Deltares
Enabling Delta Life

SimpleCoast

Dealing with Coastal Risks in Small Island States – Training Session

Alessio Giardino

Ellen Quataert, Leo van Rijn, Andrew Warren, Ad Jeuken, Marjolijn Haasnoot, Ap van Dongeren, Joao Rego

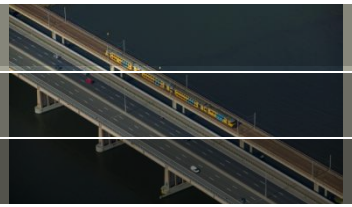
With special thanks to Sofia Bettencourt, Nicolas Desramaut and the GFDRR team
Understanding Risk Forum (Venice, May 16 – 20 2016)

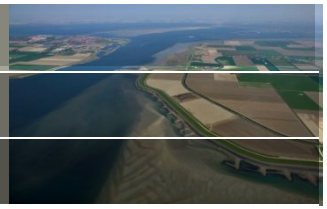
17 mei 2016

Deltares – general introduction

- Deltares is an **independent research institute** for delta technology, incorporating advanced expertise on water, soil and subsurface issues.
- About 850 employees
- Research (50%) and consultancy (50%)
- NONPROFIT ORGANIZATION

The mission





Enabling Delta Life

Deltares provides innovative solutions that make living and working in deltas, coastal areas and river basins safe, clean and sustainable

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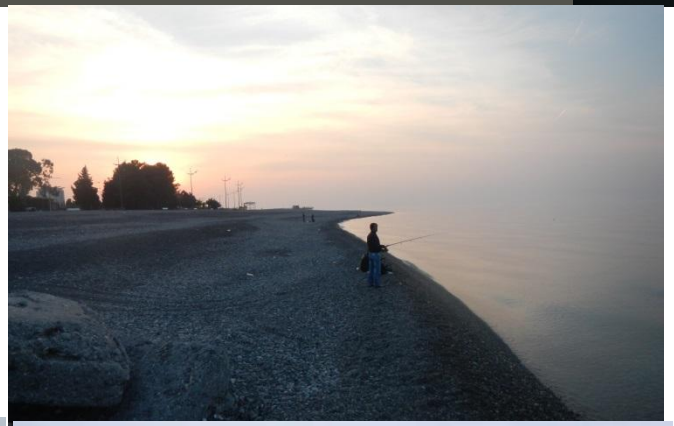
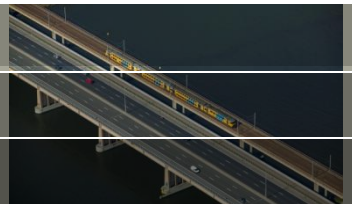
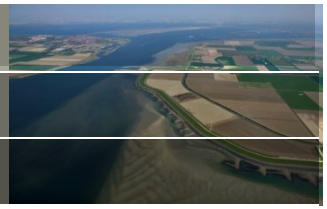
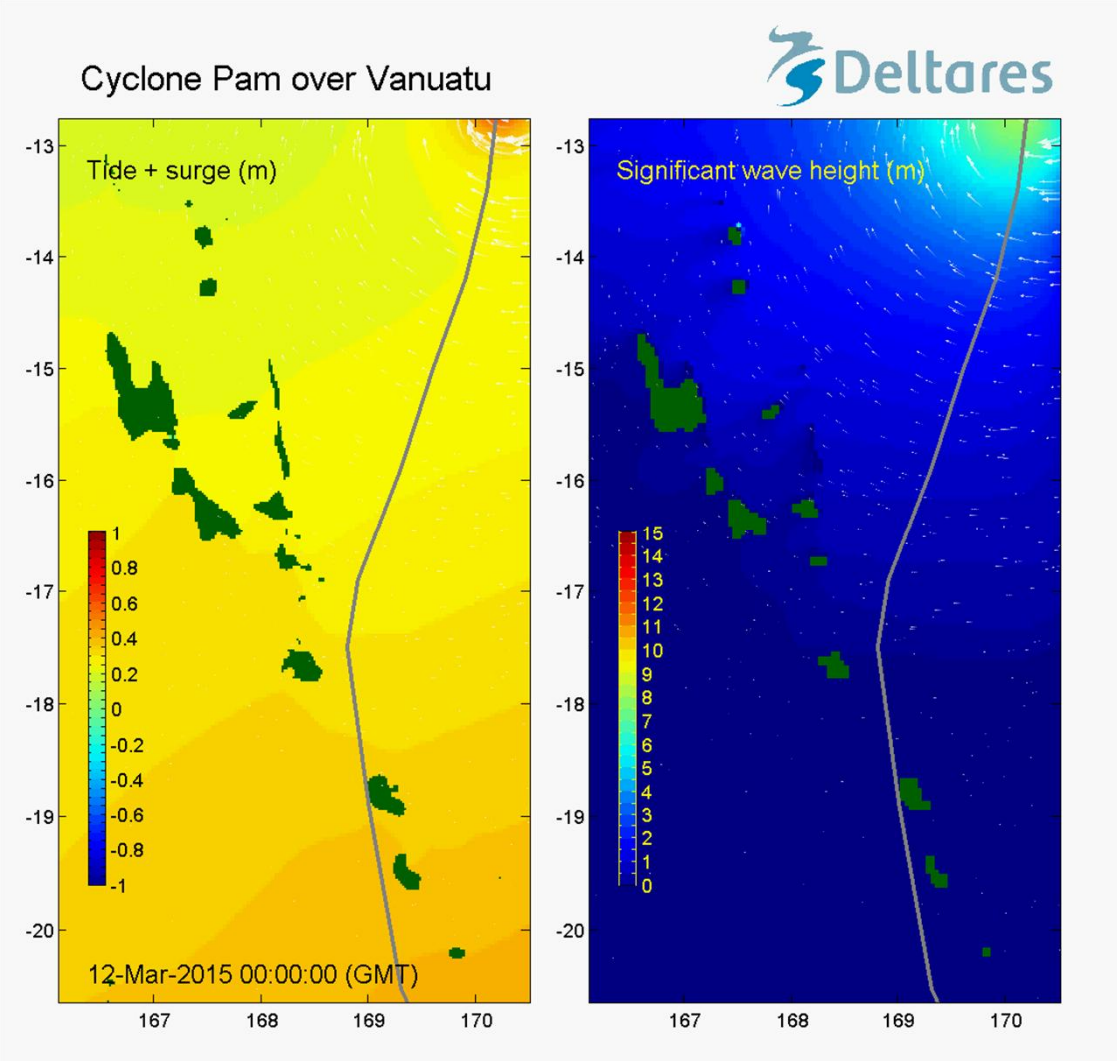
Some of our projects in the coastal sector

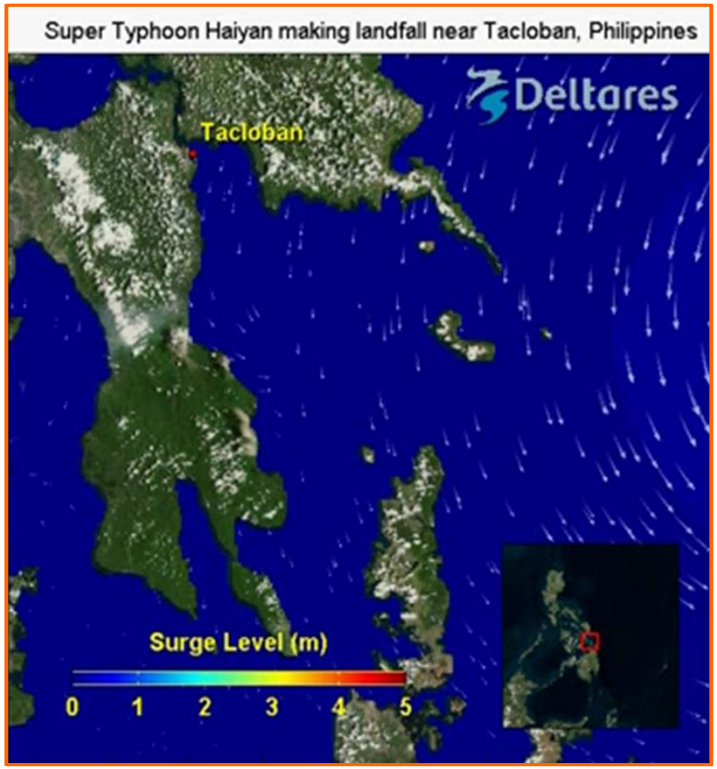


Open software









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Physical models

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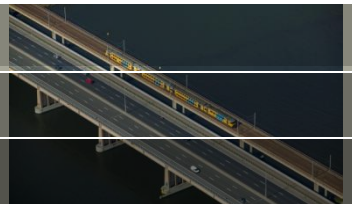
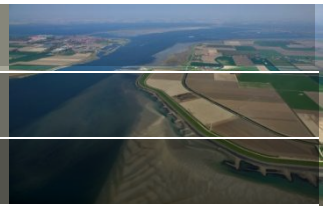
Programme of the session





14:00 – 14:30 General Introduction to SimpleCoast

14:30 – 16:30 Dealing with uncertainties in coastal management. Interactive serious game session

16:30 – 16:45 Coffee/tea break

16:45 – 17:15 Flooding on low-elevation reef-lined coasts

17.15 – 17.45 Other technologies for small island communities: storm-surge early warning systems, design tools, *etc*.

17.45 – 18:00 Final discussions / feedback from the audience

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General introduction to SimpleCoast

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Do you notice any similarity in those pictures?

Aruba

Sao Tome

Common challenges

Denis Island, Seichelles

Tubbataha Reefs Natural Park, Philippines

Kiribati

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Knowledge fragmentation

... when you are lucky

... when you are less lucky

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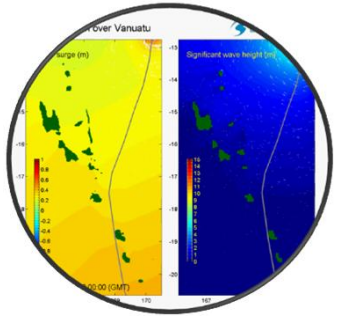
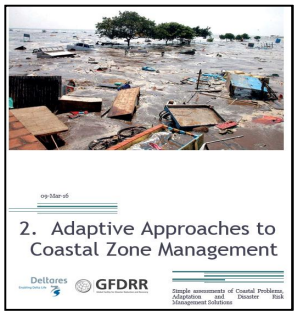
What is SimpleCoast?

