The Role of the Coastal Engineering Consultant in Harnessing Ocean Energy

Geoff Smith, WSP Africa Coastal Engineers

Outline

- Who/what are coastal engineering consultants?

ROLE IN HARNESSING OCEAN ENERGY:

- Environmental Conditions
- Design of installation
- Environmental Impacts
- Conclusion

WSP

Who/what are we?

- "Civil Engineers on the coast"
- Skills within the following fields:
  - Marine Environmental Data
  - Beach Stabilisation
  - Estuaries
  - Port Development
  - Small Craft Harbours and Marinas
  - Offshore Facilities
  - Seawater Intakes and Outfalls
  - Tourism and Recreational Developments
  - Marine Structures

WSP

Toolbox

- Codes and guidelines
- Formulations (largely empirical)
- Computational Models
- Physical scale modelling

Marine Environmental Data

- Surveys and environmental data measurement campaigns
- The modelling and analysis of wave, current, wind, water level and sediment data.
- Definition of environmental design conditions

WSP

Beach Stabilisation

- Beach stabilisation - protection structures
- Sand bypassing
- Beach setback lines

WSP

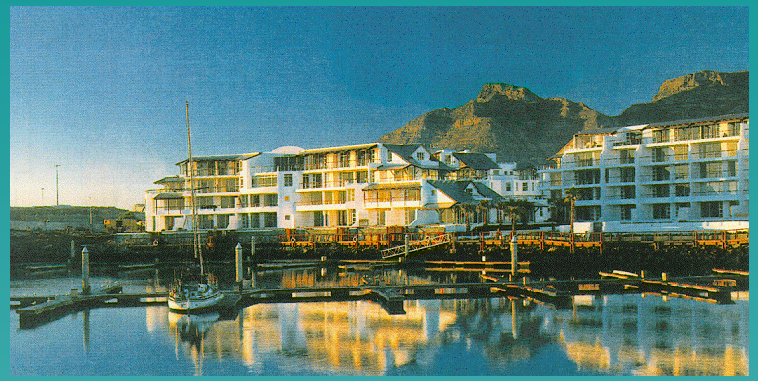
Port Development

- Navigation studies
- Wave penetration modelling
- Port layout
- Physical model studies
- Breakwater design
- Harbour sedimentation
- Planning and management of dredging operations
- Quaywalls

WSP

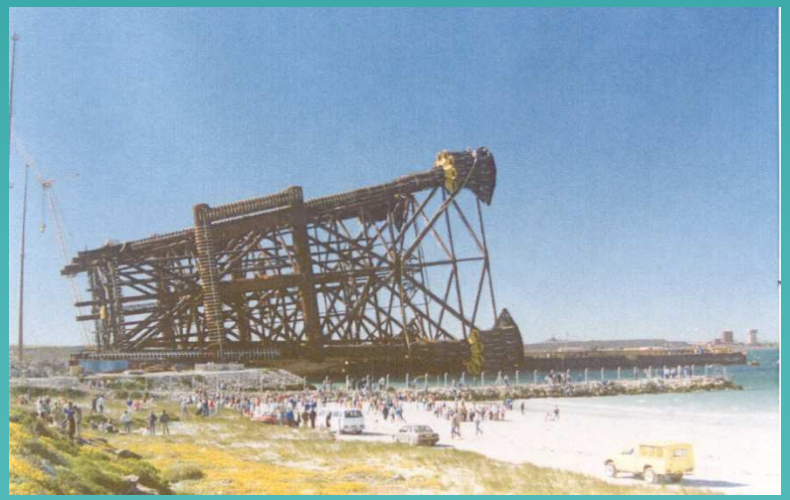
Small Craft Harbours and Marinas

- Boat launching facilities
- Marina layout
- Protective structures
- Fixed and floating moorings
- 



Offshore Facilities

- Environmental loading
- Mooring and anchor systems
- Offshore pipelines and single buoy moorings



WSP

Sea water intakes and outfalls

- Shore crossings
- Intakes, pipelines, discharges
- Marine water quality investigations and dilution studies

