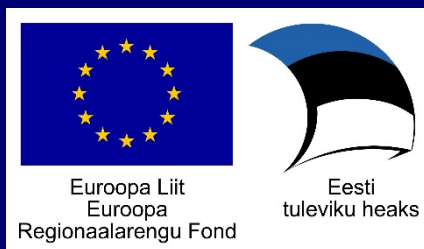


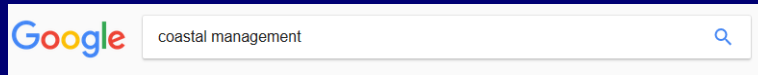
Coastal management as a driver for earth system changes in the Baltic Sea region

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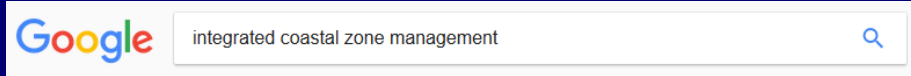


Coastal management - Approaches



- Coastal Management = Coastal Defence
 - Wikipedia – “Coastal management is defence against flooding and erosion, and techniques that stop erosion to claim lands.”
 - Acknowledges
 - Hard engineering – groynes, seawalls, revetment, offshore structures, training walls etc
 - Soft engineering – renourishment, beach dewatering, dune stabilisation
 - Planning- managed retreat, holding the line, limiting development, reclamation
- This is a very limited view of coastal management.

Coastal management - Approaches



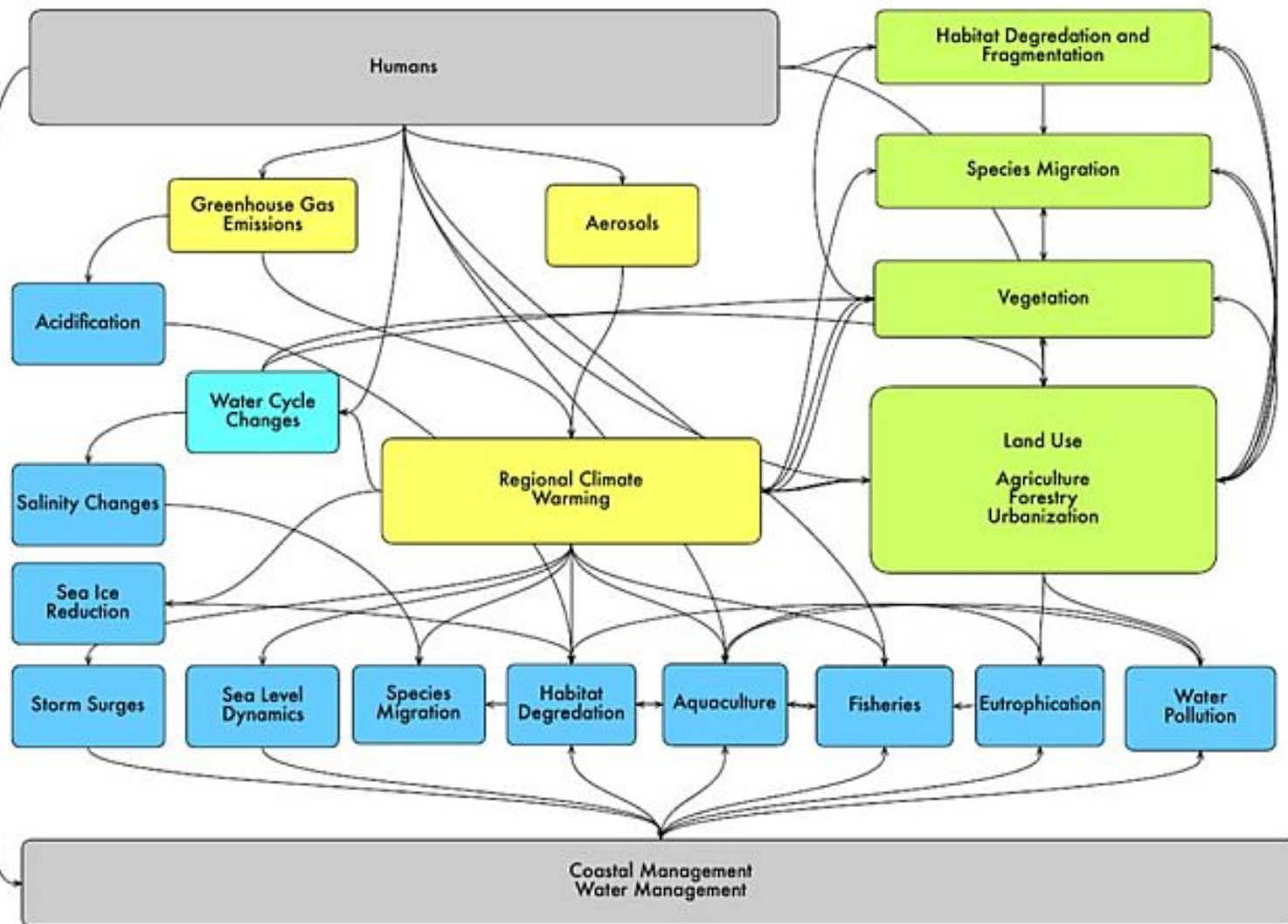
- Integrated Coastal Zone Management
 - European Commission – “A dynamic, multidisciplinary and iterative process to promote sustainable management of coastal zones.”
 - “Successful implementation is still a major challenge to the idea of ICZM.”

Definition of Integrated Coastal Zone Management:

Integrated Coastal Zone Management (ICZM) is a process for the management of the coast using an integrated approach, regarding all aspects of the coastal zone, including geographical and political boundaries, in an attempt to achieve sustainability.

This concept was borne in 1992 during the Earth Summit of Rio de Janeiro. The policy regarding ICZM is set out in the proceedings of the summit within [Agenda 21](#), Chapter 17.

