

East Kalimantan Program

Extracted from <http://www.eastkalimantan.org/> by Herman Darman

The East Kalimantan Programme (EKP) aims to enhance and support long-term scientific cooperation in coastal zone research between research groups from Indonesia and the Netherlands.

The Research Cluster: "*Upsetting the balance in the Mahakam Delta: past, present and future impacts of sea-level rise, climate change, upstream controls and human intervention on sediment and mangrove dynamics*" is one of the clusters that is funded within the EKP programme.



Figure 1. Sampling activities in Mahakam Delta: shallow coring (left), and sediment sampling (right)

Objective

The objective of the cluster is to study the impact of external forcing factors such as sea-level rise, climate change, upstream sediment, as well as human interference on past, present and future development of the Mahakam delta at different time scales. We will pay special attention to determining the resilience and restoration potentials of mangrove ecosystems and develop models forecasting catastrophic changes in coastal ecosystems. We will aim to understand issues of governance across scales, and how ecosystem appreciation and governance can be linked. The cluster will use the Delft3D model (Delft Hydraulics) as a tool to integrate data into scenarios and will extend it from its present limited decadal time scale to millennial time scales, enabling better prediction of future changes in the Mahakam delta.

Scientific relevance

We expect that this integrated multidisciplinary research effort will lead to a deeper understanding of the delicate abiotic and biotic checks and balances in delta systems in general. To our knowledge the Mahakam delta will be the first tropical delta for which short-term morpho-dynamic models and long-term sedimentary-stratigraphic models will be integrated into a single

comprehensive model. This will enable study of the impact of long-term processes such as sea-level rise as well as short term sudden anthropogenic ecological disturbances simultaneously. This model can play an important role in coastal management. Governance systems, from national government to local land and marine tenure systems, focusing on sustaining and enhancing sources of resilience in societies and life-supporting ecosystems, will reap the benefits from a versatile delta model that is able to produce scenarios at different spatial and time scales. Our research will thus lead to socially robust knowledge with recommendations for improved management of land and water, following the Ecosystem Approach of the CBD, the development of tools for matching ecosystem processes to societal levels of organization, and, through our cooperation with the Queensland study, we will provide a test of the costs and benefits of (good) governance.

Projects

The cluster research programme is subdivided into 8 work packages (WP) also named *projects*, of which WP1, WP2 and WP3 focus on sediment dynamics in different time scales (5000, 200 and 50 years), WP4, WP5 and WP7 on hydrological aspects, WP6 on

mangrove ecosystems and WP8 on stakeholder issues. Details on approaches and methods are given in each of the project pages that can be reached through the links below.

WP1: Simulating the Holocene development of the mixed tidal-fluvial Mahakam delta (Salomon Kroonenberg, Jajang Sukarna)

WP2: Quantifying sediment fluxes in the Mahakam Delta using remote sensing (Zoltan Vekerdy, Orbita Roswintarti)

WP3: Impact of decadal climatic cycles on sedimentation in the modern Mahakam Delta, Indonesia (Salomon Kroonenberg, Jajang Sukarna)

WP4: Water and sediment distribution at lowland river junctions: the Mahakam Lakes region (Ton J.F. Hoitink, Safwan Hadi)

WP5: Discharge regimes, morphometry and tides in the Mahakam delta channel network (Ton J.F. Hoitink, Gadis Sri Haryani)

WP6: Searching the brink: assessing indicators for system change through hyper-spectral analyses of mangrove systems (A. Skidmore, Wawan Kustiawan)

WP7: Hydraulic interaction between channels, lakes and aquifers in the middle Mahakam region (Ton J.F. Hoitink)

WP8: Stakeholder interests and potential for sustainable coastal management through rights regulation practices in the context of decentralisation in the Mahakam Delta, East Kalimantan (G.A. Persoon, J.M. Otto)

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EXAMPLE OF REMOTE SENSING ANALYSIS ON MAHAKAM DELTA BY BUDHIMAN (2004)

