Coastal Erosion and Sea Level Rise at the Global Scale: an Assessment of Impacts and Adaptation

LOICZ Inaugural Open Science Meeting
27th June 2005 (Day 1, Session 1, 11.30 – 11.45)
Session: "Climate Change and the Coastal Zone"

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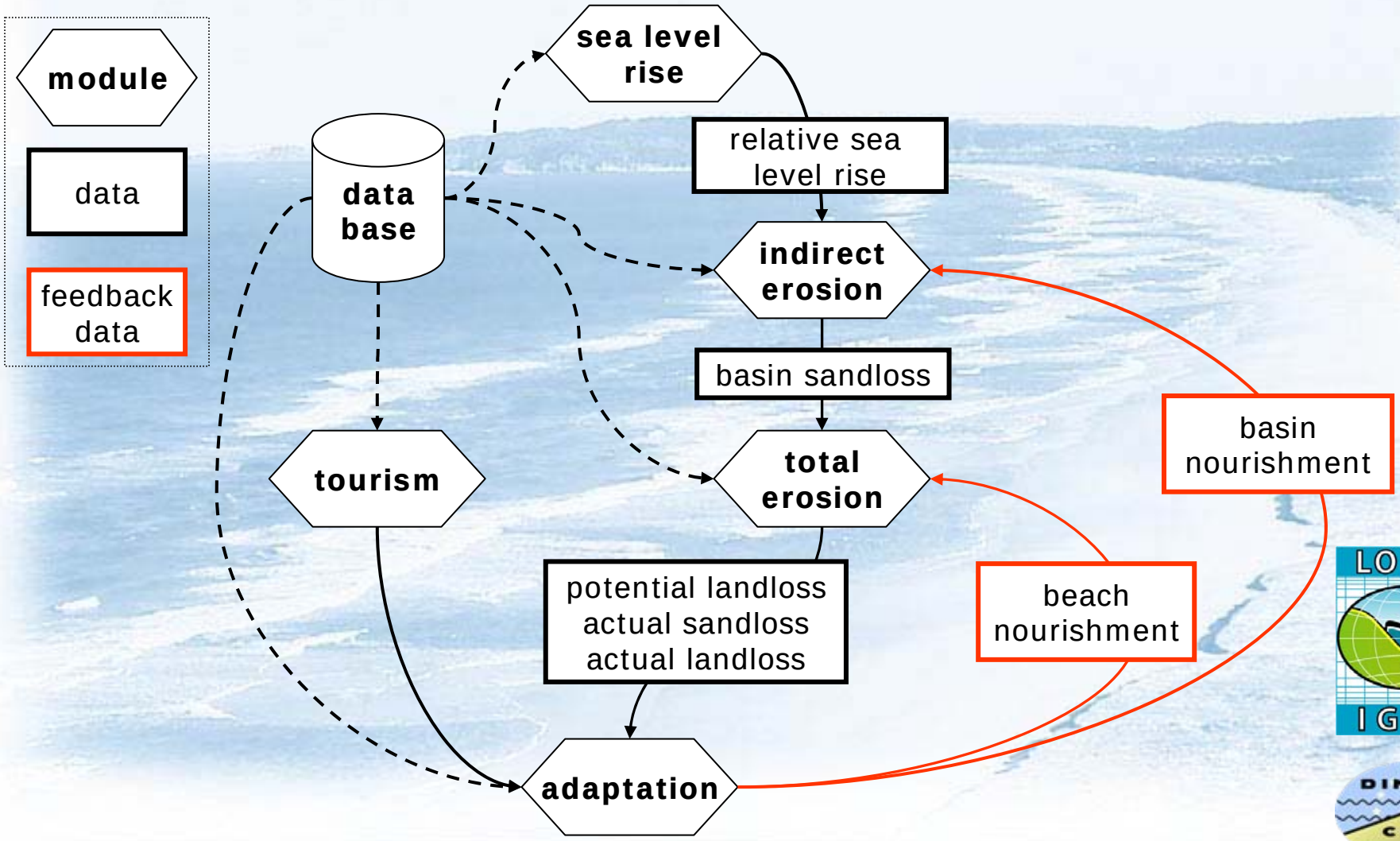
Outline