The European Commission defines ICZM as “a dynamic, multidisciplinary and iterative process to promote sustainable management of coastal zones. It covers the full cycle of information collection, planning (in its broadest sense), decision making, management and monitoring of implementation. ICZM uses the informed participation and cooperation of all [stakeholders](#) to assess the societal goals in a given coastal area, and to take actions towards meeting these objectives. ICZM seeks, over the long-term, to balance environmental, economic, social, cultural and recreational objectives, all within the limits set by natural dynamics. 'Integrated' in ICZM refers to the integration of objectives and also to the integration of the many instruments needed to meet these objectives. It means integration of all relevant policy areas, sectors, and levels of administration. It means integration of the terrestrial and marine components of the target territory, in both time and space”^[1].



Reactive Coastal Management

- Reactive Coastal Management – cleaning up the mess
 - Actions taken to remedy or mitigate situations or changes that negatively impact on the coastal environment.
 - Many problems have resulted from past actions that have been undertaken with the best intentions, but without understanding.
 - Reactive management has been the most common approach to coastal management.
 - We can no longer use a 'lack of knowledge' as an excuse for inadequate

Proactive Coastal Management

- Proactive Coastal Management – forward thinking and acting
 - Actions taken to avoid consequent problems
 - Climate-change preparation
 - Providing for the use of resources with a knowledge of the consequences.
 - While not perfect, current knowledge is adequate to make good decisions for earth systems, but good decisions are frequently incompatible with other realities.

Coastal management as a DRIVER of earth system changes

Coastal management **should** result in positive outcomes with any negative consequences anticipated and mitigated.

Law of Unintended Consequences: Locke (1691), Smith (1759), Merton (1936) – An outdated concept for the environment?

- Deliberate (purposive) action may have unanticipated outcomes in which the outcome is beneficial, creates drawbacks or is perverse (makes the problem worse).
- Manipulation of one part of a subsystem can cause effects in other parts of that subsystem or in other subsystems, occasionally in unexpected ways.
- Merton (1936) said that negative unintended consequences were caused by
 - Ignorance (very rarely can this be used as an excuse)
 - Error (multiple checks should be built in to decision processes)
 - Immediacy (immediate interests override long term interests)
 - **Basic values** (examples: private property rights, freedom of navigation, rights to use a resource, sovereign rights)

'Basic values' example from the coastal zone: private property rights OR public property (and environmental) rights

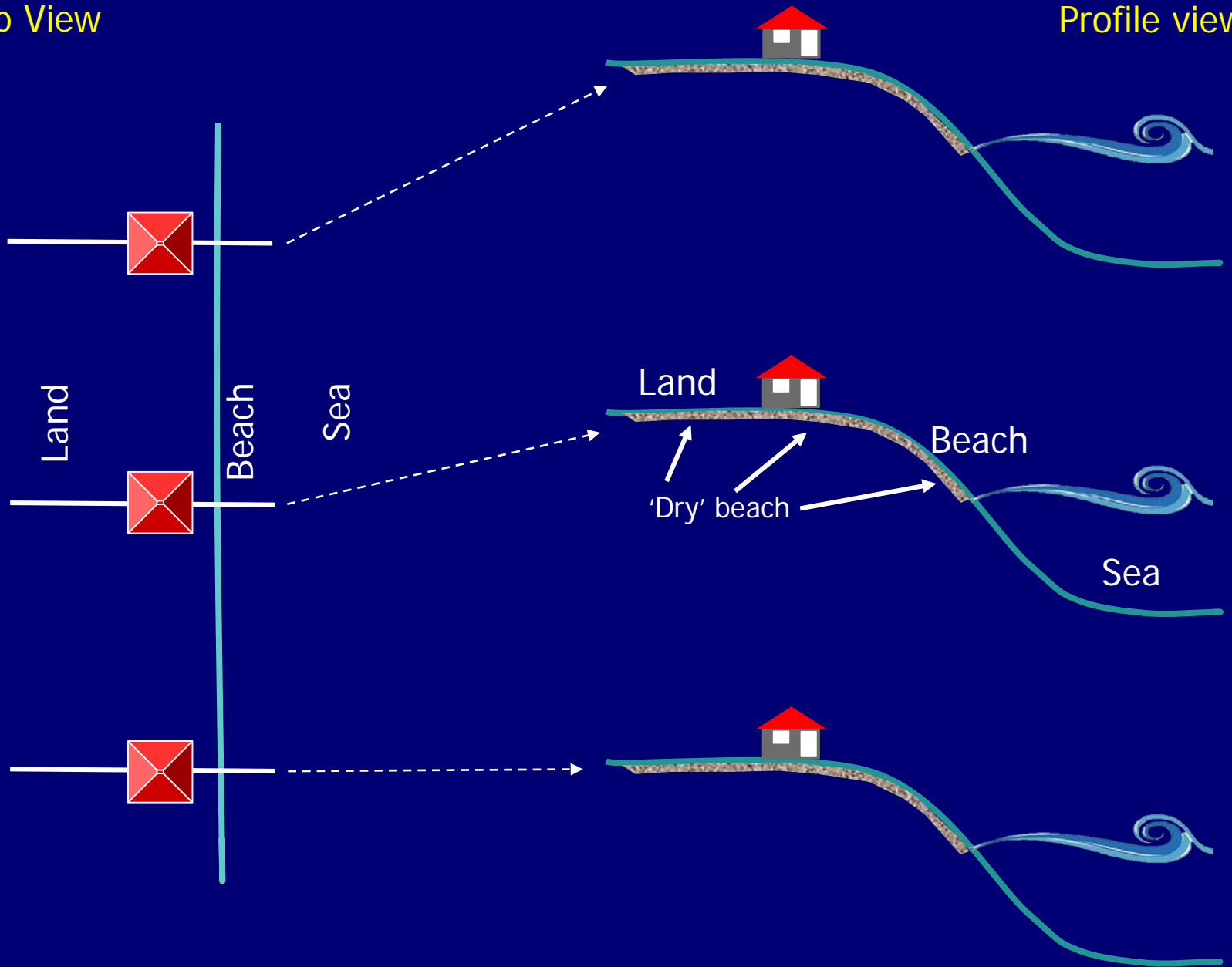
- A seawall built to 'protect' against coastal erosion WILL result in the loss of the dry beach. If that does not happen, then the seawall was unnecessary.
- This happens because of PASSIVE EROSION.
- Should a person have the right to maintain their property boundary, or should a property boundary be ambulatory (thereby protecting the beach albeit at a different, more inland, location)?