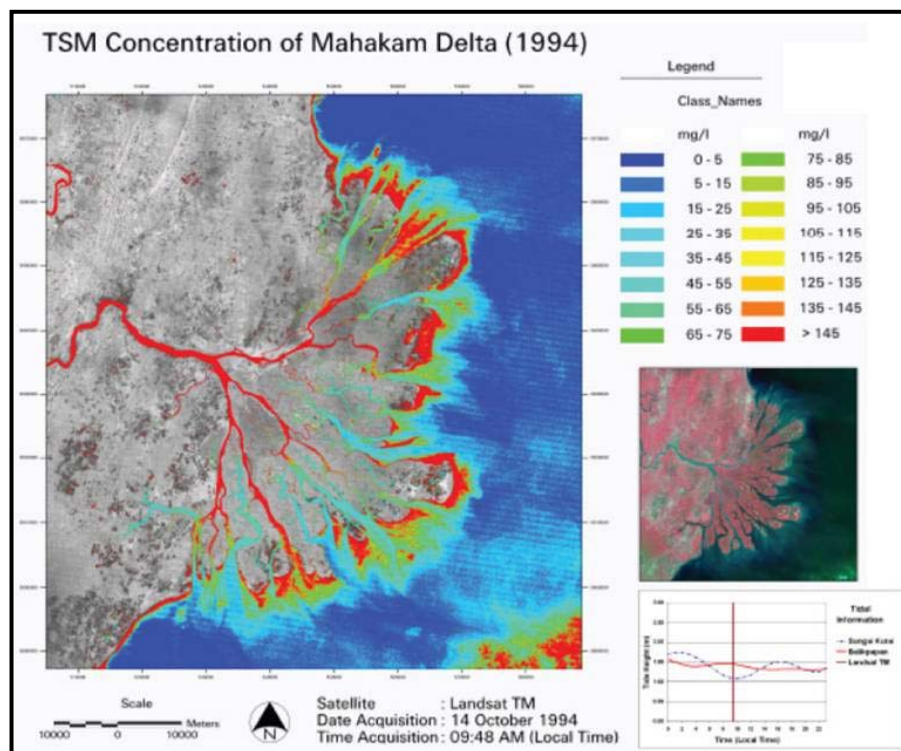


Figure 2.a. Modeled Total Suspended Matter concentration at high river discharge and low tidal amplitude: mainly fluvial distributaries are active (Landsat TM), Budhiman, 2004

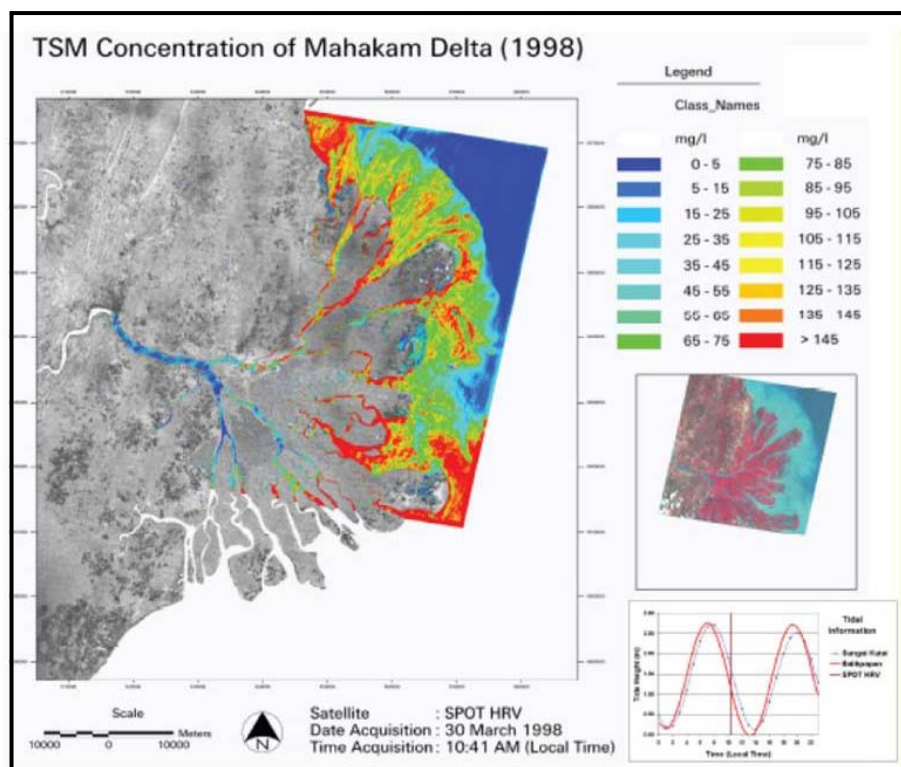


Figure 2.b. Modeled Total Suspended matter concentration at low river discharge and high tidal amplitude: mainly tidal channels are active (SPOT HRV), Budhiman, 2004

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Results

Results for the Mahakam Cluster research will be posted as the project progresses. Some early results and data gathered from the completed field seasons are available below.

