A NEW ASSESSMENT OF
COASTAL VULNERABILITY TO CLIMATE CHANGE:

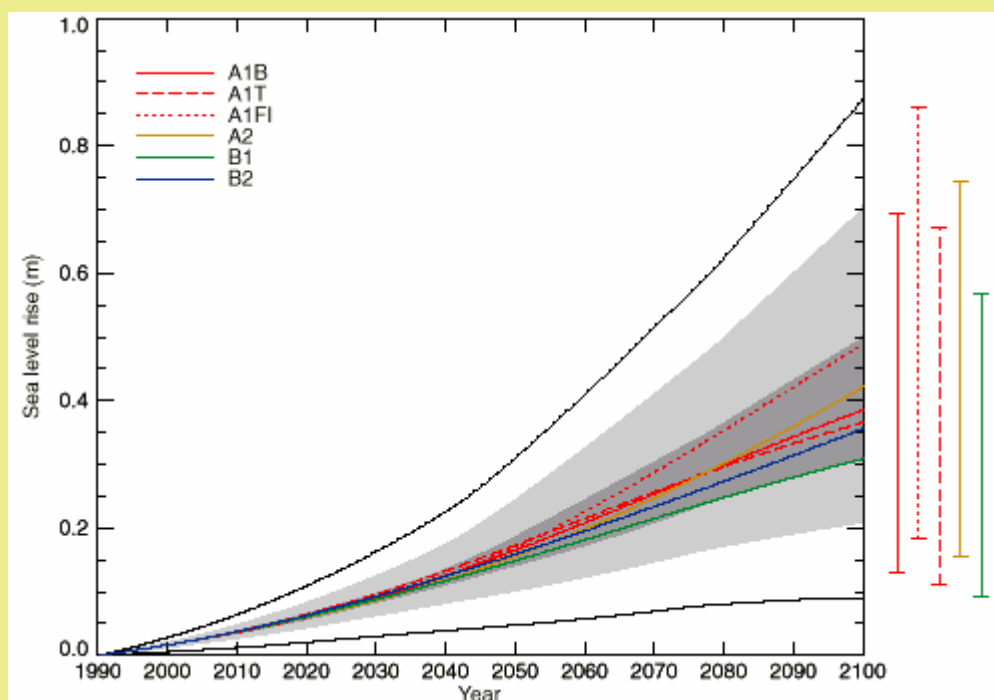# DINAS-COAST and the model DIVA

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- Rationale and objectives of DINAS-COAST
- Components of DIVA
- Preliminary results
- Conclusions and future work

Scenarios of Sea-Level Rise

IPCC Third Assessment Report (2001)

LOICZ Expectations

DINAS-COAST addresses two of the seven GAIM questions that are
relevant to LOICZ:

- Question 7: Which are the most vulnerable coastal regions under global change?
  (LOICZ expectation: a typology of coastal vulnerability to global change on various spatial and temporal scales)

- Question 14: What are the most appropriate methods for integrating natural and social scientific knowledge?
  (LOICZ expectation: successful integration of natural and social sciences to overcome the traditional disciplinary divide)

LOICZ II Science Plan and Implementation Strategy (2005)

The Rationale for DINAS-COAST

One of the most widely cited reports on coastal vulnerability to climate change is the Global Vulnerability Assessment from 1993.

However, its limitations have become increasingly apparent:

- The obsolescence and low spatial resolution of underlying data sources
- The reliance on global mean sea-level rise as the only driver of coastal vulnerability
- The non-consideration of biogeophysical and socio-economic dynamics and feedback
- Arbitrary and rather simplistic assumptions regarding adaptation.