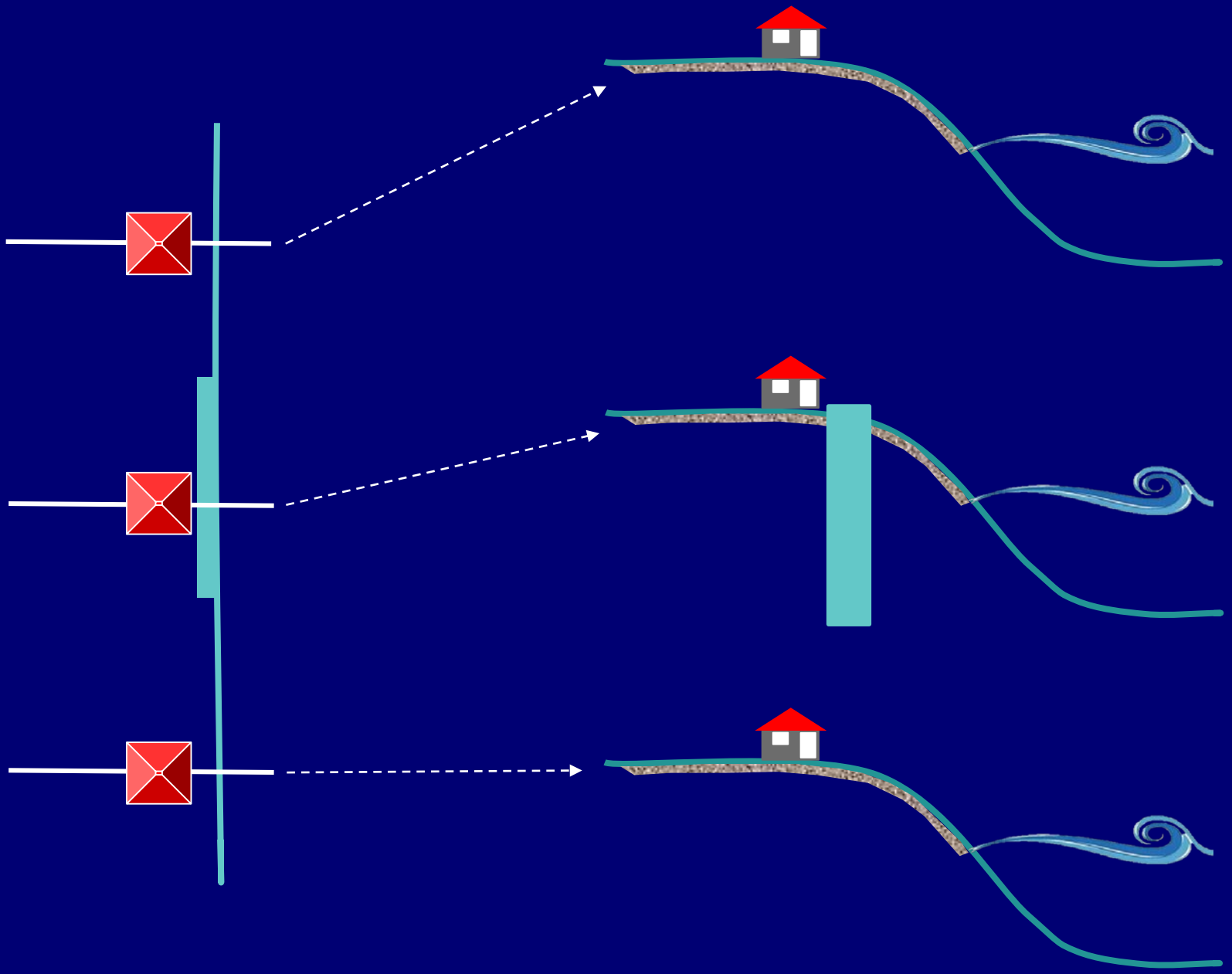
BASIC VALUES: Private property rights OR public property and environmental rights

Until this is resolved, MANAGED RETREAT as a management response to coastal erosion is almost impossible