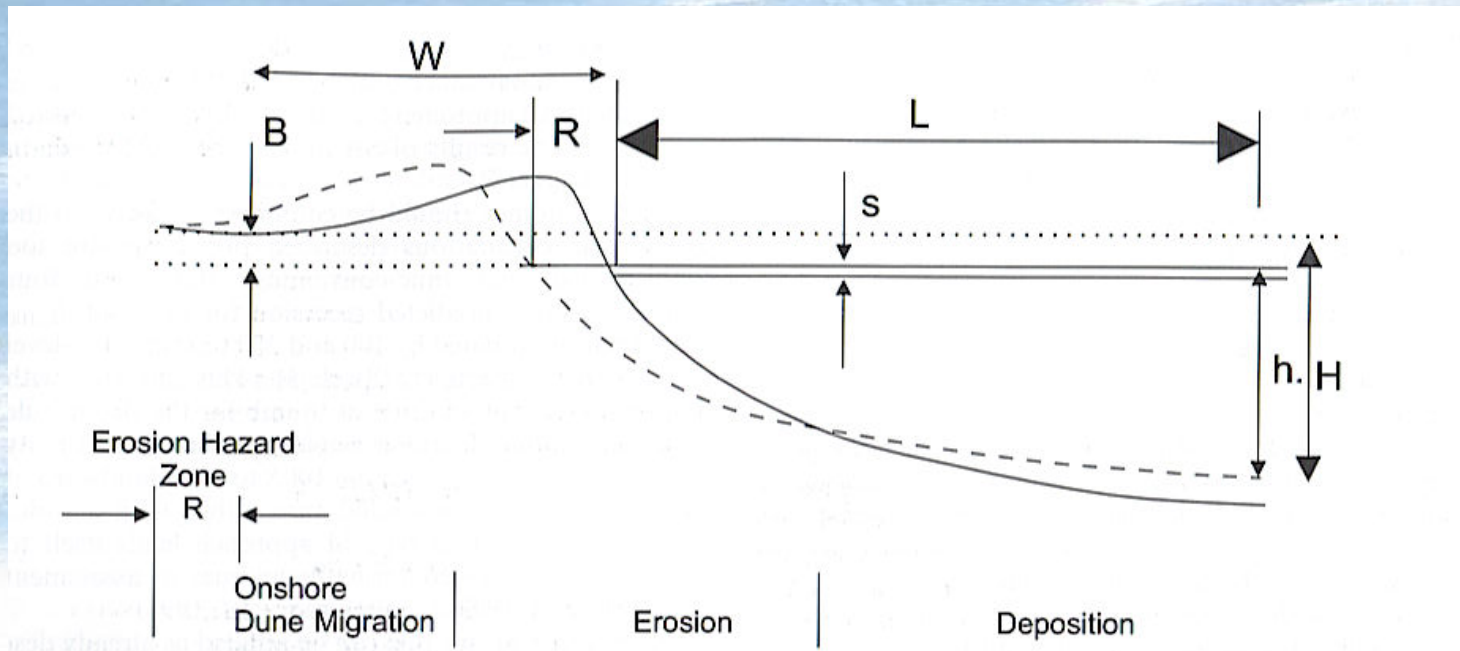
- Background DINAS-COAST: Erosion (related) modules in DIVA;
- Direct Erosion (open coasts)
- Indirect Erosion (tidal basins)
- Results
- Conclusions
- Limitations and further developments

Erosion (related) modules in DIVA



Direct Erosion

- Bruun rule:
  - R = G(L/H)S
  - H = B + h*
  - R translated to sandloss/landloss
- > 12,000 coastline segments



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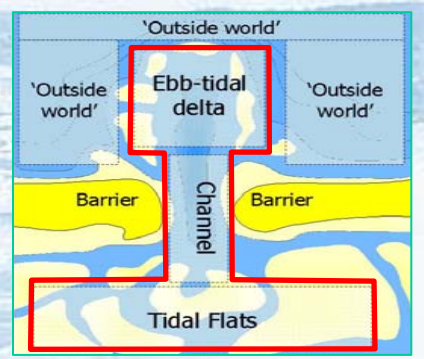
Indirect Erosion

- Erosion caused by presence of tidal basins adjusting to sea level rise
- Sand supply:
  - adjacent open coast(s)
  - tidal basin nourishment
- Model algorithms: ASMITA (Delft Hydraulics)
- Model calculates:
  - loss of flats in a tidal basin (m^2);
  - sand loss of the adjacent coast (m^3);
  - (additional) nourishment to maintain tidal basin (m^3);



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ASMITA: Basics

- Aggregated Scale Morphological Interaction between a Tidal inlet system and Adjacent coast;

- Empirical knowledge of equilibrium situation tidal basin elements;
- Equilibrium relation sediment concentration and volume of the element;
- Concentration "Outside world' = constant;
- Sediment transport between elements: driven by concentration. differences;

- Enforced change: e.g. sea level rise → Morphological volume change;
- Adjustment by the system: sediment demand → new equilibrium;
- Maximum rate of change: Critical sea level rise (dCrit, mm/y).