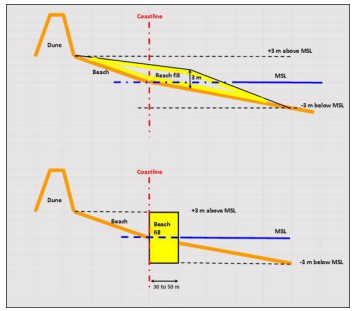


Knowledge fragmentation

Knowledge sharing platform for simple assessment of problems and solution:

- Website
- Knowledge notes
- Free tools and tutorials
- Trainings





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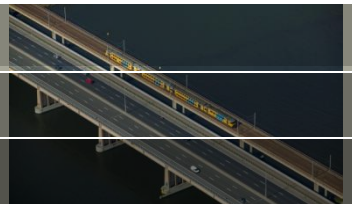
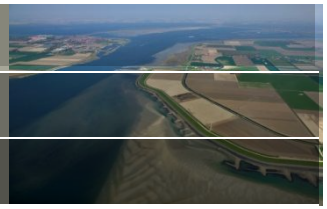
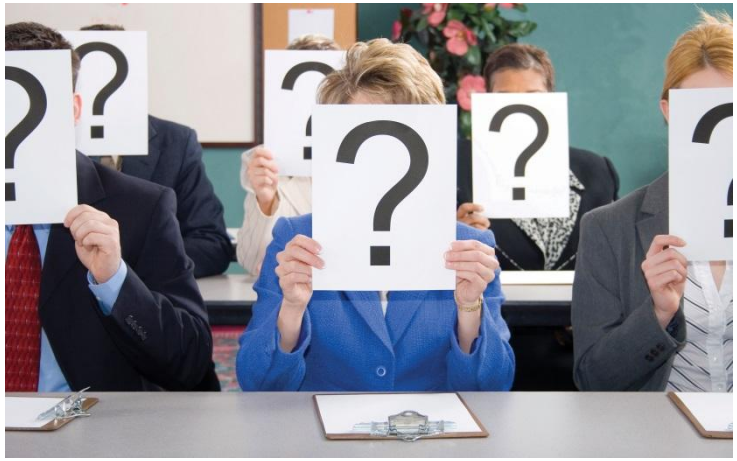
For whom?





- Local practionioners
- Government officials and national leaders in Small Island States
- Regional organizations
- NGOs working on the ground in Small Island States to build resilience
- Specialists at the World Bank, other MDBs and UN and bilateral partners



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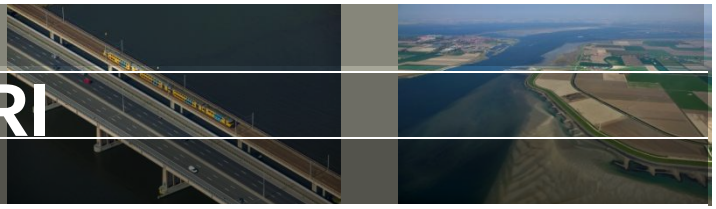
In close cooperation with SISRI



GFDRR
Global Facility for Disaster Reduction and Recovery

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Small Island States Resilience Initiative

The **Small Islands States Resilience Initiative** (SISRI) is a global program launched by the World Bank in September 2014, in response to calls by Small Island States for greater and more effective support to build their resilience to climate change and disaster risk.

SISRI seeks to bring together experiences from Disaster Risk Management and climate resilience to help reduce fragmentation of the financial landscape, provide technical assistance to overcome capacity challenges in fiduciary and technical aspects of investments, and assist Small Island States in accessing scaled up and more efficient financing for resilience.

To support the initiative and share experiences, a global team specialized in the needs of Small Island States has been established, spanning multiple technical disciplines and regions.

SISRI's main building blocks are shown below.

Institutional	Operational	Technical		
Institutional Strengthening	Program Management & Monitoring and Evaluation	Risk Information		Coastal Protection
Mainstreaming	Safeguards	Risk Reduction	→	Risk Based Spatial Planning
Awareness	Fiduciary (Procurement and Financial Management)	Preparedness and Early Warning Systems		Safer Infrastructure
		Financial and Social Protection		Community Based Landslide Management
		Resilient Reconstruction		Managed Population Retreat

Contact: Sofia Bettencourt (sbettencourt@worldbank.org) and Habiba Gitay (hgitay@worldbank.org)

AT A GLANCE
SISRI is a global partnership through the World Bank and GFDRR to support Small Island States in reducing climate and disaster risks.

SISRI Flier

SISRI in Images

SISRI Operations

SISRI Thematic Group members

LinkedIn

Publications

- SimpleCoast Online Manual

Other

- What is SISRI?

Media

Knowledge Notes

- Building Resilience through Social Protection
- Managing Population Retreat from At-Risk Areas

Upcoming Events

- Special session at the Understanding Risk Forum, May 16-17, Venice
- SimpleCoast training at the Understanding Risk Forum, May 16-17, Venice

External Resources

- Key data for SIDS (WDIs)
- Relevant literature

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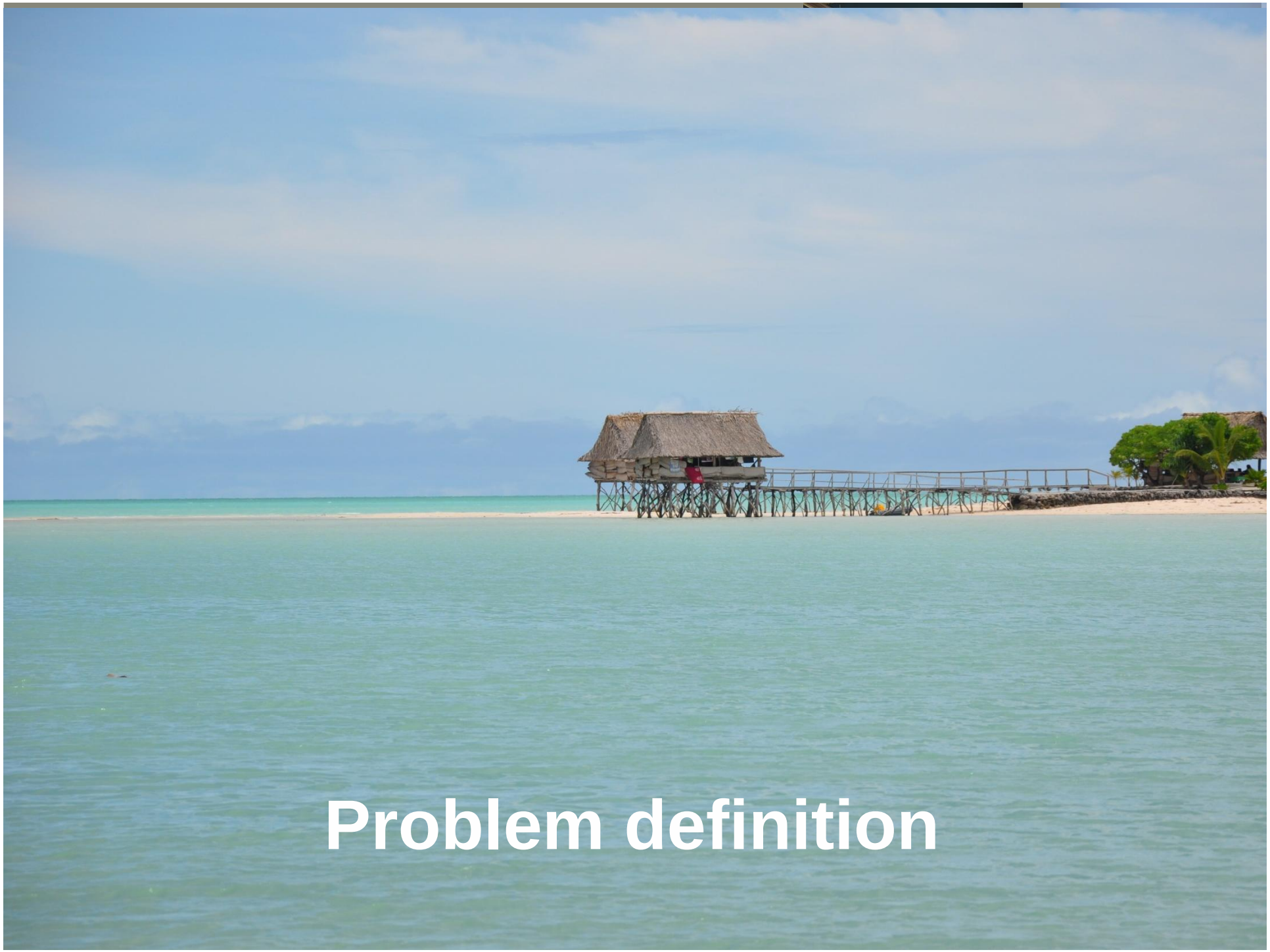
Problem definition

But what is actually the problem? Importance of problem definition

The dynamic response of reef islands to sea-level rise: Evidence from multi-decadal analysis of island change in the Central Pacific

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[b] School of Environment, The University of Auckland, Private Bag 92019, Auckland, New Zealand

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island migration
Pacific Ocean

ABSTRACT

Low-lying atoll islands are widely perceived to erode in response to measured and future sea-level rise. Using historical aerial photography and satellite images this study presents the first quantitative analysis of physical changes in 27 atoll islands in the central Pacific over a 19 to 61 yr period. This period of analysis corresponds with instrumental records that show a rate of sea-level rise of 2.0 mm yr^{-1} in the Pacific. Results show that 86% of islands remained stable (43%) or increased in area (43%) over the timeframe of analysis. Largest decadal rates of increase in island area range between 0.1 to 5.6 ha. Only 14% of study islands exhibited a net reduction in island area. Despite small net changes in area, islands exhibited larger gross changes. This was expressed as changes in the planform configuration and position of islands on reef platforms. Modes of island change included: ocean shoreline displacement toward the lagoon; lagoon shoreline progradation; and, extension of the ends of elongate islands. Collectively these adjustments represent net lagoonward migration of islands in 65% of cases. Results contradict existing paradigms of island response and have significant implications for the consideration of island stability under ongoing sea-level rise in the central Pacific. First, islands are geomorphologically persistent features on atoll reef platforms and can increase in island area despite sea-level change. Second, islands are dynamic landforms that undergo a range of physical adjustments in responses to changing boundary conditions, of which sea level is just one factor. Third, erosion of island shorelines must be reconsidered in the context of physical adjustments of the entire island shoreline as erosion may be balanced by progradation on other sectors of shorelines. Results indicate that the style and magnitude of geomorphic change will vary between islands. Therefore, island nations must place a high priority on resolving the precise styles and rates of change that will occur over the next century and reconsider the implications for adaption.

Subsidence?