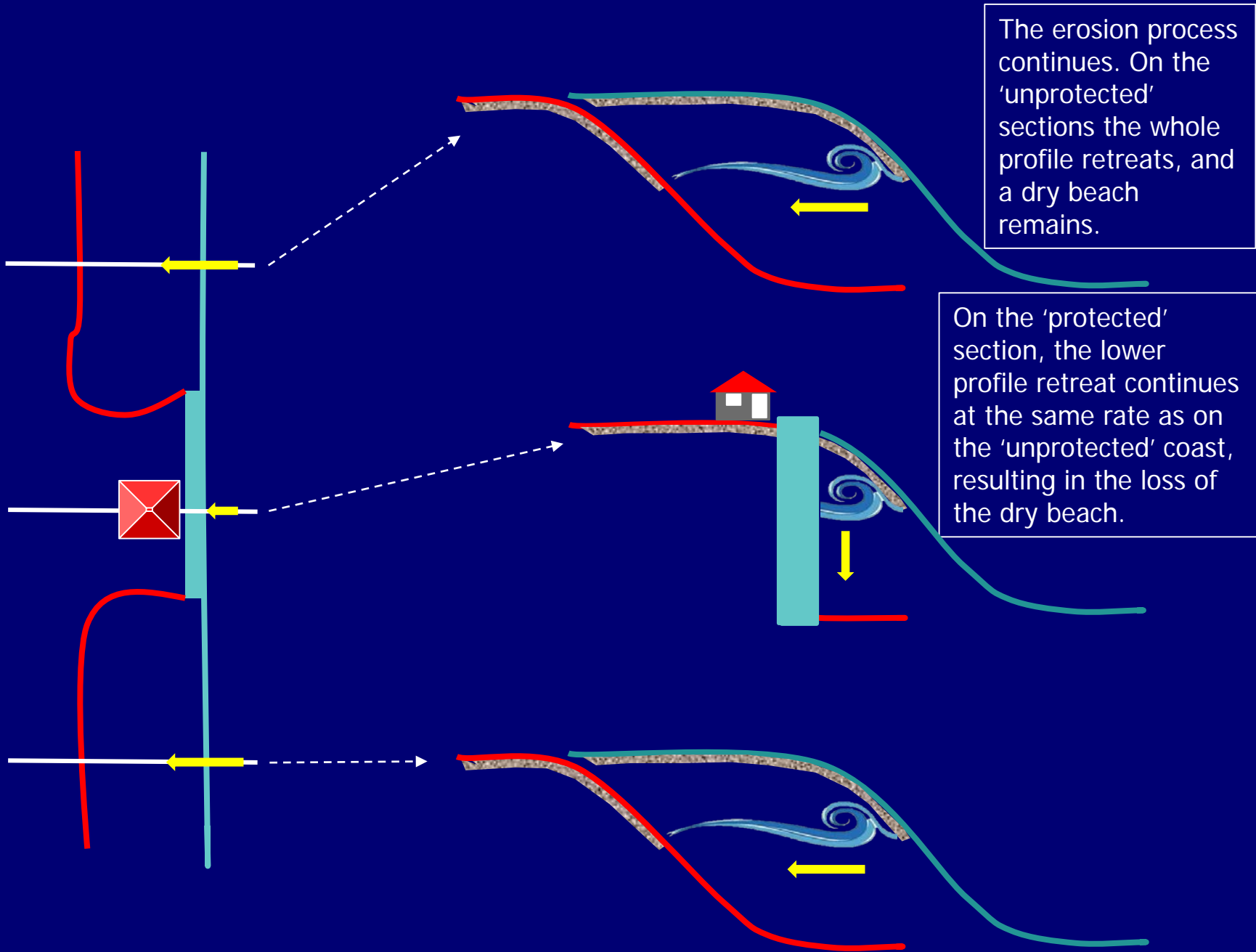
Map View

Profile view



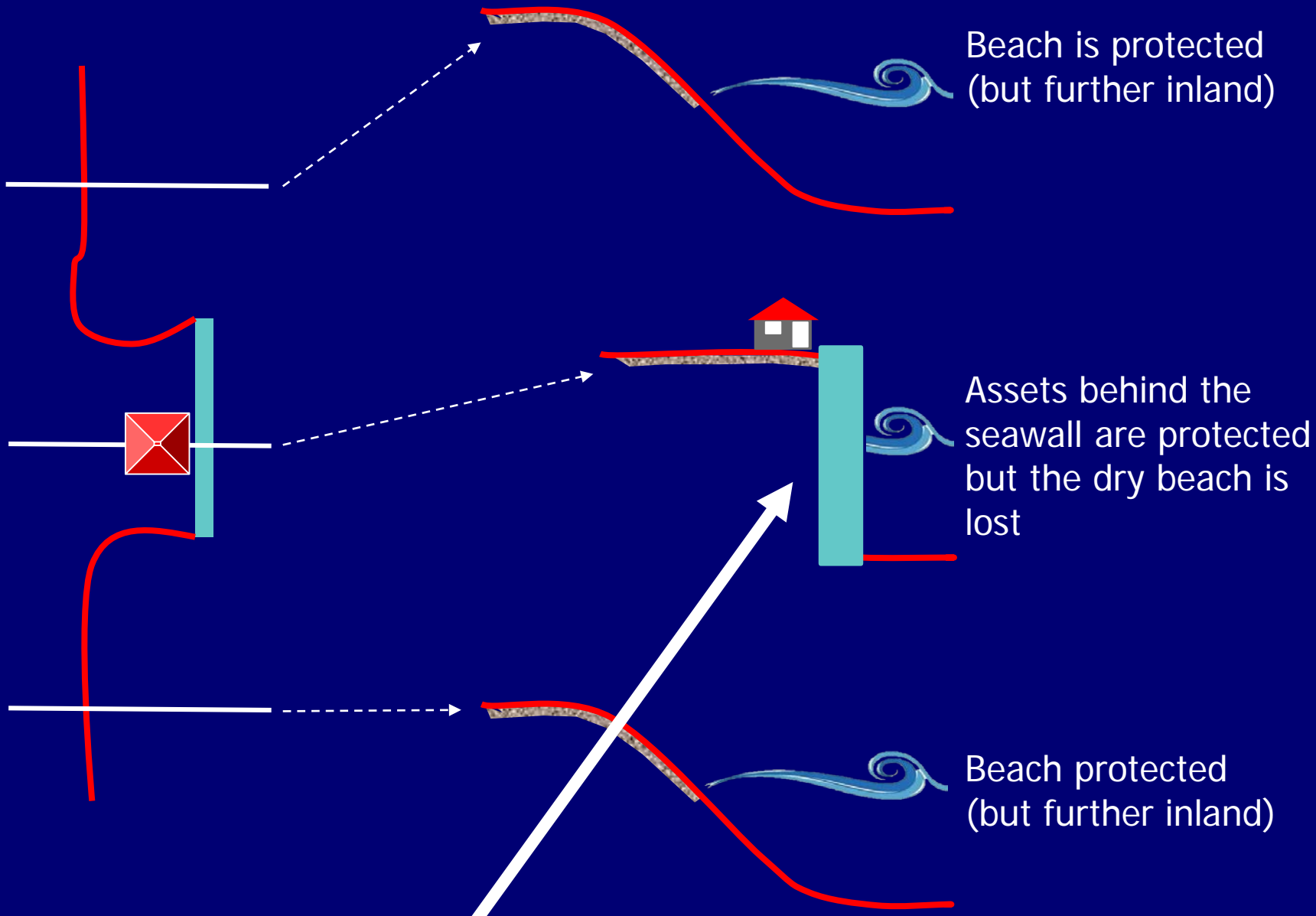


A seawall is built to protect a section of eroding coast



The erosion process continues. On the 'unprotected' sections the whole profile retreats, and a dry beach remains.

