mississippi River Delta. If we know how a delta will respond hydraulically to sea level rise and changes in flow regime, then we can 'guide' it… That's 'adaptation' not control. Someone in the audience asked if the sediment input is affected by climate change. That is probably the case. Sand distribution stays more or less the same but the finer materials can fluctuate up till a third of the original amount present. The magnitude of the changes they propose makes that they will not get there by consensus. Proposed restoration projects will necessarily involve controversial trade-offs in the short-term, without which long-term sustainability is unachievable. Sound forecasts based on robust statistical methods can play an important role in ensuring that long-term consequences are adequately considered.

Carol Wilson demonstrated that there are many hazards associated with living in the Ganges-Brahmaputra River Delta such as earthquakes, storms, regular widespread flooding and elevation loss due to tectonic deformation. You can not say that 5 meter sea level rise will mean that the mean water level will be 5 meter higher. It is not that simple. It has to do with river dynamics and waves and tides. Human activities and responses also have a lot of influence on the situation. For example, in the recent decades in the Ganges-Brahmaputra River Delta, 15000 km2 of coastal islands have been embanked ('poldered') for flood protection and agricultural development, resulting in a sediment starvation and a loss of elevation (>1m) relative to natural tidal landscapes. Recent ongoing anthropogenic modifications of the land surface and their impact could be comparable to, if not larger then, increasing sea level rise. There is a water and sediment authority that look into sediment management approaches but it is difficult. Not all sediment is the same. Sometimes farmers welcome the extra sediment on their lands and sometimes they scrape it off because for example they need a really fine grained soil for their rice.