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Sand mining from the beach

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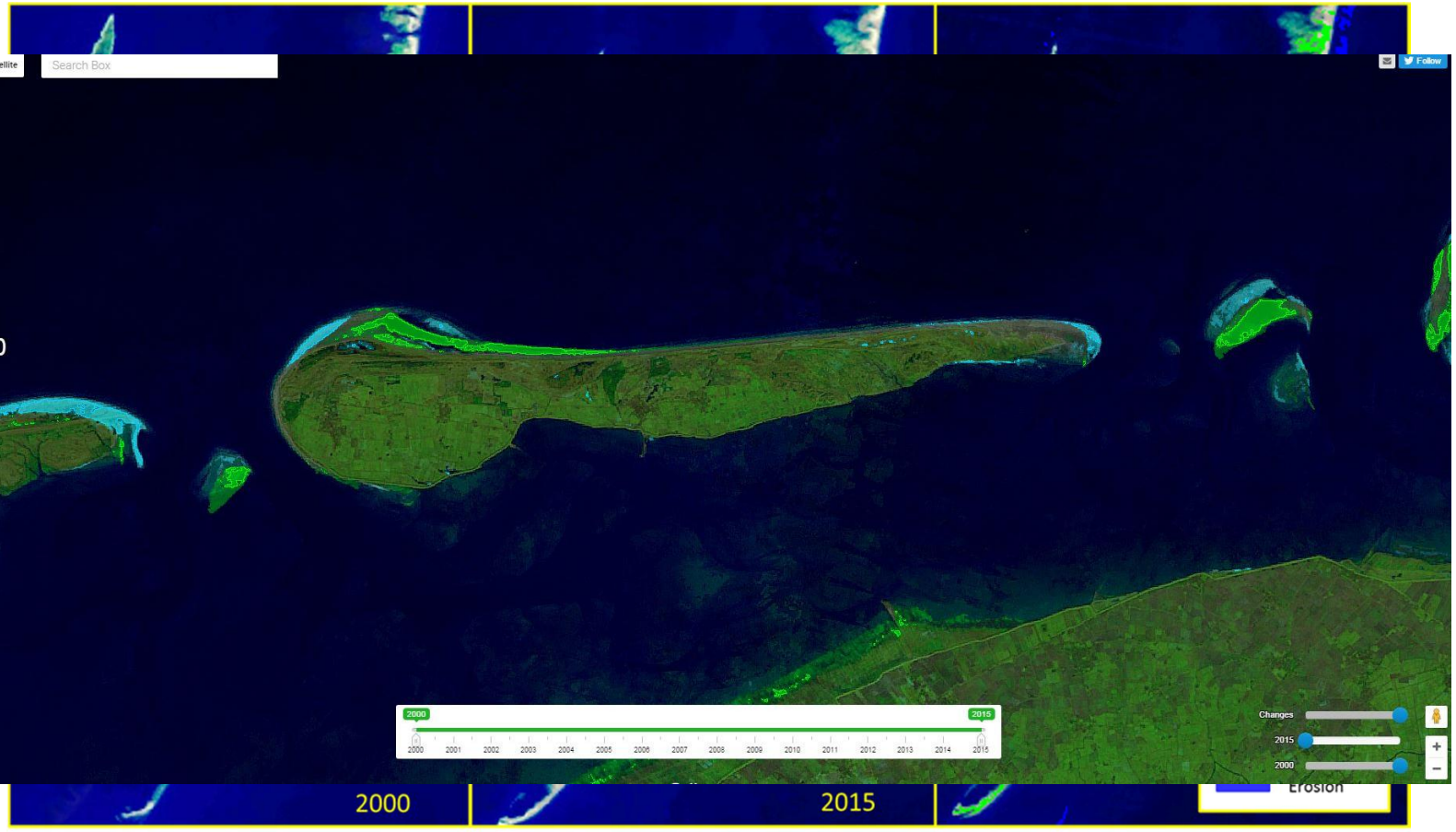

Morphodynamics

Amelahd - Coastal erosion app (Deltares)

Chandeleur Islands - Coastal erosion app (Deltares)

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Other forms of man-made erosion: navigation channel trapping sediment transport

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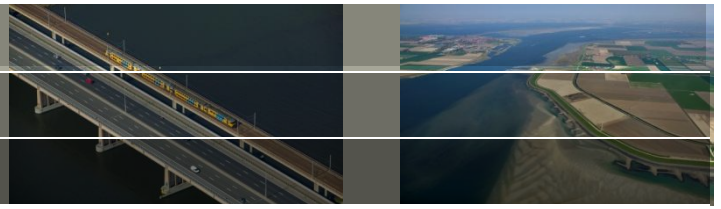

Sub-optimal spatial planning

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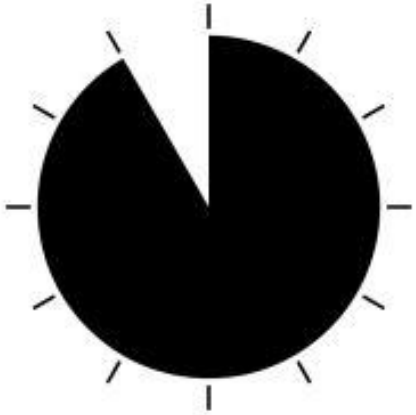

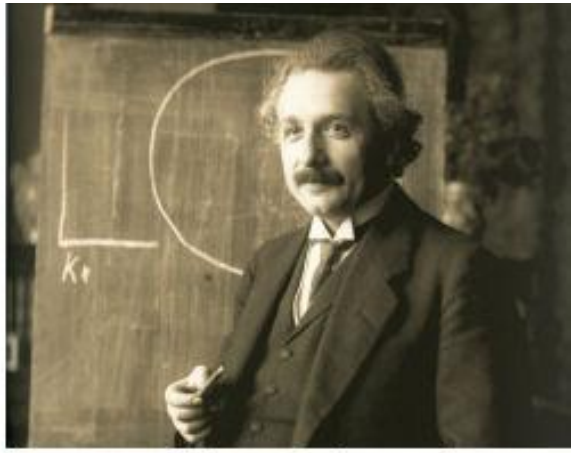

“If I had one hour to save the world I would spend fifty-five minutes defining the problem and only five minutes defining the solution”

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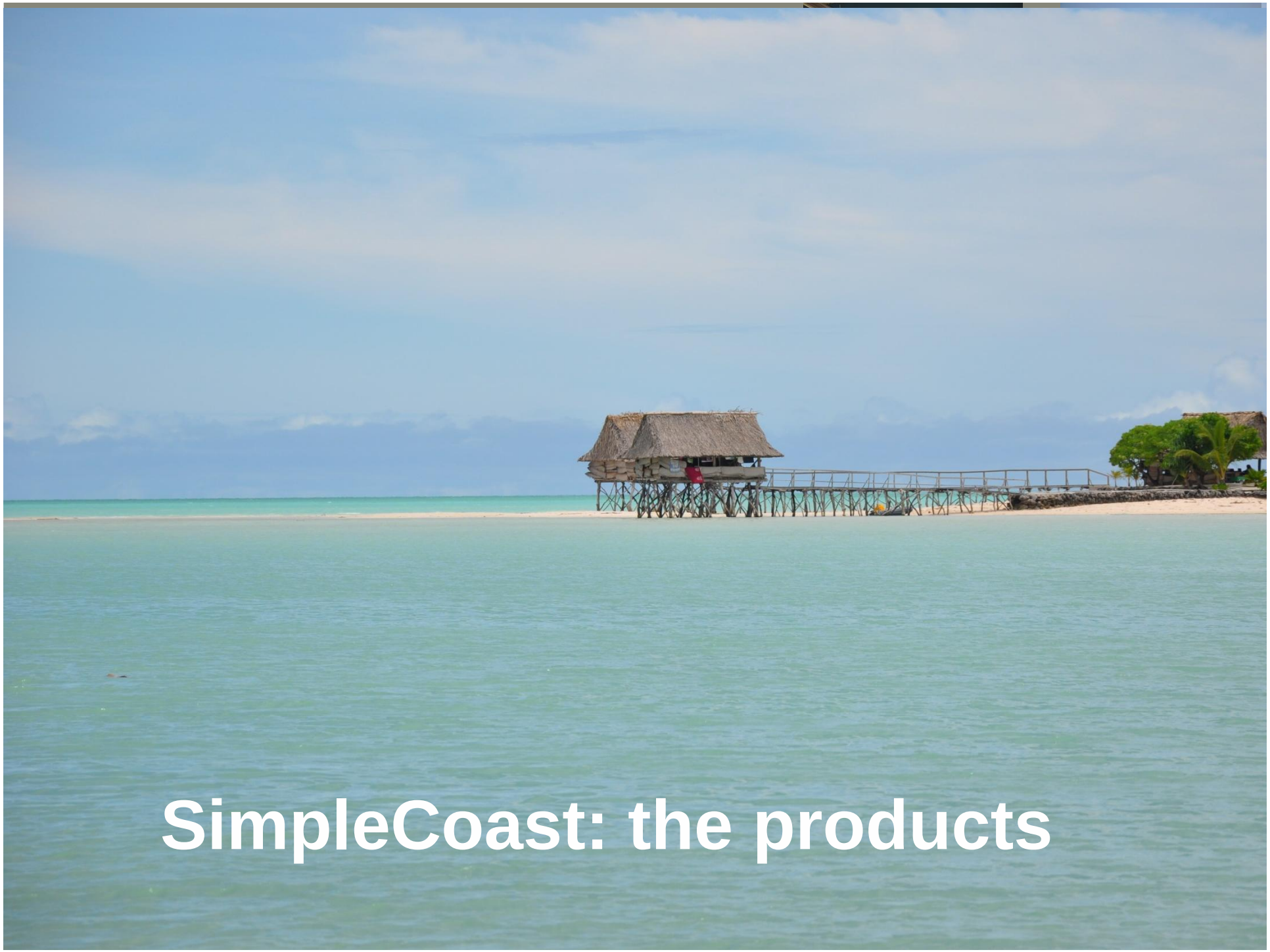
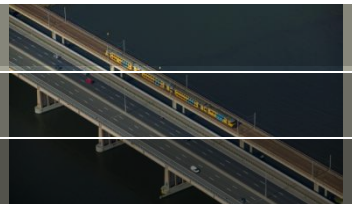
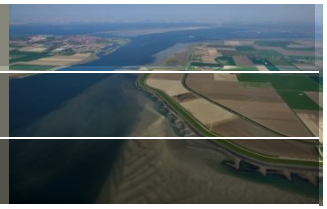


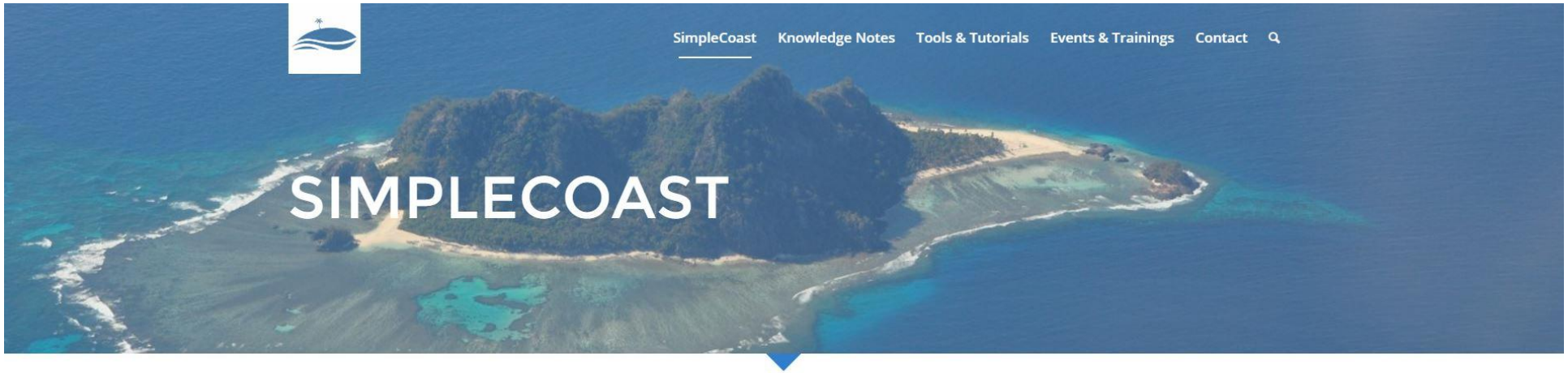
SimpleCoast: the products

The website





http://www.simplecoast.com/



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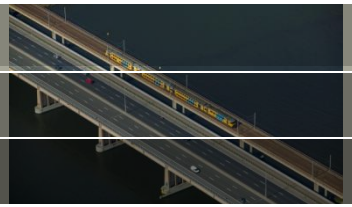
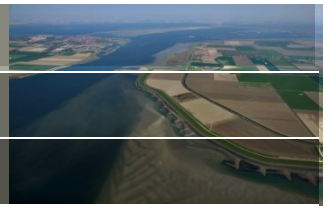
Knowledge notes





Notes of about 15 – 20 pages on the following topics

- Adaptive Approaches to Coastal Zone Management
- Coastal Processes and Problems
- Data Collection and Monitoring
- Coastal Adaptation Solutions

“Simple and Practical”