On the 'protected' section, the lower profile retreat continues at the same rate as on the 'unprotected' coast, resulting in the loss of the dry beach.

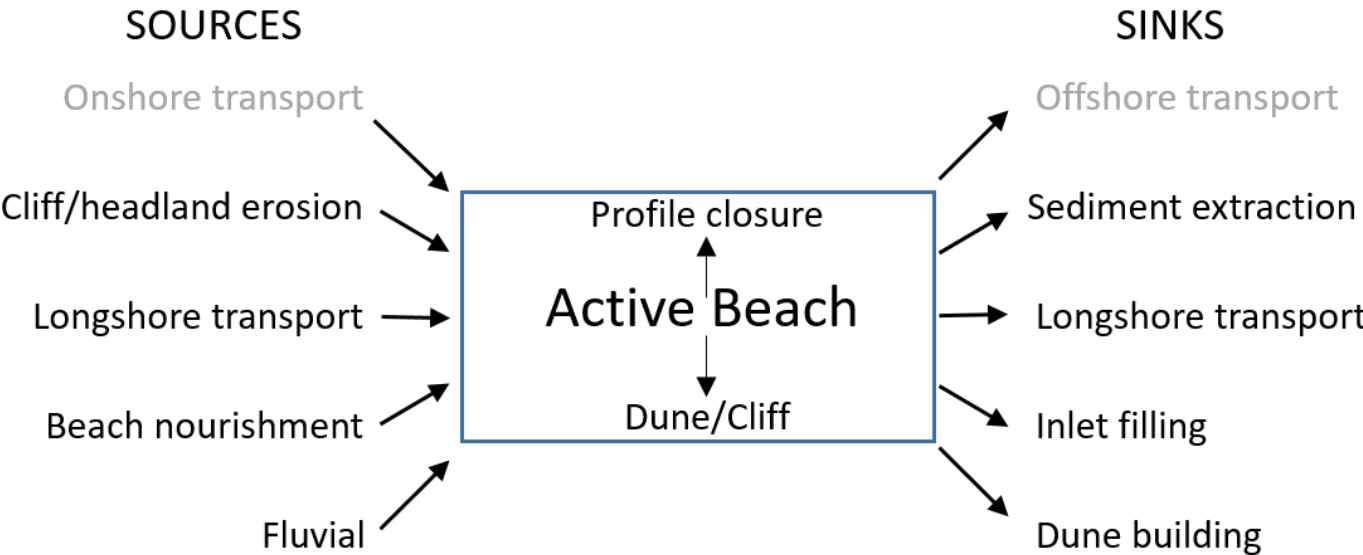


Question: What is the common interpretation of the term "Beach Protection"?

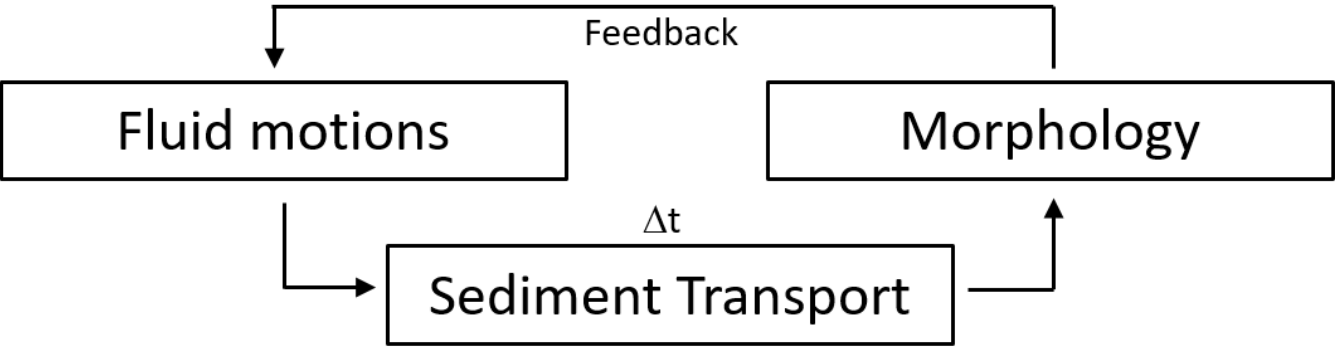
Some coastal management actions that affect the physical coast