DINAS-COAST Objective

Building on methods and expertise developed in a range of disciplines, the objective of DINAS-COAST has been to develop a dynamic, interactive and flexible CD-ROM-based tool that enables its users to produce quantitative information:

- On a range of coastal vulnerability indicators
- For user-selected climatic and socio-economic scenarios and adaptation policies
- On national, regional and global scales, covering all coastal nations

This tool is called DIVA:
Dynamic and Interactive Vulnerability Assessment

Components of DIVA

DIVA comprises four main components:

- A detailed global database with biophysical and socio-economic coastal data
- Global and regionalised sea-level and socio-economic scenarios until the year 2500
- An integrated model, consisting of interacting modules that assess biophysical and socio-economic impacts and the potential effects and costs of adaptation
- A graphical user interface for selecting data and scenarios, running model simulations and analysing the results.
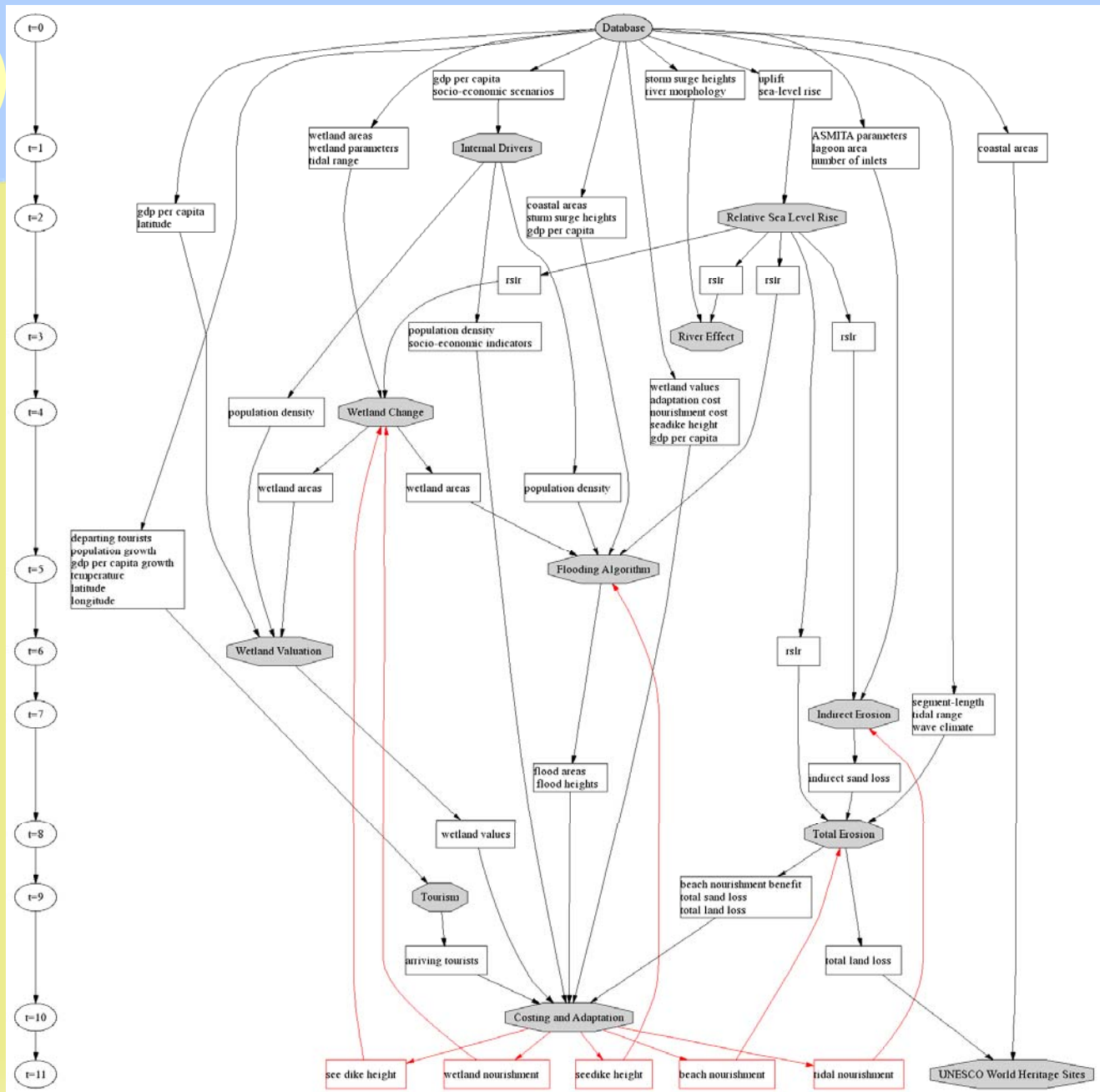
Modules in DIVA

The following modules have been developed:

- Relative sea-level rise
- River effect
- Indirect erosion
- Total erosion
- Wetland change
- Flooding
- Wetland valuation
- Tourism
- World heritage sites
- Costing and adaptation

Adaptation in DIVA

For each time step the model selects an adaptation option according to the following adaptation strategies:

- No adaptation: the model only computes potential impacts
- Full protection: raise dikes or nourish beaches as much as is necessary to preserve the status quo
- Optimal protection: optimisation based on the comparison of monetary costs and benefits of adaptation options and potential impacts
- User-defined protection: the user sets a protection standard by defining a return period against which to protect

DIVA Flooding
1-m rise by 2100 and A1 world

[Results cannot be shown until published]

DIVA Flooding
1-m rise by 2100 and A1 world

[Results cannot be shown until published]

People Actually Flooded
by GVA Region in 2000

[Results cannot be shown until published]

People Actually Flooded
by SRES Region in 2000

[Results cannot be shown until published]

People Actually Flooded
by Country in 2000

[Results cannot be shown until published]

People Actually Flooded
by Administrative Unit in 2000

[Results cannot be shown until published]

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Preliminary Findings

- A multitude of different analyses are possible
- Present exposure to coastal flooding by surges is higher than earlier estimates
- Flood impacts under cost-benefit selection of adaptation are predicted to be much lower
- Wetland losses appear comparable to earlier estimates
- Analysis of results will continue by the DINAS-COAST consortium and others

Potential Users of DIVA

Two types of users are envisaged:

- Academic users: IPCC, IGBP/IHDP LOICZ, integrated assessment, the broader academic community
- Policy-related users: Parties and observers to the UNFCCC, international organisations

Potential Users of DIVA

What about coastal planners and managers?

- The scale and resolution required for coastal decision-making are not offered by DIVA
- DIVA can at most be informative to local planning and management; it cannot evaluate strategies on the local scale
- DIVA can be used as an educational tool to create awareness of the relevance of climate change to coastal management:
  a discussion-support tool

Conclusions

DINAS-COAST has been innovative both in terms of its methodology and its deliverables:

- A reiterative, distributed, internet-supported model development process
- A unique coastline segmentation approach to define the basic unit of analysis
- Explicit consideration of adaptation, which influences impacts in the next time step
- Integration of modules representing natural and socio-economic knowledge relevant to coastal vulnerability
- The final product is the published model, not only the results

Future Work

Having (almost) completed DIVA 1.0, a range of opportunities have been identified for future work:

- Application of DIVA 1.0
- Development of training package
- Enhance DINAS-COAST website functionality
- Contribute to integrated assessment model
- DIVA Europe, including some new modules
- Other regions?

Other DINAS-COAST Presentations

A number of issues related to DINAS-COAST and DIVA will be discussed in detail at this conference:

- <u>Gerben Boot:</u> Coastal erosion and sea-level rise at the global scale: an assessment of impacts and adaptation, Session 1, Day 1, 11:30.
- <u>Jochen Hinkel:</u> Methodological issues in coastal vulnerability assessment. Keynote address, Workshop 1, Day 1, 14:00.
- <u>Loraine McFadden:</u> A new model of wetland loss and sea-level rise. Session 19, Day 1, 15:15.
- <u>Nassos Vafeidis:</u> Data requirements for global-scale coastal vulnerability analysis and the DINAS-COAST database. Session 18, Day 3, 11:30.
- <u>Poul Grashoff:</u> A demonstration of the DIVA tool for assessing coastal vulnerability. Session 18, Day 3, 12:15.

This Session

A number of presentations in this session address topics not yet considered in DIVA:

- <u>Gerben Boot:</u> Coastal erosion and sea-level rise at the global scale: an assessment of impacts and adaptation
- <u>Lindy Dingerson:</u> Predicting future shoreline condition based on land-use change and increased risk associated with climate change
- <u>Barbaro Moya:</u> Hicacos peninsula, a coastal territory with urban and non-urban space facing future changes
- <u>Frank Thomalla:</u> Understanding human vulnerability to coastal hazards and adapting to uncertain futures
- <u>Susanne Rupp-Armstrong:</u> The future of managed realignment in Northern Europe: a comparative study of southern North Sea coastal areas