Impacts of Dam-orientated Water-Sediment Regulation Scheme on the Lower Reaches and Delta of the Yellow River, China: A review

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The Water-Sediment Regulation Scheme (WSRS), beginning in 2002, was an unprecedented engineering effort to manage the Yellow River with the aims to mitigate the siltation both in the lower river channel and within the Xiaolangdi Reservoir employing dam-regulated flood water. Ten years after its initial implementation, multi-disciplinary indicators allow us to offer a comprehensive review of this human intervention on a river-coastal system. The WSRS generally achieved its objective, including bed erosion in the lower reaches with increasing capacity for flood discharge and the mitigation of reservoir siltation. However, the WSRS presented unexpected disturbances on the delta and coastal system. Increasing grain size of suspended sediment and decreasing suspended sediment concentration at the river mouth resulted in a regime shift of sediment transport patterns that enhanced the disequilibrium of the delta. The WSRS induced an impulse delivery of nutrients and pollutants within a short period (~20 days), which together with the altered hydrological cycle, impacted the estuarine and coastal ecosystem. We expect that the sediment yield from the loess region will decrease due to soil-conservation practices, and the lower channel erosion will also decrease as the riverbed armors with coarser sediment. These, in combination with uncertain water discharge concomitant with climate change, increasing water demands and delta subsidence, will put the delta and coastal ocean at high environmental risks. In the context of global change, this work depicts a scenario of human impacts in the river basin that were transferred along the hydrological pathway to the coastal system and remotely transformed the different components of coastal environment. The synthesis review of the WSRS indicates that an integrated management of the river-coast continuum is crucially important for the sustainability of the whole river-delta system. The lessons learned from the WSRS in the Yellow River provide insights to the integrated management of large rivers worldwide.

Keywords: Water-sediment regulation, the Yellow River, Human activity, Delta morphology, Coastal ecosystem

Water: The Major Driver for Livelihood in Indian Sundarban Delta

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The estuarine islands within Indian Sundarban Delta are extremely vulnerable due to the changing climate, sudden shocks of cyclone & storm surge, prolonged erosion and regular inundation creates salinization and of course with increasing population. Around 4.6 million people living within the 19 blocks of Sundarban notified area are under constant threat of several events, affecting their traditional resource based economy and dependency on forest resources for their livelihood. Through time, this delta has been traditionally considered as a human centric terrestrial system in view of the developmental perspective. This diagnostic overview is instigating a paradigm shift towards considering this ecosystem as an aquatic system. Water within this delta, either excess or shortage, or, in terms of quality or quantity, is responsible to support or destroy the morphology, nature of water usage, and the profession of the people like agriculture, fishing etc. actually influence the livelihood of the people. Also, absence of implementable effective adaptation plan and disaster risk reduction mechanism is leading towards failed adaptation, loss in livelihood practices and tends to seasonal migration.

Keywords: Water, Livelihood, Indian Sundarban

Sediment facies and environment in distributary channels of the Mekong River delta, Vietnam

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The Mekong River delta is one of largest deltas in Asia, ranked world’ s third largest in delta plain area, and one of typical mixed wave- and tide-dominated deltas. River channels in the delta are strongly influenced by tides, up to Phnom Penh in Cambodia during the dry season. The coastal zone of the delta is strongly influenced by waves, resulting in the formation of beach ridges and alongshore sediment transport towards the Cape CaMau. Sediment sampling for sediment facies analysis and salinity survey were conducted in river channels in Vietnam from 2015 to 2016, and river morphology; channel depth, width, and sinuosity was analyzed.
The result shows clearly two main tracts in the river channels in Vietnam; an upstream, fluvial-dominated tract and a downstream, tide-dominated tract, and these tracts are divided into two subzones respectively. From upstream to downstream, the four subzones are identified: fluvial-dominated, tide-affected; fluvial-dominated, tide-influenced; tide-dominated, fluvial-influenced; and tide-dominated, fluvial-affected.
Tidally induced water-level changes affect the entire study area and extend into Cambodia. Salinity intrudes ~15 km upstream of the river mouth during the wet season, and ~50 km upstream during the dry season. Brackish water species of mangroves, mollusks, and diatoms, however, occur landward of these limits, suggesting that highly diluted brackish water may reach ~160 km upstream of the river mouth during the dry season. In the fluvial-dominated tract, channels are sinuous and show a seaward-deepening trend, whereas width is relatively constant. In the tide-dominated tract, channels are straight, and show seaward-widening and seaward-shallowing trends. Natural levees are present in the fluvial-dominated, tide-affected subzone, but are replaced by mangroves. In the fluvial-dominated tract, mud content is low, sand grain size fines seaward, and gravelly sand and sand are dominant facies. In the tide-dominated tract, mud content is high, sand grain size is constant, recycled sand is common, and tidal rhythmites are the dominant facies. Mud pebbles are common in sediments of a large part of the study area.