- Simulating the Holocene development of the mixed tidal-fluvial

Mahakam delta (Data Report WP1). All data gathering for this project has ceased and there are no further plans for extra data gathering in the near future. The first phase of the fieldwork consisted of a combined subsurface echosounder survey and a coring campaign. The ten mechanical corings (up to 25.5 m deep) were carried out in combination with WP 3. A second field campaign in the Mahakam delta was performed using a higher resolution echosounder; the detailed very high-resolution seismic/bathymetric survey resulted in a survey of unprecedented detail in the subsurface characterization of the Holocene Mahakam deposits.

- Rainfall-runoff modelling in large tropical poorly gauged basin - The Mahakam River, Kalimantan (Data Report WP4). Surface water level, groundwater level and rainfall were measured along the Mahakam River. The data has been collected over an interval of more than one year.
- Discharge regimes, morphometry and tides in the Mahakam delta channel network (Data Report WP5). Data analysis has been focused on water level variation along the river from the outer delta up to the lakes area. Water level sensors were located at selected locations along the river and in the delta, salinity sensors in

Example of high-resolution seismic/bathymetric survey of the delta platform in the tidal zone up into the fluvial and tidal channels using the Innomar Parametric Echosounder (www.innomar.com) in Dalman et al., 2009

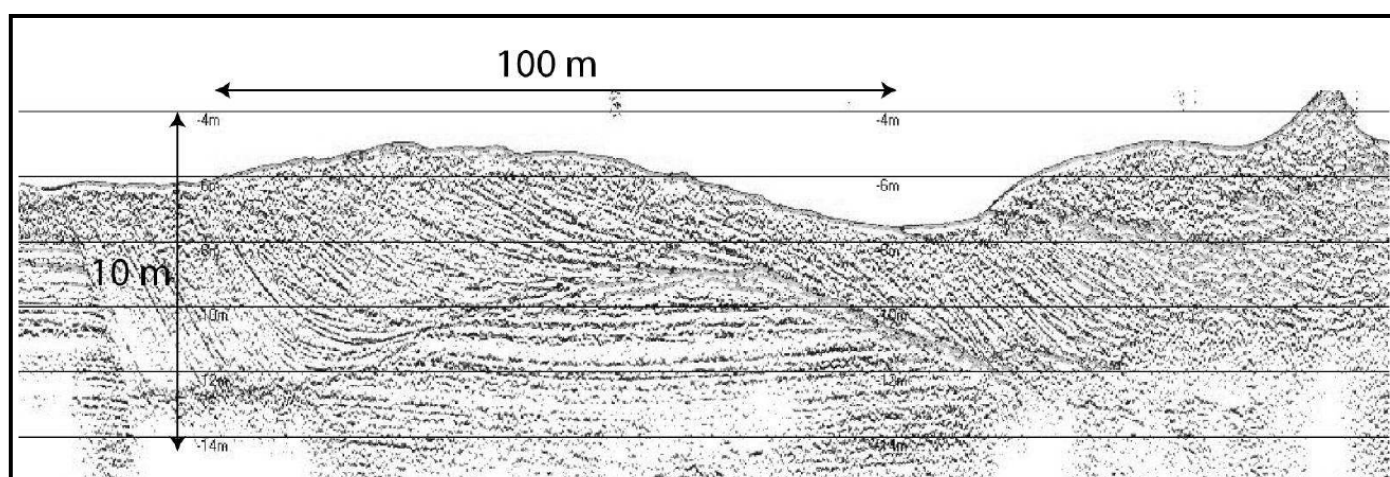


Figure 3.a. Cross-section profile of a channel fill in a meander bend of a tidal channel. Note the change in elevation of the paleo-channel floor. The channel is filled by lateral accretion; changes in angle are most likely caused by change in direction of accretion.