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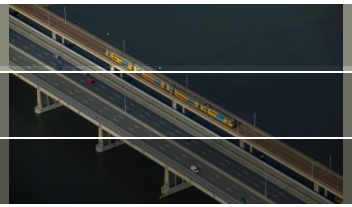
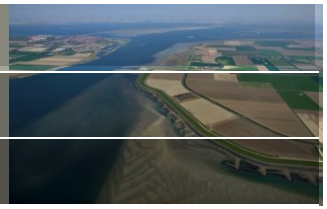
Tools and Tutorials

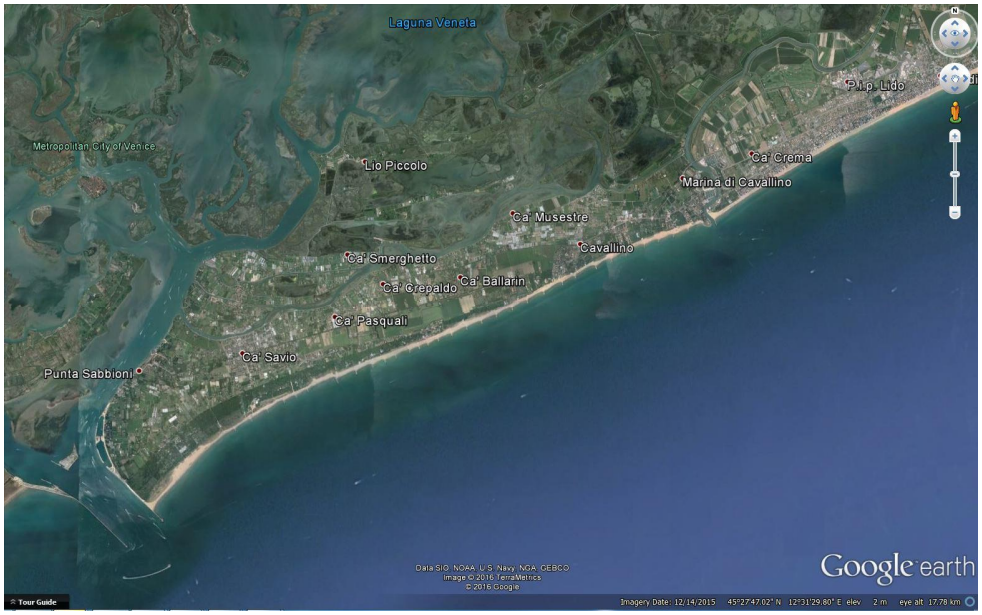




Tools + tutorials (1 for each tool) including practical examples and applications

Title	Description
Adaptive Coastal Zone Management	Adaptation pathways generator
Flooding	Computation of flood level due storm surge, wave setup and wave runup
Wave parameters	Computation of basic wave parameters
Wave models	Computation of wave height in cross-shore direction
Sediment parameters	Computation basic sediment parameters
Littoral	Computation of net annual longshore sediment transport
Dune-beach erosion	Computation of dune and beach erosion volume during a storm event
Beach nourishments	Computation of a life-time of a beach nourishment
Armour	Computation of dimensions of rocks, stones and concrete elements for coastal protections
River flow and transport	Computation of river flow and sand transport in a river cross-section
Scour	Computation of scour depth near structures
Nature-based flood defenses	Effect of wave attenuation of nature-based flood defences
Coral reefs	Assessment of flooding on low-elevation reef-lined coasts

Example: compute life-time of a nourishment



Venice – Marina di Cavallino

Physical setting:

Tidal range spring tide ≈ 1.1 m
Alongshore sediment transport ≈ 150,000 m^3/year
Average wave height at breaking ≈ 1 m
Sediment size ≈ 0.15 mm

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Is the coastline at Cavallino eroding or accreting?
What is the direction of natural alongshore transport?

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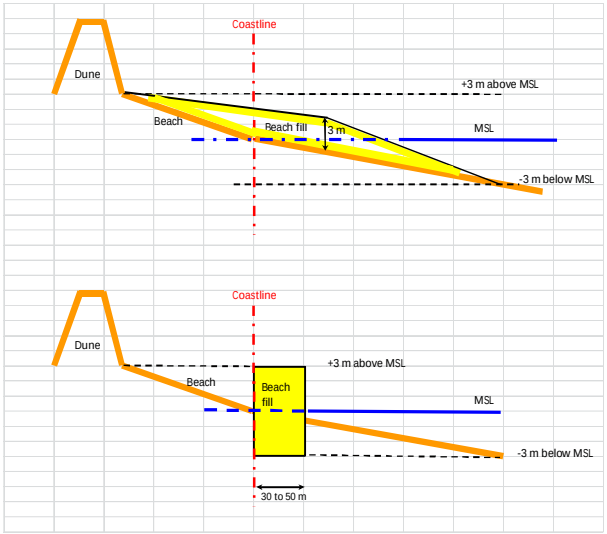

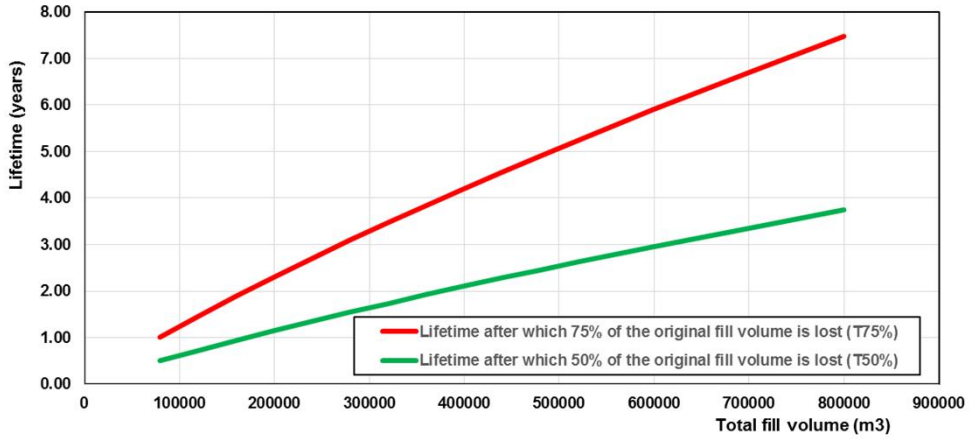

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Trainings


Coastal Protection and Adaptive Coastal Management - training Session:
São Tomé and Príncipe
12-16 February 2016.

General programme

- General theory on coastal processes with examples from São Tomé
- Field work and data collection (Praia Melão)
- Data analysis
- Numerical modeling by mean of simple tools
- Serious game session: “Adaptive coastal management in small islands”
- Project presentations (in groups)




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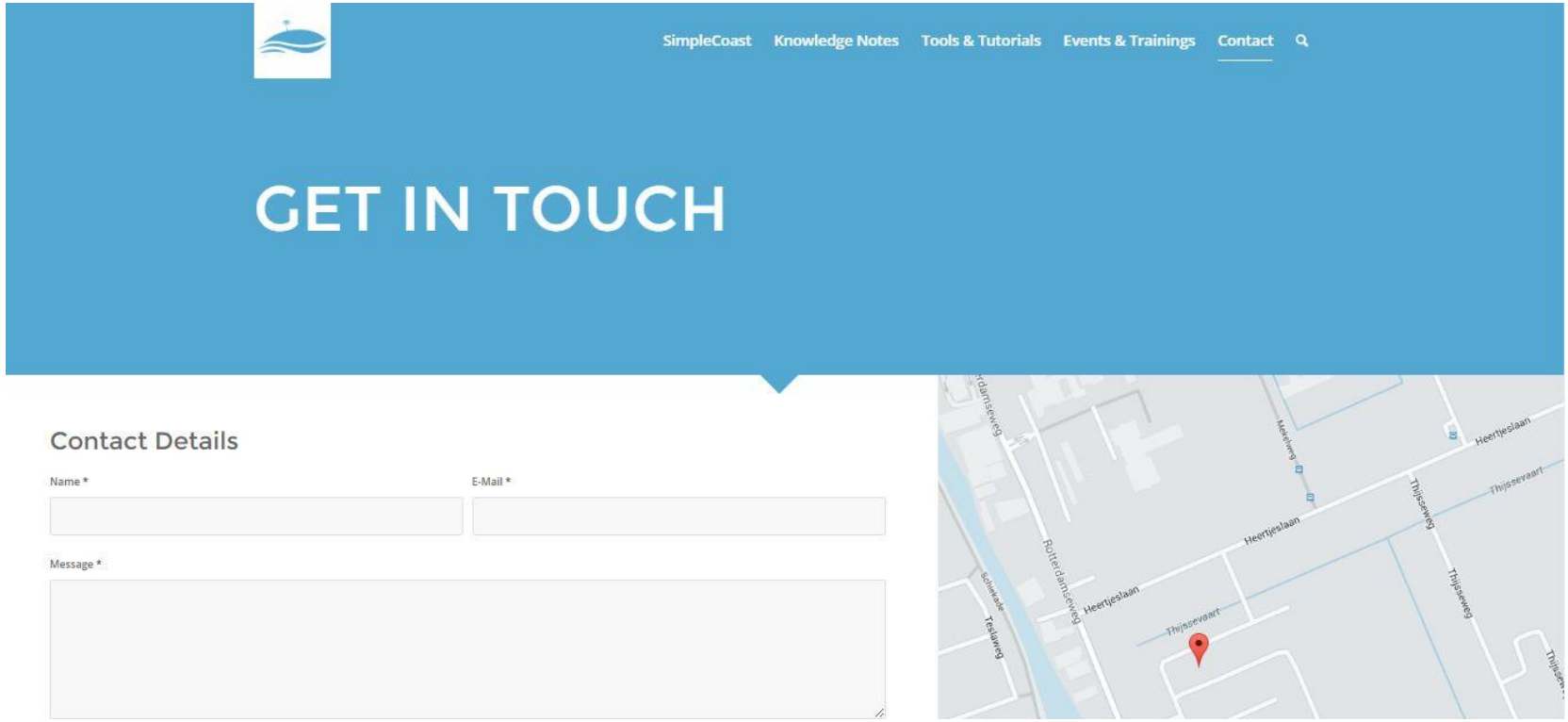
Get in touch – exchange of experience