WSP

Tourism and Recreational Developments

- Waterfronts
- Resorts
- Beaches
- Jetties and piers
- Tidal pools
- Boardwalks

Marine Structures

- Breakwaters
- Quaywalls; jetties and piers
- Piled, cantilever and gravity structures
- Revetments
- Groynes
- Floating structures

Estuaries

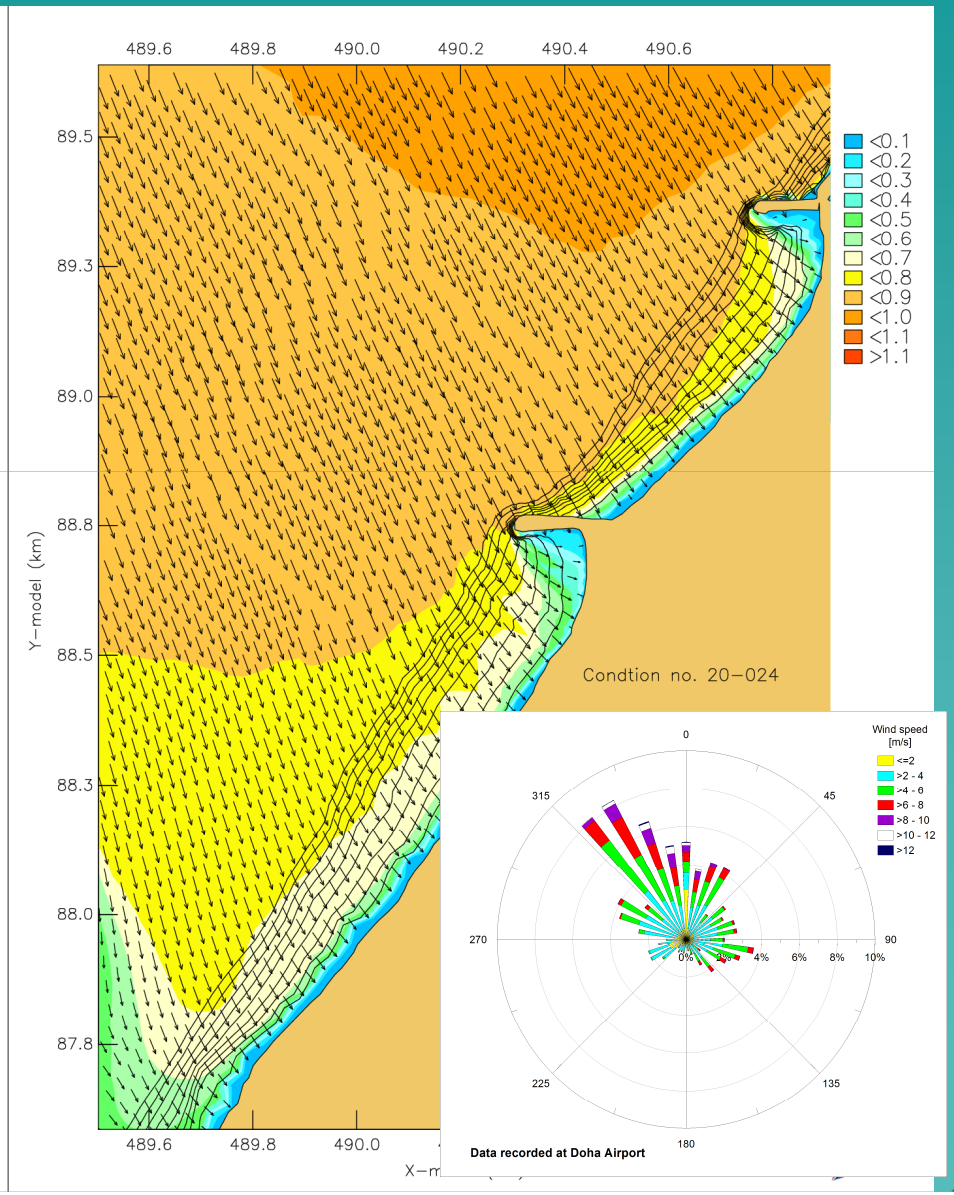
- Flood levels
- Erosion control

Role of Coastal Engineer in Harnessing Ocean Energy

- Environmental Conditions
- Installation design and implementation
- Environmental Impacts