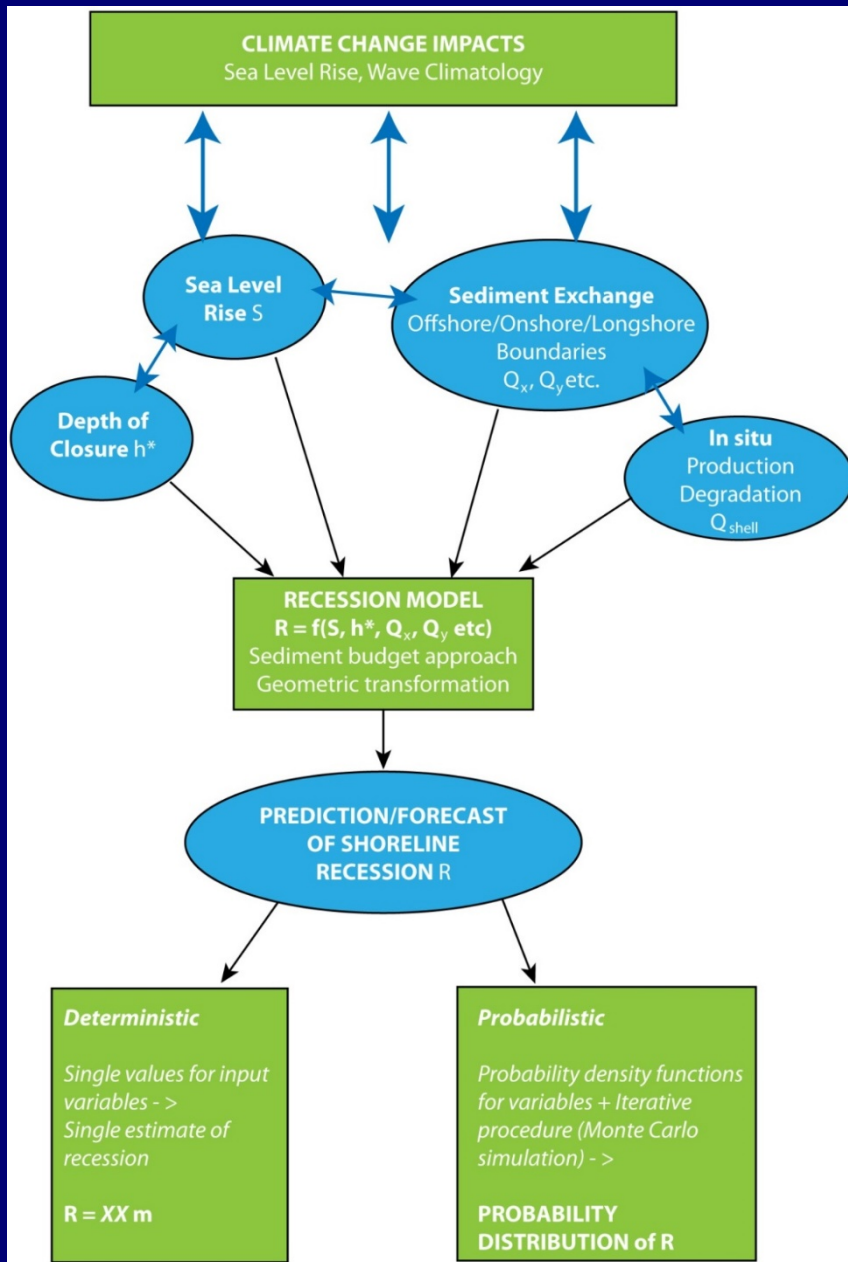
Coastal Management Action	Possible consequence
Seawalls for 'beach protection'	Loss of dry beach
Beach nourishment	Effects on borrow area; Ecological impacts
Groynes	Downdrift erosion
Port development	Updrift and Downdrift effects; Sedimentation and dredging requirement
Insurance	Encourages inappropriate rebuilding
Dune stabilisation	Loss of available sediment buffer
Managed retreat	Displacement; Violates rights of individuals
Aggregate extraction	Direct loss to sediment budget
Dams on rivers	Decreased sediment supply to coast

SEDIMENT BUDGET



MORPHODYNAMICS





- At what scale do we apply these methods?
- SEDIMENT COMPARTMENTS may be appropriate
- Analogous to CATCHMENTS
- NESTED sediment compartments are used depending on the problem
 - Primary
 - Secondary
 - Tertiary



Australian Government
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COASTAL SEDIMENT COMPARTMENTS

June, 2013

SCALE 1:22 000 000
0 1000 km

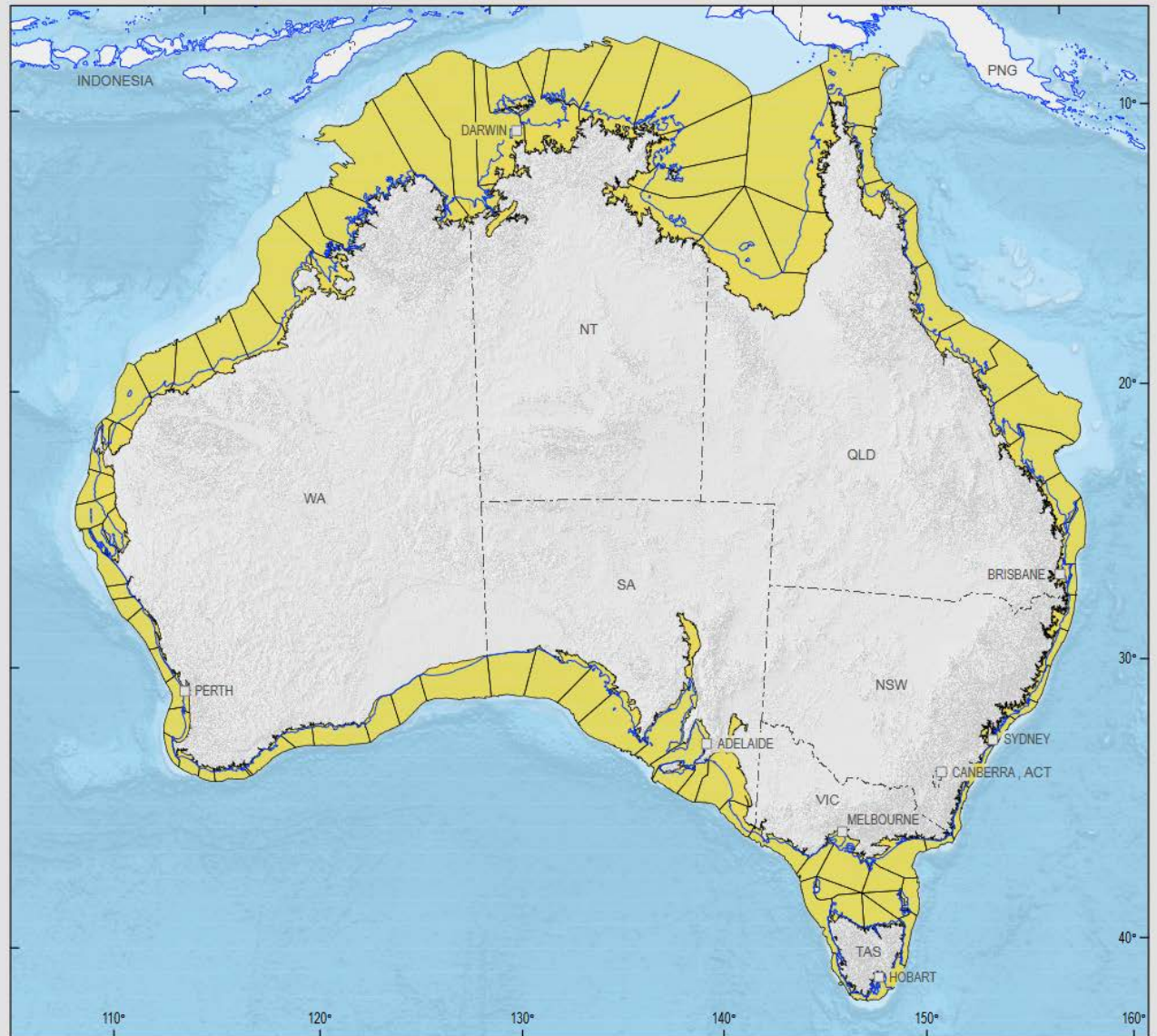
LAMBERT CONFORMAL CONIC PROJECTION
Central Meridian: 134°E Standard Parallels: 18°S, 36°S
Geocentric Datum of Australia