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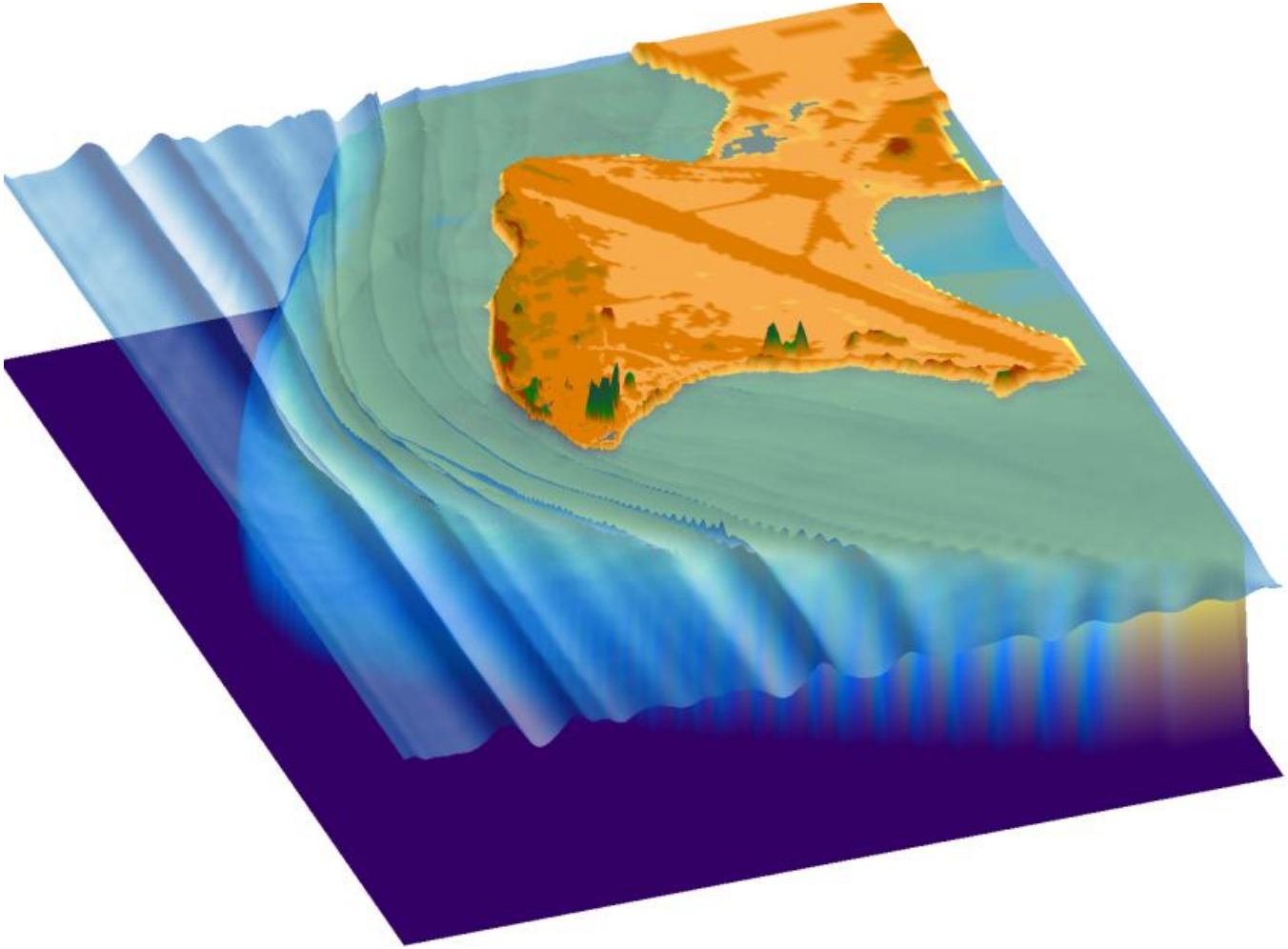
Dealing with uncertainties in coastal management. Interactive serious game session



Assessment of flooding on low-elevation reef-lined coasts

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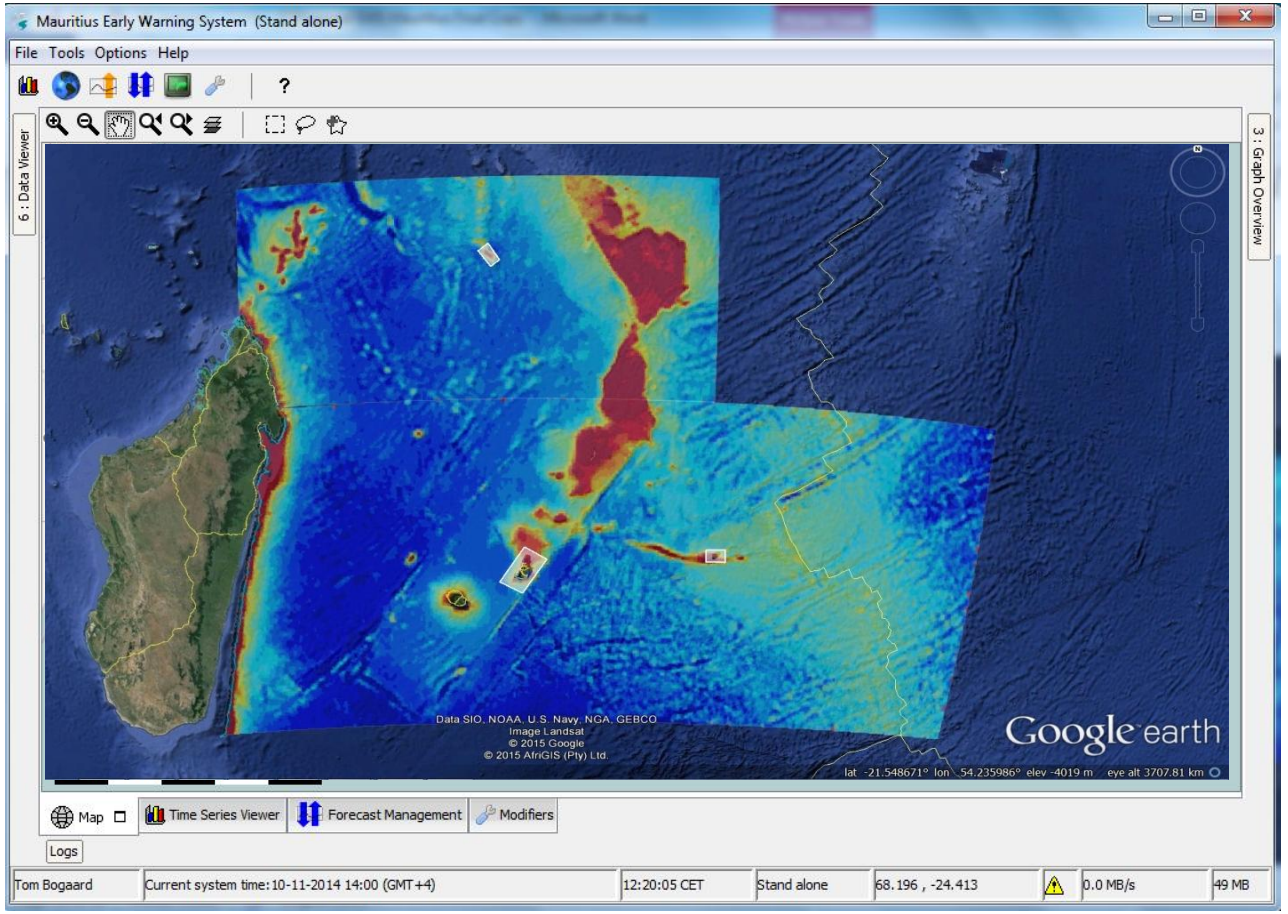
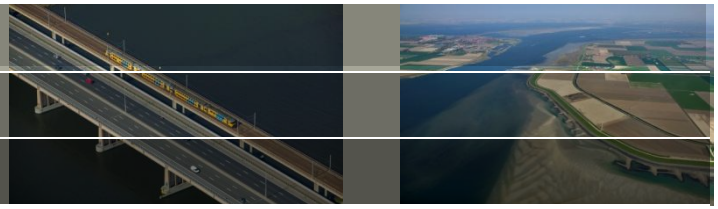


Early Warning Systems for Small Islands



Why?

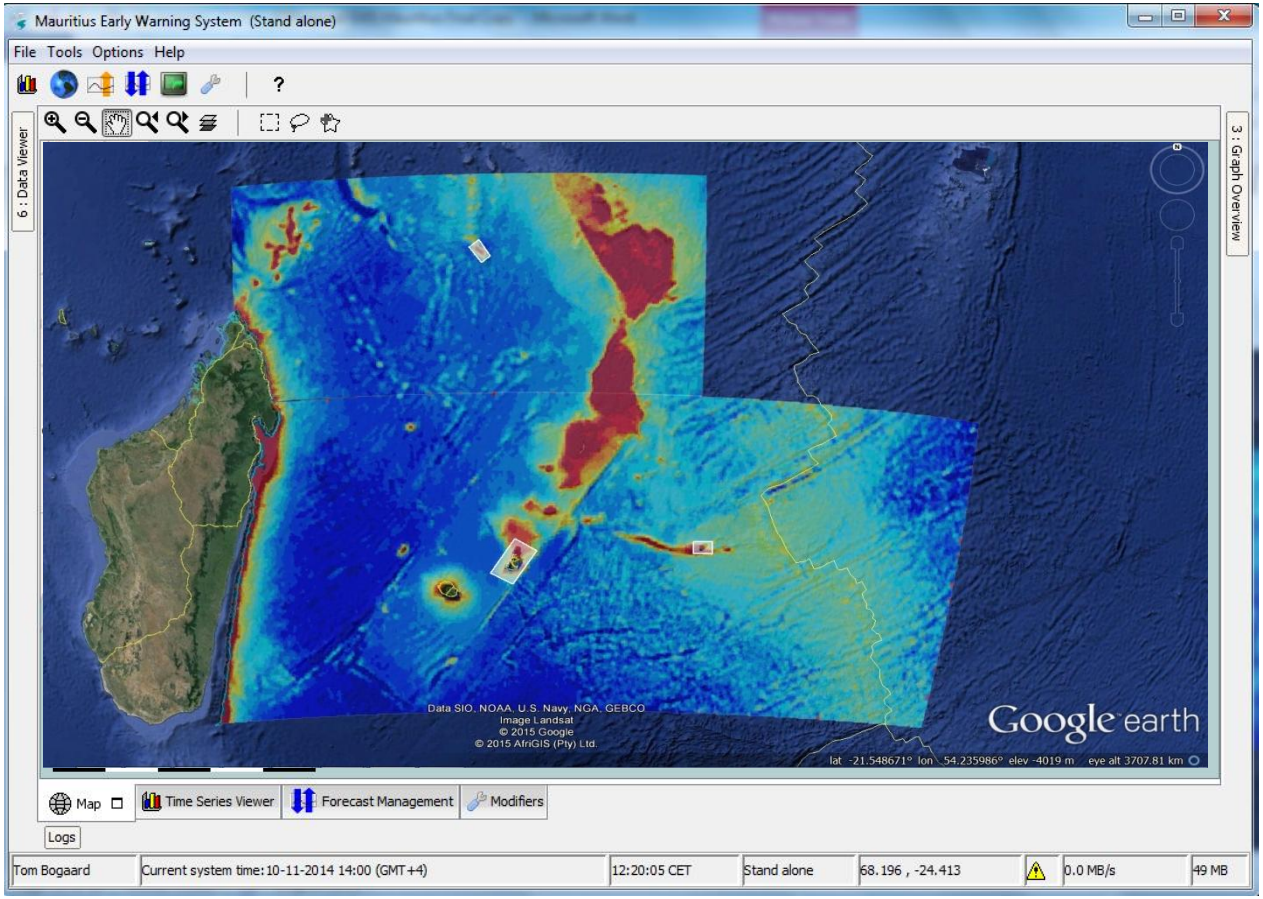
- Storm and hurricane induced surges are a continuous threat to coastal areas across the globe, and are likely to increase due to climate change.
- Investment in the coastal zone will increase the risks in the coastal zone.

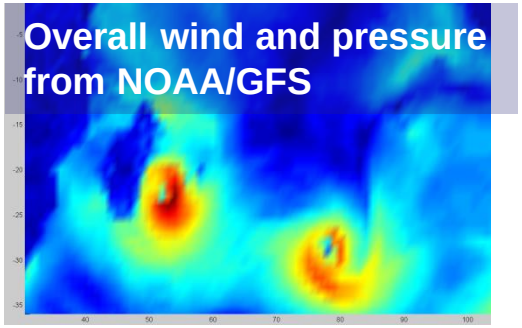
What?