Keywords: distributary channel, tide-dominated delta, sediment facies, tidal river, backwater, tidal rhythmite

Southwest Mekong delta: the last piece of the delta evolution pazzle and its implications to recent shoreline erosion

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The Mekong delta, one of the largest deltas in the world, attracts increasing concerns about the coastal stability affected by the human-induced decrease in sediment supply. Serious erosion has been reported in the coast outlining the southwestern part of the delta, from the mouth of the Bassac River, through Bac Lieu and Camau Point, to Gulf of Thailand, where only muddy sediments are supplied by the southwestward longshore drift from the distributaries in the northeastern part. Little is known about the long-term coastal evolution of the southwest Mekong delta disproportionately to its large area (up to 40 % of the lower delta plain) as the effort has been focused on the distributary region. Here we report seven radiocarbon dated sediment cores and twenty optically-luminescence stimulated dates of beach ridges and intertidal mud flat deposits to constrain the position of shorelines at 2.4 ka, 1.4 ka, and 0.6 ka in the southwest Mekong delta. These shorelines have a similar shape with the modern shoreline and show the delta growth toward the SSW. The rate of the delta plain increment is estimated as 2 km^2/y from 2.4 to 1.4 ka, 6 km^2/y from 1.4 to 0.6 ka, and 8 km^2/y from 0.6 ka to the present, respectively, which is much more significant than that in the distributary area, 0.5–2 km^2/y. The increase in the rate after 1.4 ka may be related to the increased precipitation in the catchment as the palaeoenvironment reconstruction in Tibetan suggests a drier period of the weakened Indian summer monsoon during 2.4–1.4 ka. After 0.6 ka, the updrift part of the coast, from the Bassac River to Bac Lieu, has not prograded much, and the sediment accumulation has been concentrated around the Ca Mau Point, suggesting the increased exposure to the longshore drift in relation to the overall delta progradation. The accumulation trend after 0.6 ka also highlights the uniqueness of the modern shoreline that has been retreated almost entirely.

Keywords: coast, delta, monsoon

Relationship between sea-level change and incised-valley fill deposits at the Zengwen River, western Taiwan

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Eustatic sea-level change since around the Last Glacial Maximum (LGM) has been studied based on dated, shallow marine clastic sediment and corals. However, the sea-level change especially before 14 ka is still unclear due to the lack of data. This study focuses on incised-valley fill deposits at the Zengwen River, western Taiwan where tectonic subsidence has been dominant and huge fluvial sediment supply has occurred to clarify the sea-level change especially between the LGM and 14 ka. We obtained a new borehole core (NU-TN-1), 300 m long, near the river mouth in 2015. We performed sediment facies analysis, radiocarbon dating, measurement of grain size and electric conductivity (EC), and small macro- and microfossil analyses (mollusc shell, foraminifera, and ostracoda). Incised-valley fill deposits of the NU-TN-1 since the LGM are very thick, reaching 180 m, which is much larger than the amplitude of sea-level change, ~130 m. The core sediments can be divided into nine facies (A to I) in ascending order, and six of them (D to I) formed since around the LGM. Age–elevation plots of faces D to I were located below the estimated relative sea-level curve. Relatively slow accumulation rates of facies E between 17.5 and 15 ka may respond to slow sea-level rise. Facies F probably formed close to sea level contributes to reconstruct sea-level change between 14 and 12 ka. Retreat of the river mouth since the LGM might be very limited due to huge sediment supply.

Keywords: sea-level change, sediment supply, Last Glacial Maximum