Legend

-  Primary compartments
-  Coastline
-  State border
-  Capital cities



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Australian Government
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COASTAL SEDIMENT COMPARTMENTS

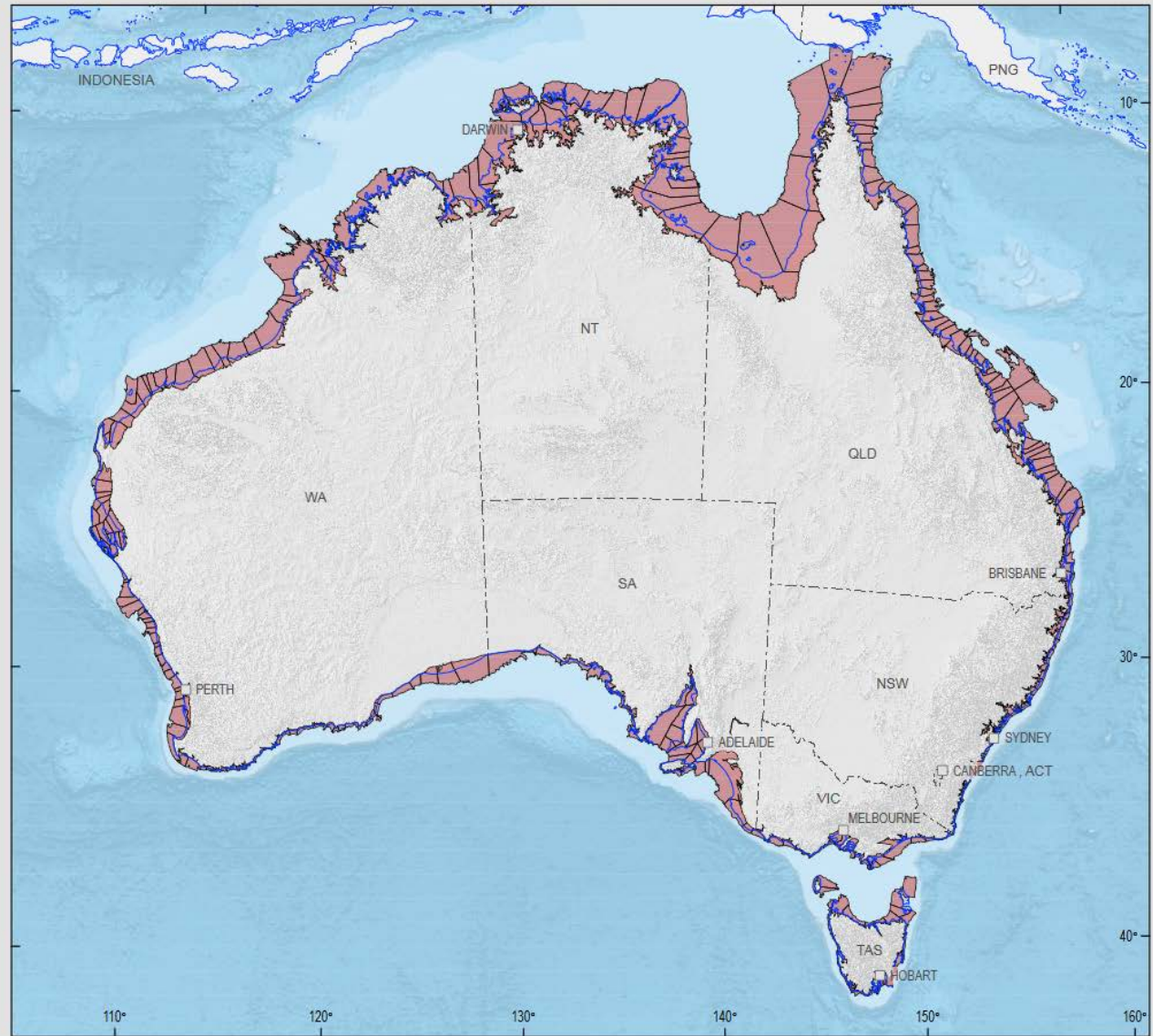
June, 2013

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COASTAL COMPARTMENT SCALES, USE AND TIMEFRAMES

PRIMARY

Defined by large landforms (headlands, rivers).

Suitable for large scale engineering works and long-term strategic plans.



LONG TERM MANAGEMENT TIMEFRAMES



SECONDARY

Defined by sediment movement on shoreface within and between beaches.

Suitable for regional planning & engineering decisions.