Numerical tide-surge models can be applied to

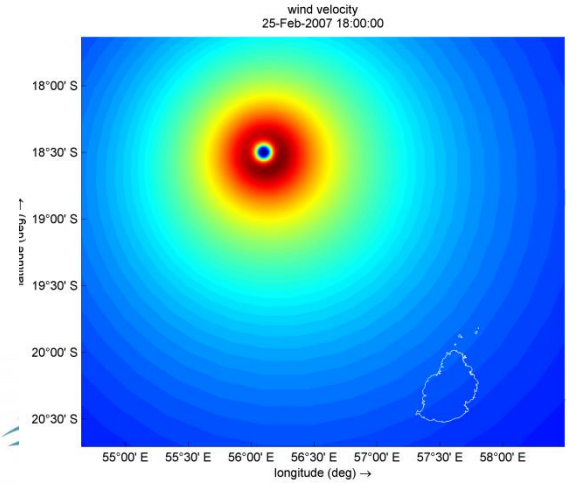
1) assess the impacts and effectiveness of proposed coastal flood protection, before any events occur, and
2) provide timely and reliable early warnings before a storm landfall, based on wind and pressure forecasts.

The Mauritius Early Warning System project

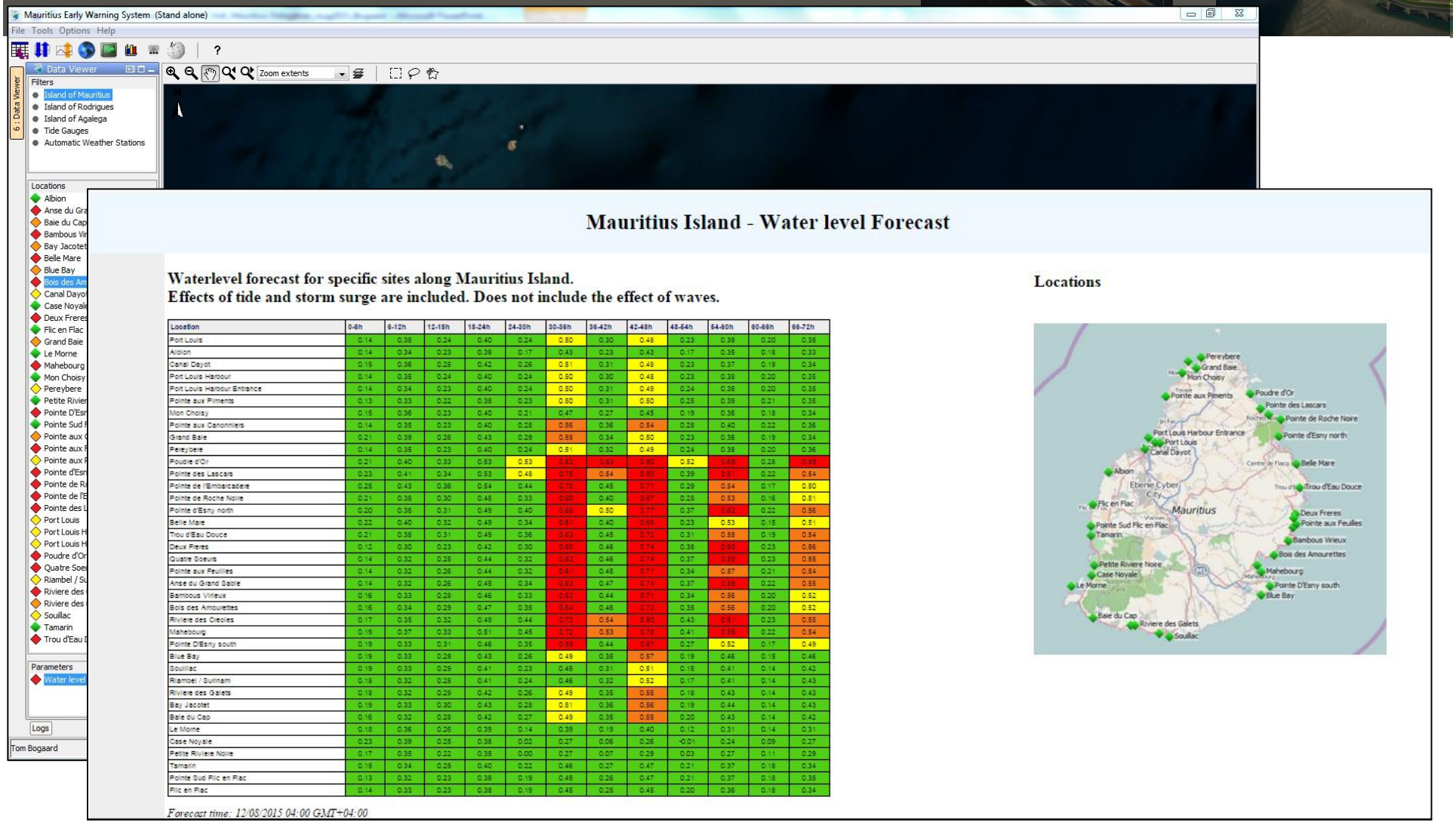




Cyclone winds & pressure based on cyclone parameter specified (Holland's model) merged with the global results



The Mauritius Early Warning System project



HTML bulletin issued every forecast, one for each island, for easy dissemination / interpretation between Mauritian organizations

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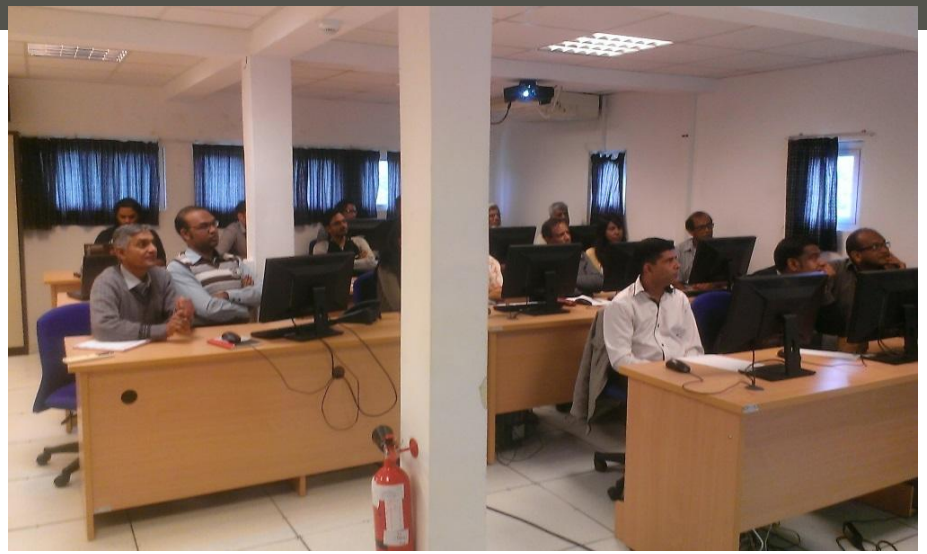
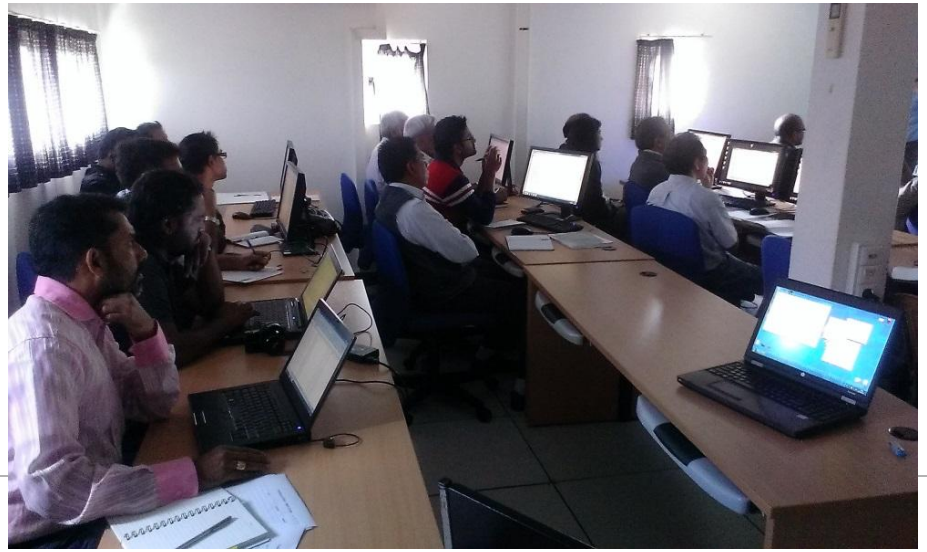
The Mauritius Early Warning System project



Several weeks' training in Mauritius by Deltares specialists,

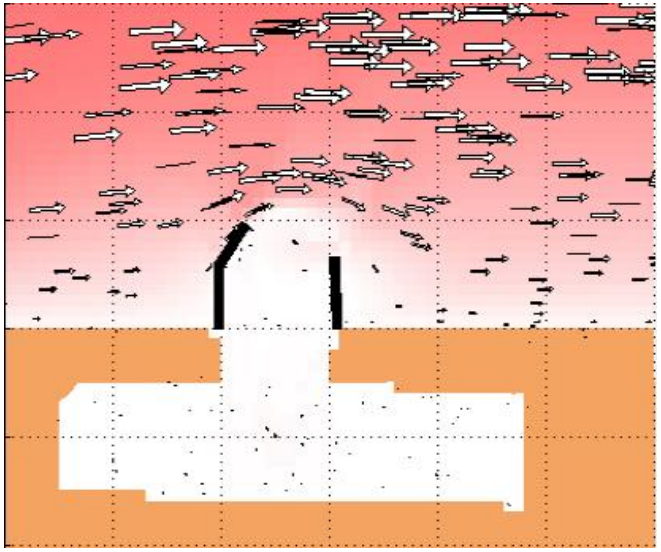
also a two-week workshops to Mauritian staff, in Delft