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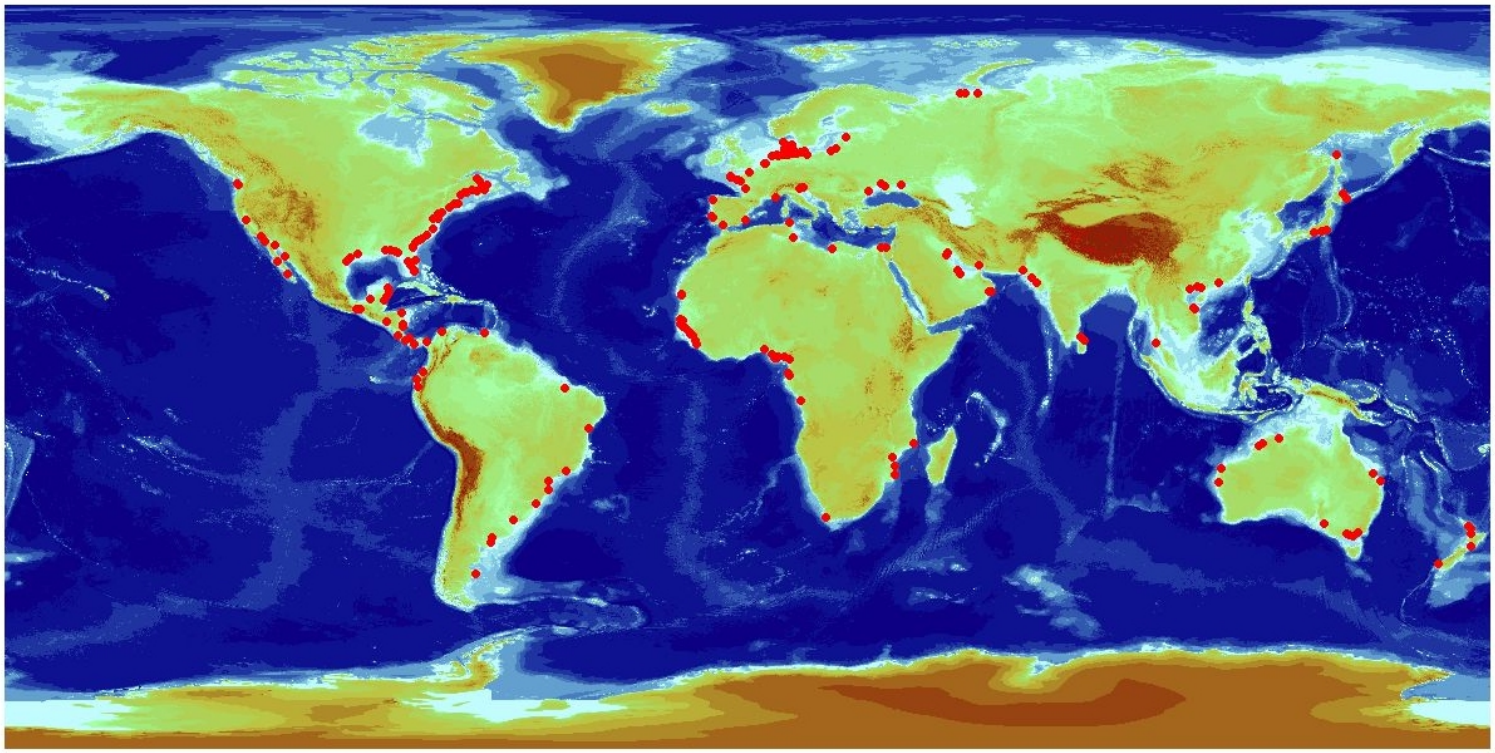
Tidal Basin locations in DIVA

Tidal Basins

- 200 tidal basins around the world
- Coupled to 1 coastline segment

ASMITA Coefficients

- Default (Dutch) Waddensea values
- Editable for (experienced) users



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Preliminary conclusions/remarks

- Assessment in DIVA is a worldwide exercise which has not been carried out before (although it is crude)
- Indirect erosion is relatively important although the figures for total sandloss are dominated by direct erosion (12,000 segments vs. 200 tidal basins)
- CBA: Tourism drives *value* for beaches. Higher values mean more nourishment for (high valued) beaches
- Substantial improvements in case of better data

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Limitations and further developments

- Limitations:
  - Poor state of world's beach data (bruun rule factor) – role LOICZ (?)
  - Lack of tidal basin data: sediment exchange parameters (Wadden Sea case study)
  - ASMITA is a coarse-scale approach, but fine-scale for DIVA.
  - Method for including sand availability for nourishment could be improved.

- Further developments:
  - DINAS COAST / DIVA on regional scale

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