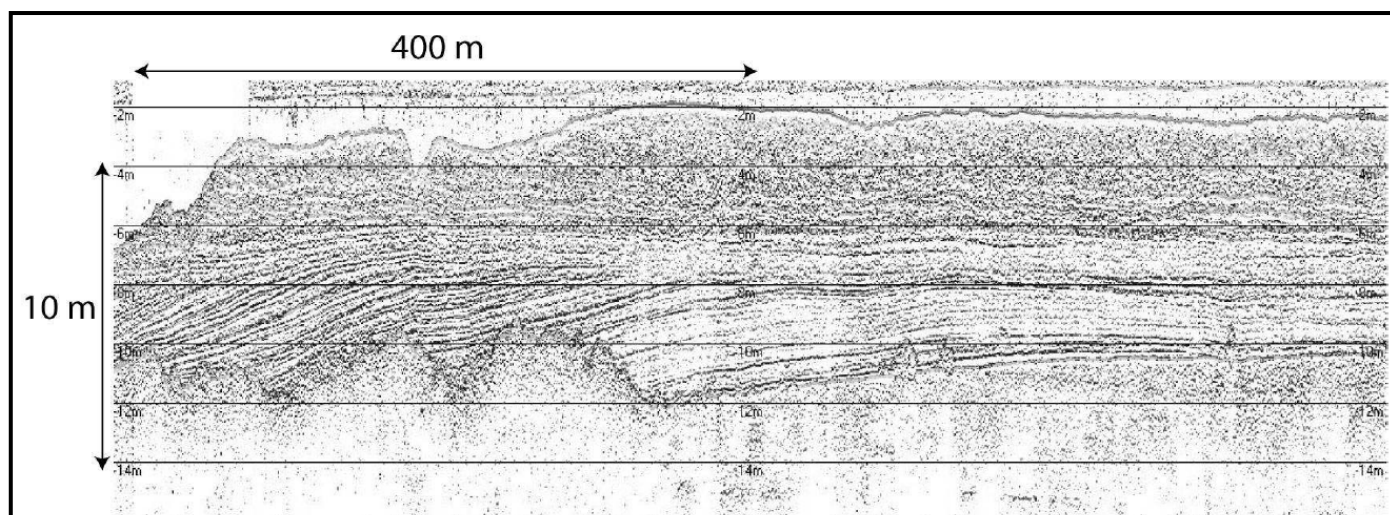


Figure 3.b. Prograding clinoforms overlain by aggrading parallel beds in a tidal channel. Note the irregular surface at 10-12 m bsf, most likely caused by the upward migration of shallow gas.

the delta, a horizontal ADCP discharge station and a turbidity sensor near Samarinda city. After installing the permanent stations for long-term measurements, several surveys were conducted to collect bed samples, bathymetry and hydrography along the study area (from Samarinda until the delta apex). In total, eight hydrographic surveys were completed during spring and neap tides.

- Stakeholder interests and the potential for sustainable coastal management through regulation practices in the context of decentralization in the Mahakam Delta (Data Report WP8). This research aims to examine and detail the evolvement of formal and informal arrangements for the use of natural resources in the Mahakam Delta. On the basis of socio-legal research at the level of the state and the people, the researchers will propose improvements of the laws and regulations of the use rights, in particular with respect to shrimp aquaculture and fishery. Literature

research and fieldwork has been done.

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References

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PT. GEOSERVICES

GEOLOGICAL & LABORATORY SERVICES DIVISION

- CORE ANALYSIS
- ROCK DESCRIPTION
- STRATIGRAPHY
- PETROLEUM GEOCHEMISTRY

Core Analysis

Core handling, preservation, gamma logging, CT scanning and digital photography. Routine and special rock properties analysis of plugs and whole core. Rock mechanics and formation damage studies. Reservoir unitization and graphical correlation with geological data.

Rock Description

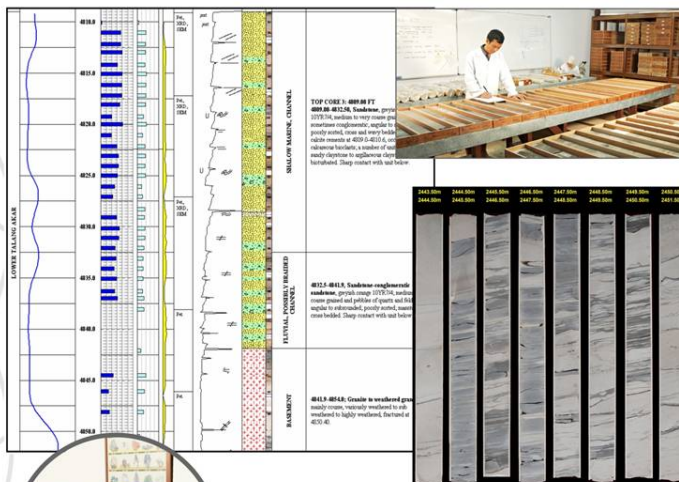
Petrography, mineralogy, diagenesis, XRD, SEM, lithological description of cores and cuttings. Sedimentology, facies analysis, micro to macro scale reservoir studies.

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