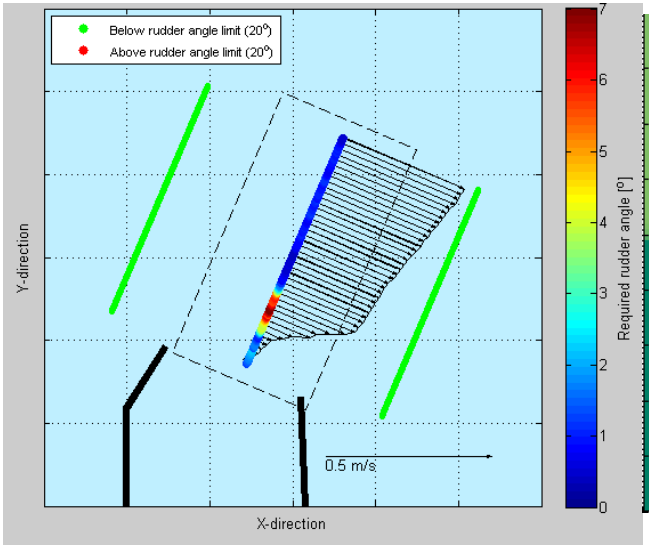


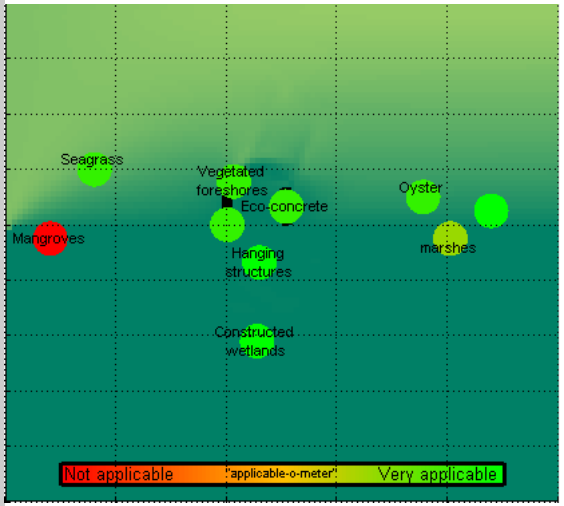
Coastal design support tools

17 mei 2016

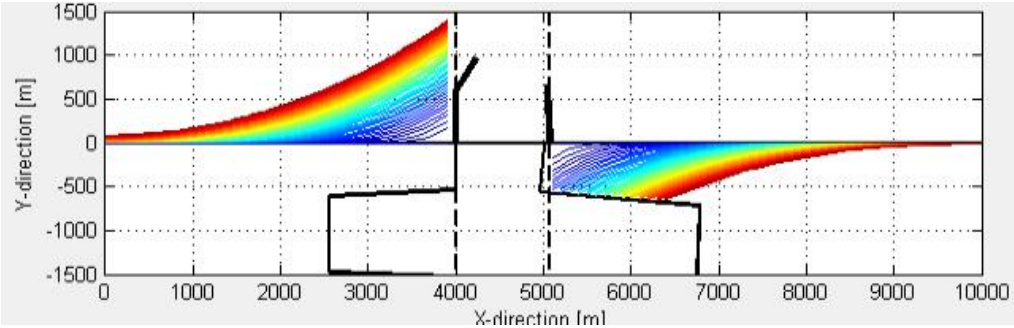
Example/screeshots



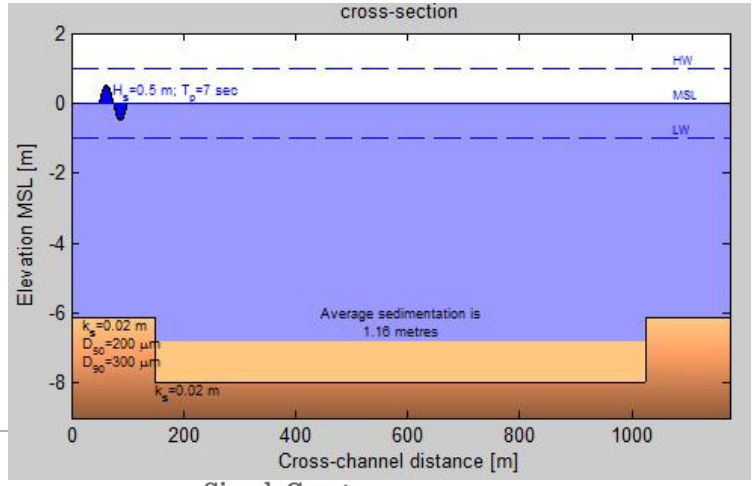




Coastline evolution



Channel sedimentation



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Waves

Hard-structures

Nature-based flood defenses

Sediment characteristics

Alongshore transport

Beach development

Dune development

Storm erosion

Beach nourishment design

Groundwater quantity & quality

Coral reef restoration

Maintenance costs

Harbor design

Harbor siltation

Flooding

Fancy

New Sandy Bay Village

Vallibou

St David

Richmond Vale

O'Briens

St Vincent and the Grenadines

Bye

Barrouallie

St Patrick

Hermitage

Charlotte

Layou

St Andrew

Biabou

St George

Mesopotamia

Kingstown

Brighton

Coastal design support tools for small islands

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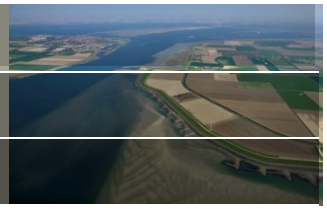
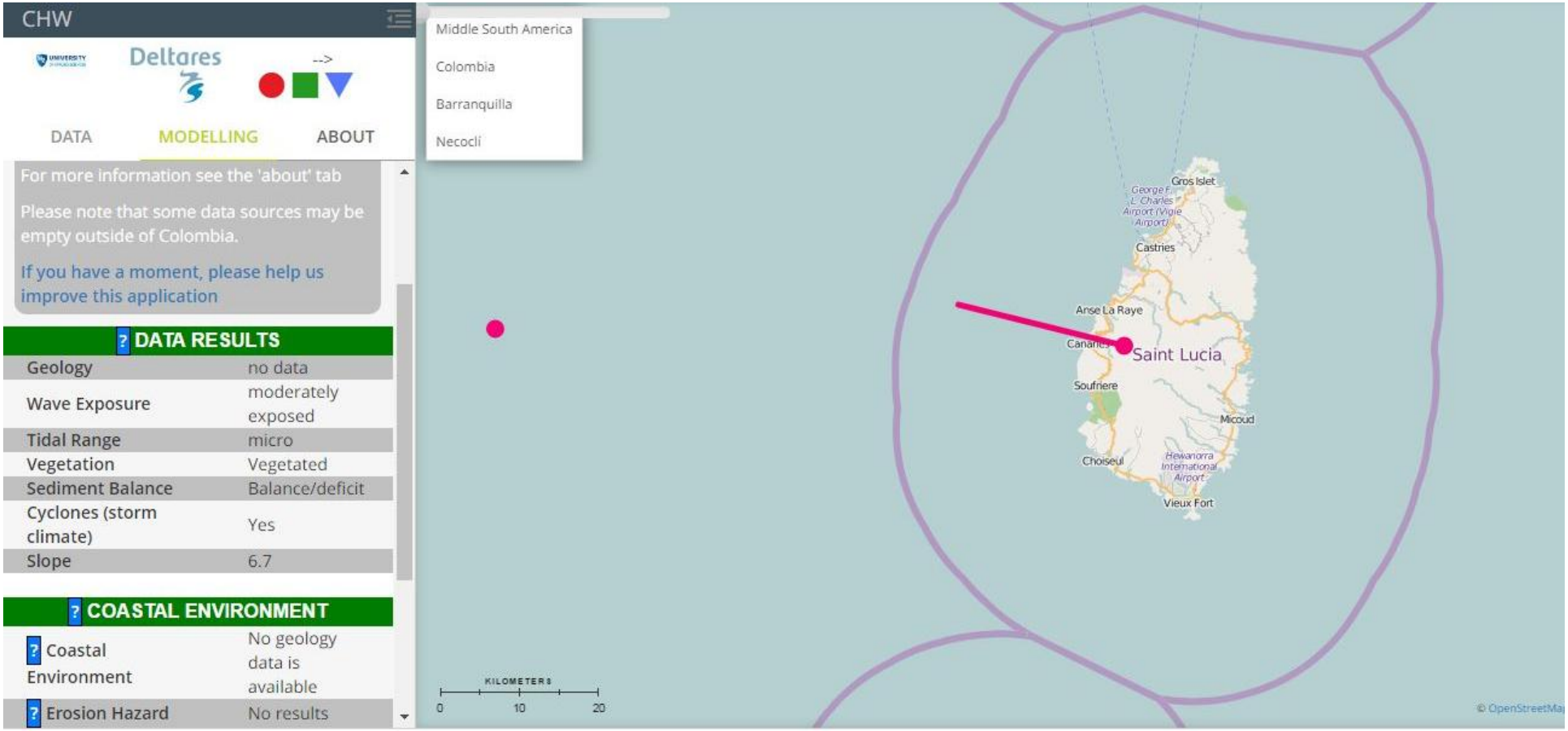
Open data & Online modelling





Coastal hazard wheel system

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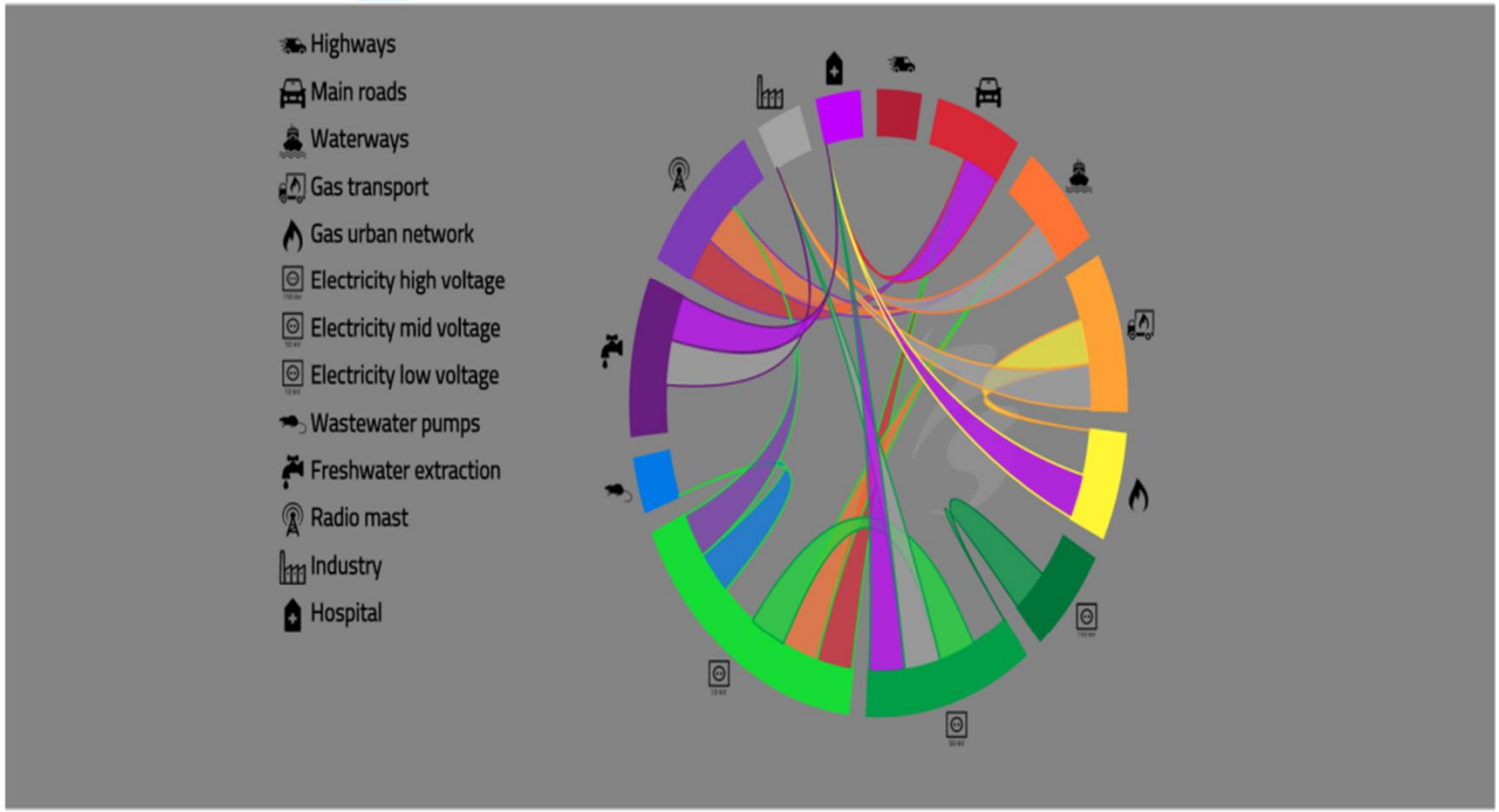
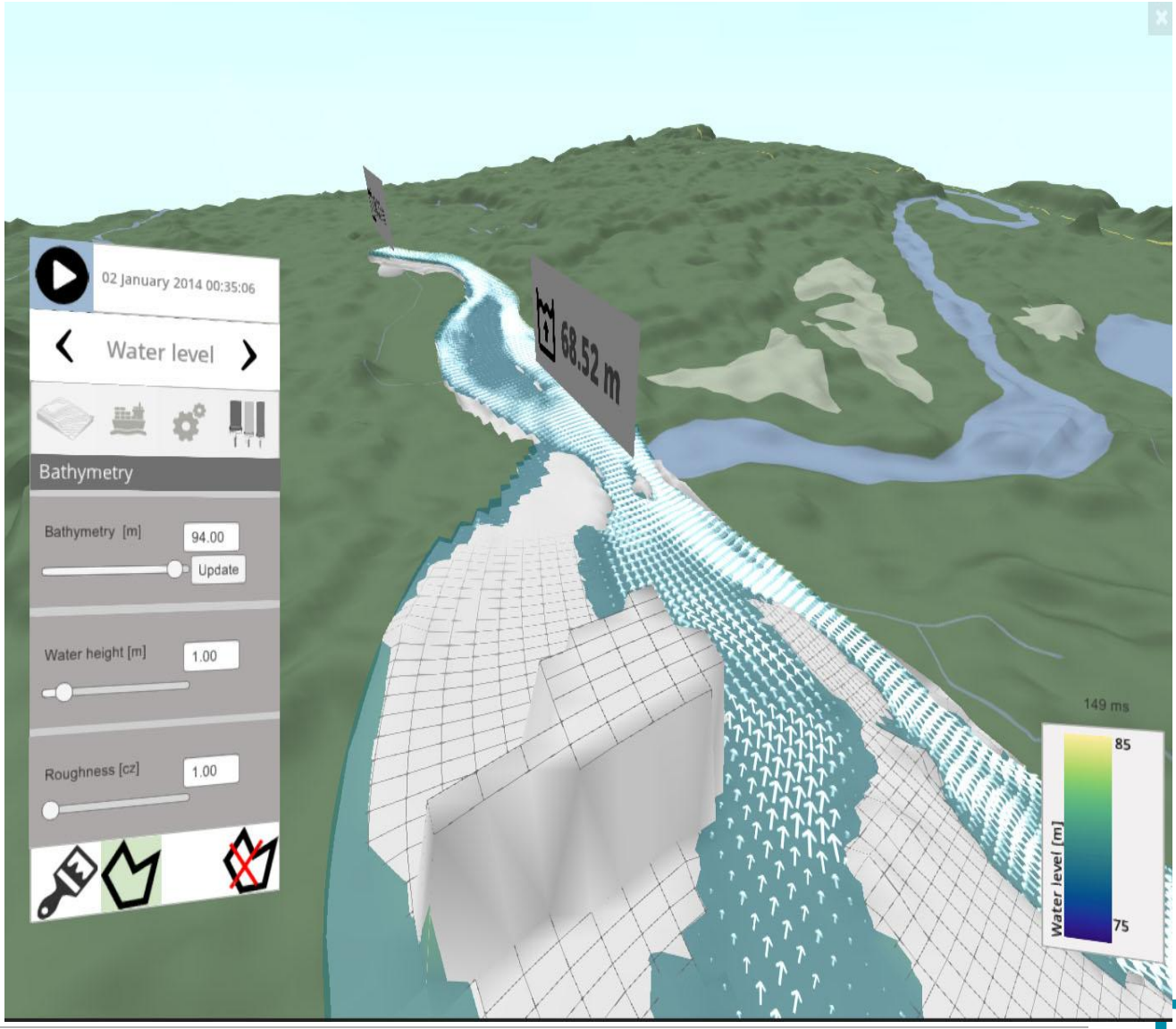
CIrcle (Deltares)