WSP

Environmental Conditions



- Assessment of optimum sites in terms of wave conditions
- Assessment of energy/operational windows at specific sites

Assessment of optimum sites in terms of flow conditions

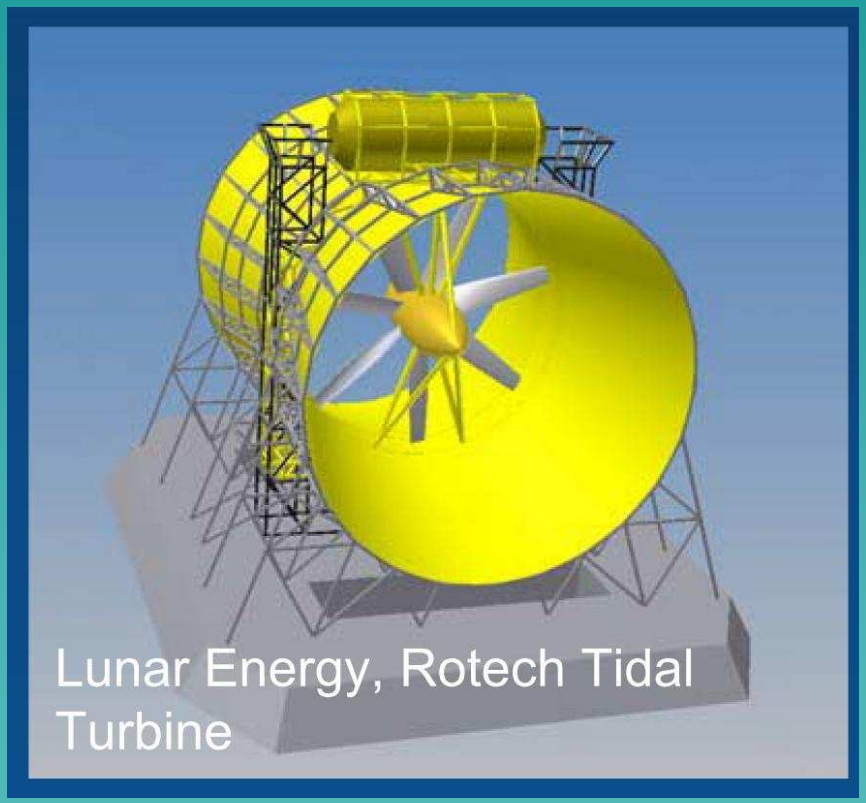
- Animation

current-anim_nomarina-vs-marina.avi

Design and implementation of the installation

- Anchored/Fixed to sea-bed