CIrcle - Critical Infrastructure: Relations and Consequences for Life and Environment

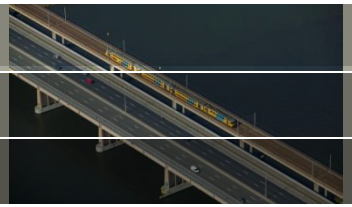


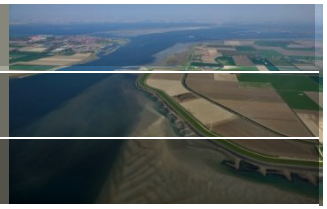
Deltares

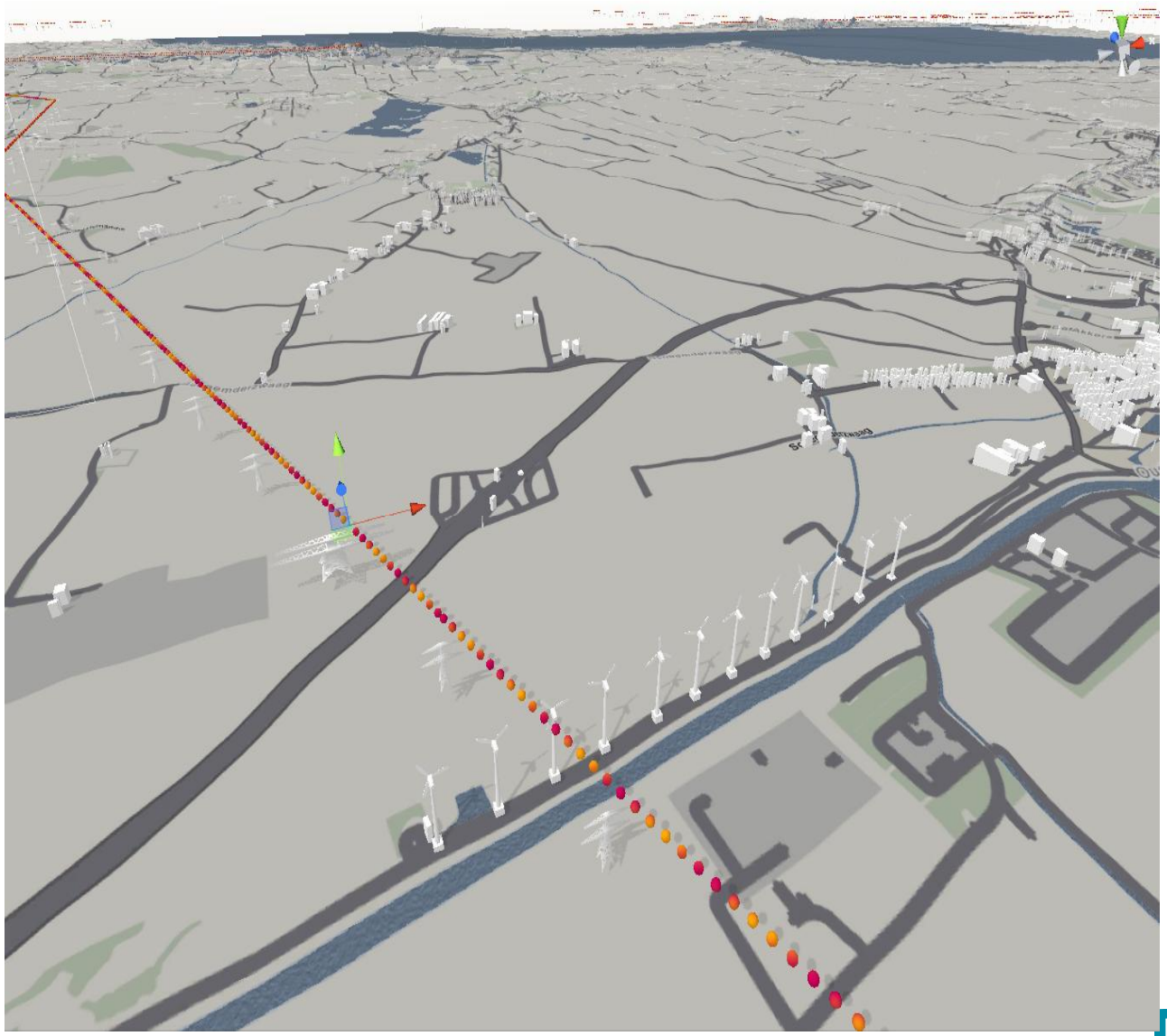
CIrcle (Deltares)



CIrcle (Deltares)







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Discussion and feeback from the audience: the next steps

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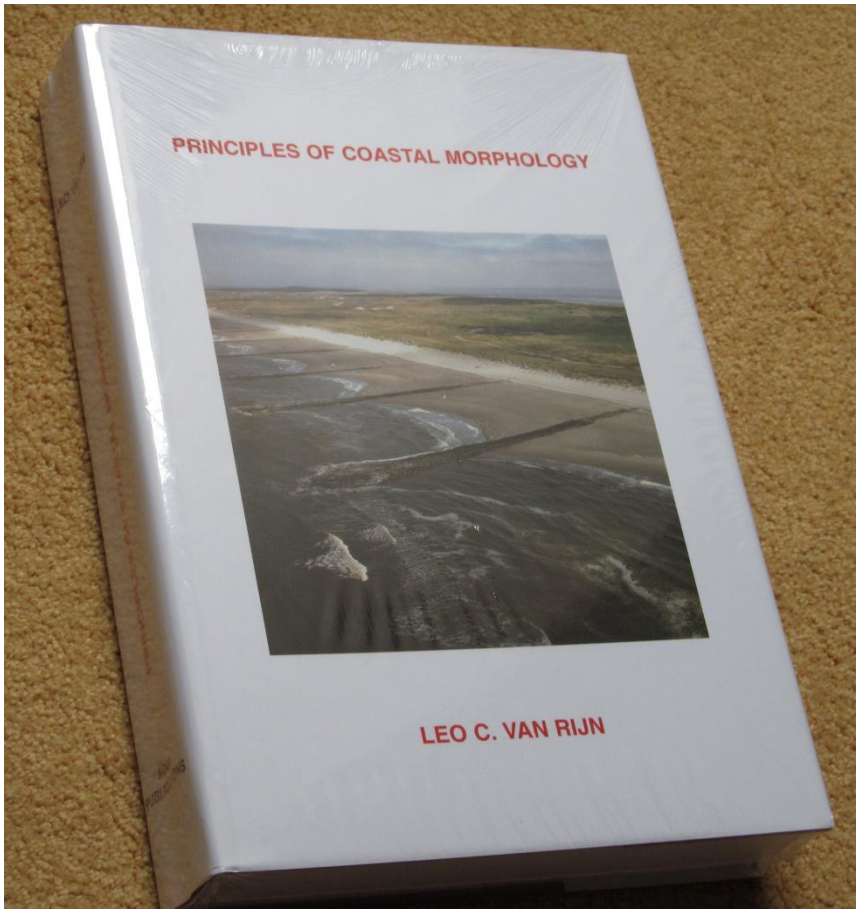

30 copies available for the most motivated students!

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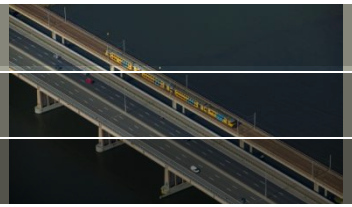
Acknowledgmenents



WATER PARTNERSHIP PROGRAM

Deltares
Enabling Delta Life

SISRI
SMALL ISLAND STATE RESILIENCE INITIATIVE

WORLD BANK GROUP
Climate Change

GFDRR
Global Facility for Disaster Reduction and Recovery

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“Is there anyone
who can watch without fascination the struggle for supremacy between land and sea?”
(Bascom, 1964)

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