- Fixed at shoreline

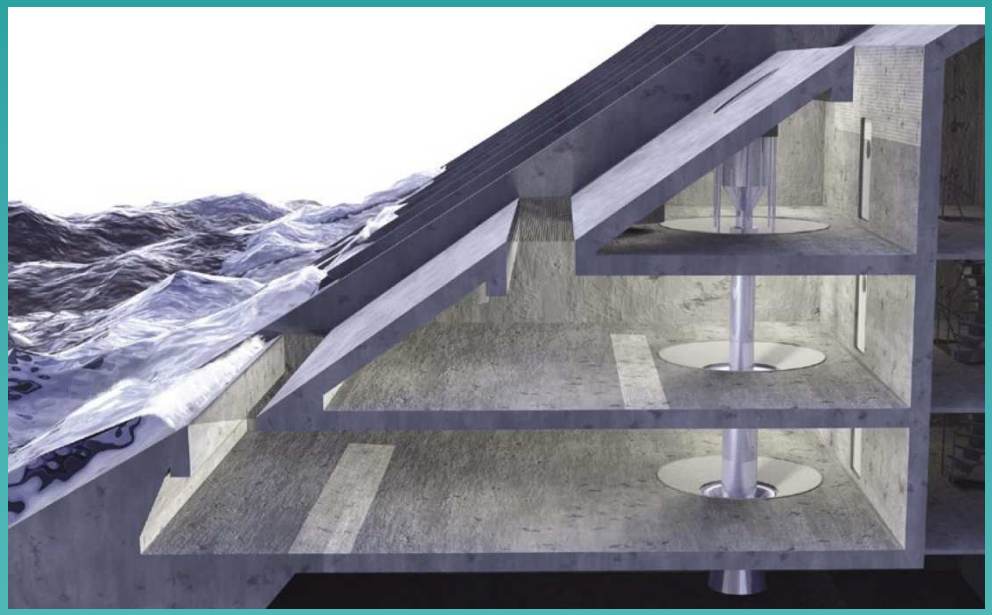
Anchored/fixed to sea bed



Design and implementation: anchoring/sea-bed installation

Connection to shore

Design and implementation: shore-based devices

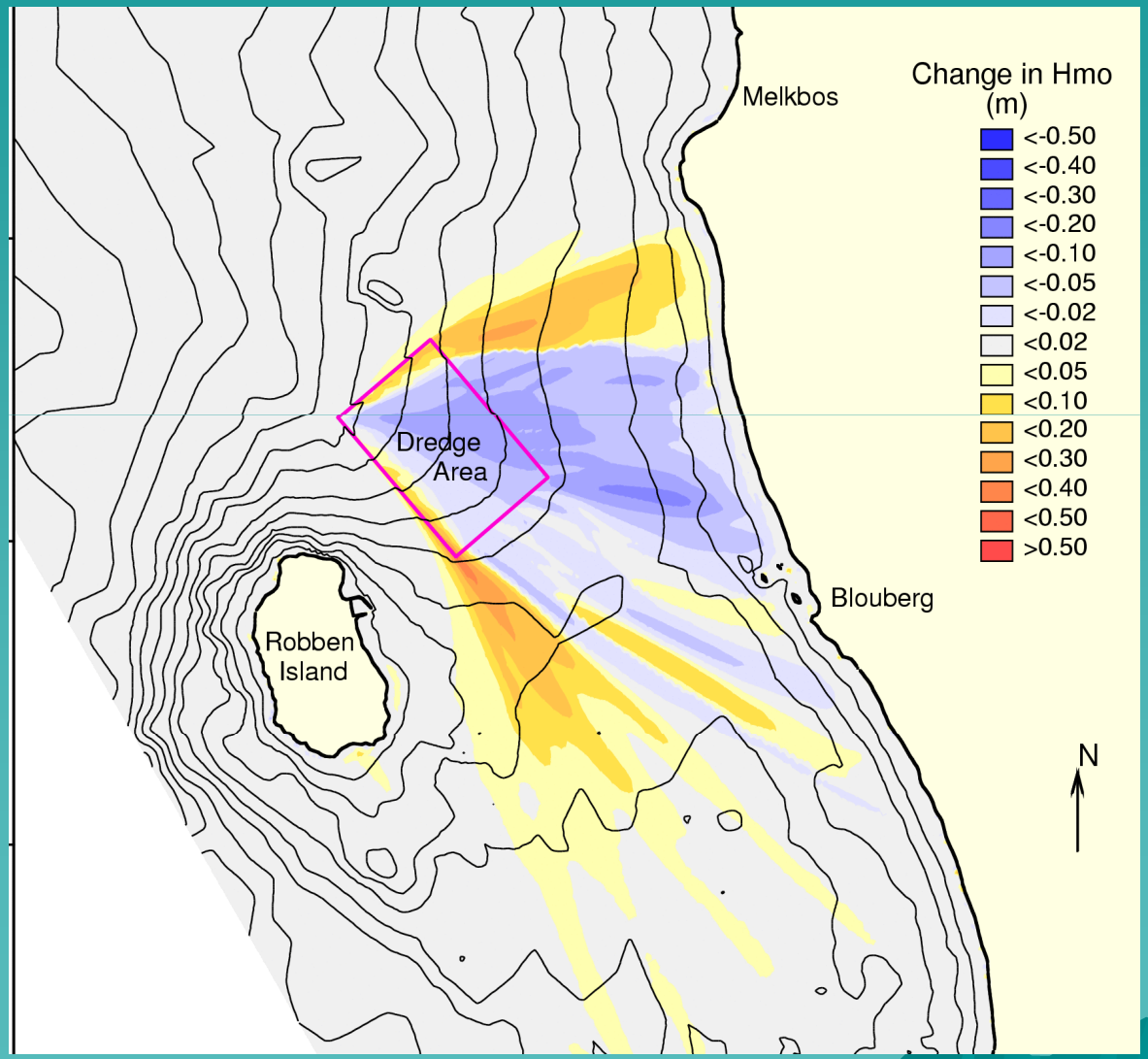


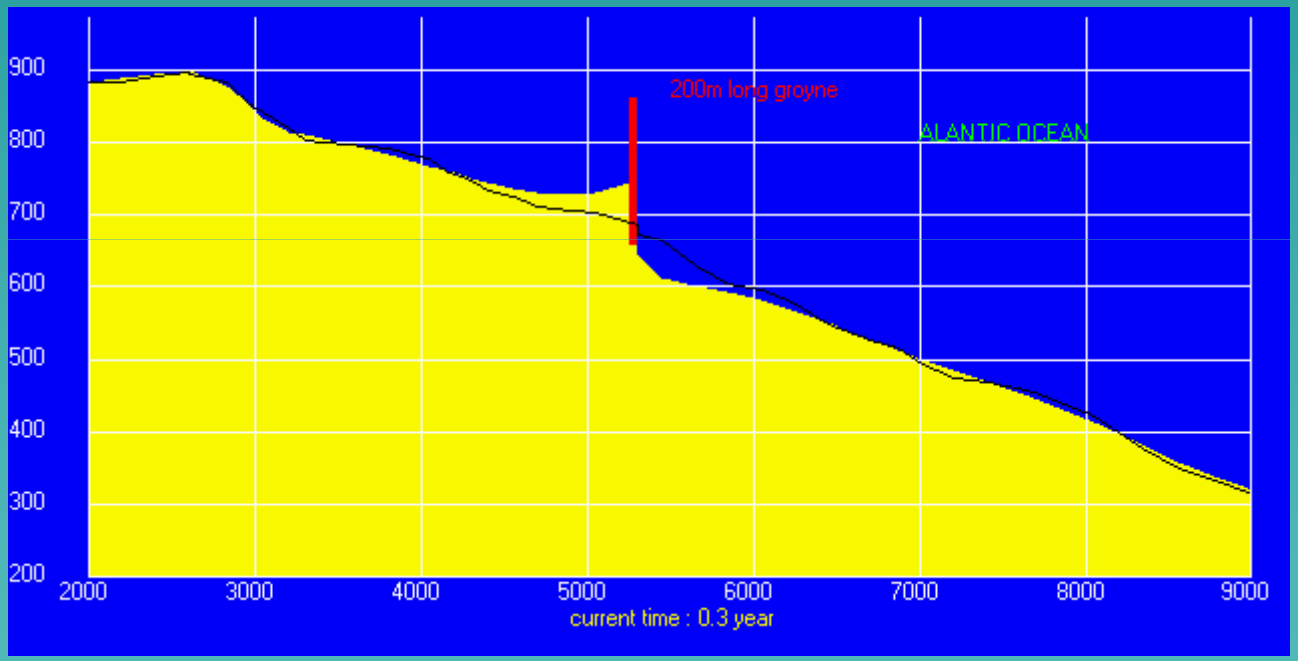
Wave Gen; OWC; Islay, Scotland

Design and implementation: shore-based devices: Structural

Overtopping

Physical Environmental Impacts




900
800
700
600
500
400
300
200
2000
3000
4000
5000
6000
7000
8000
9000
200m long groyne
ATLANTIC OCEAN
current time : 0.3 year

Conclusions

Coastal Engineering Consultants have a significant role:

- Environmental conditions
- Installation design and implementation
- Environmental impact


SPIDER