INTERDECADAL MANAGEMENT TIMEFRAMES



TERTIARY

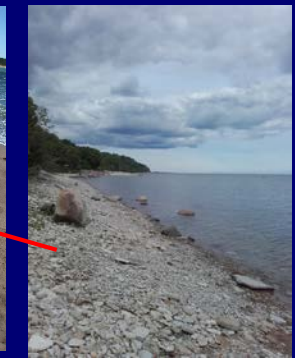
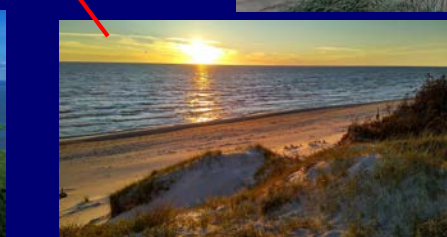
Sediment moves in the nearshore area (often individual beaches).

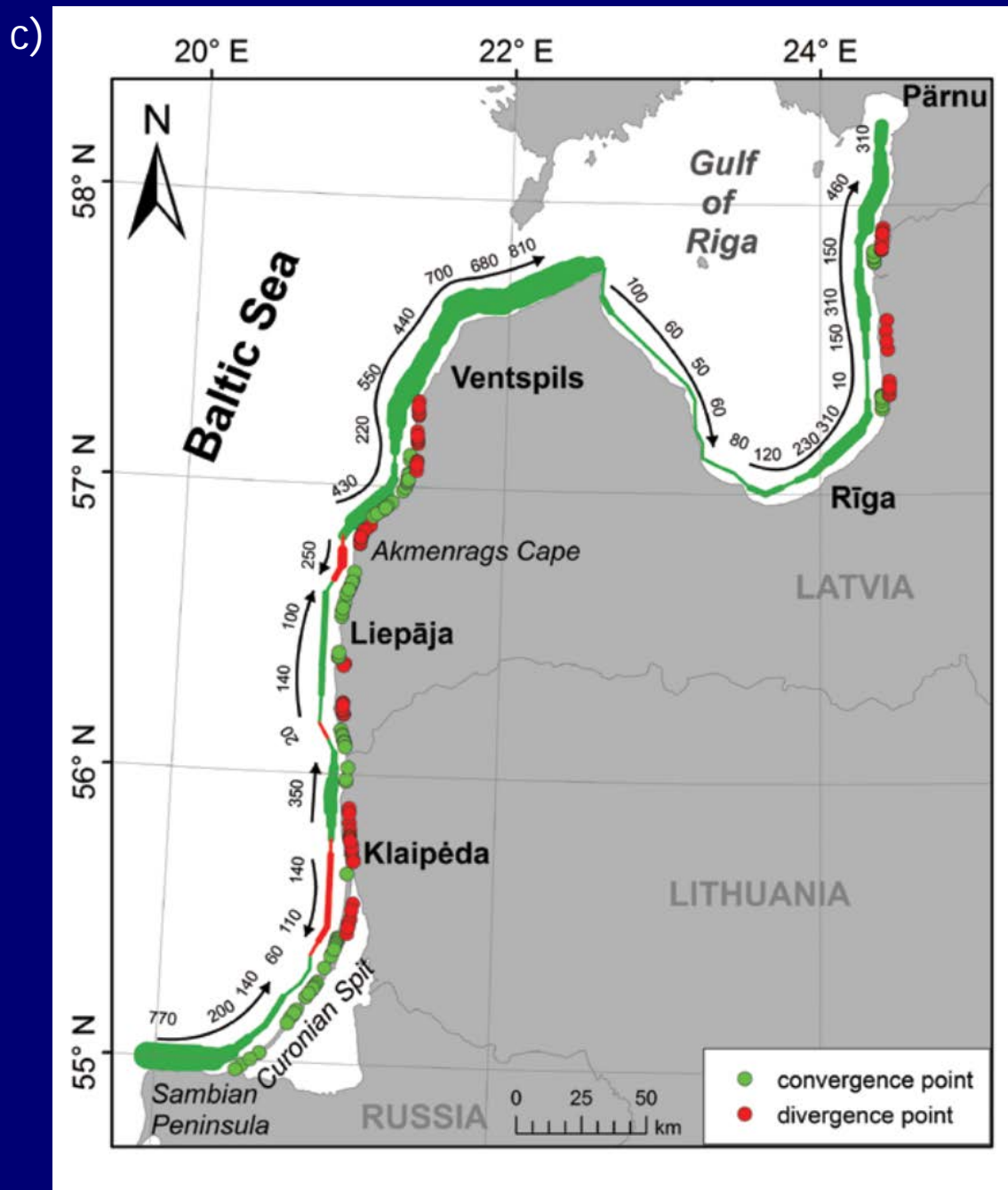
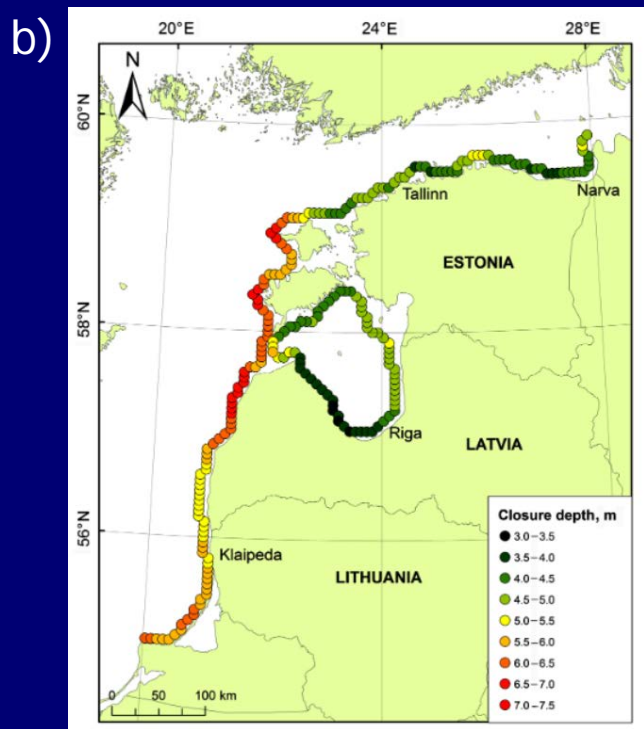
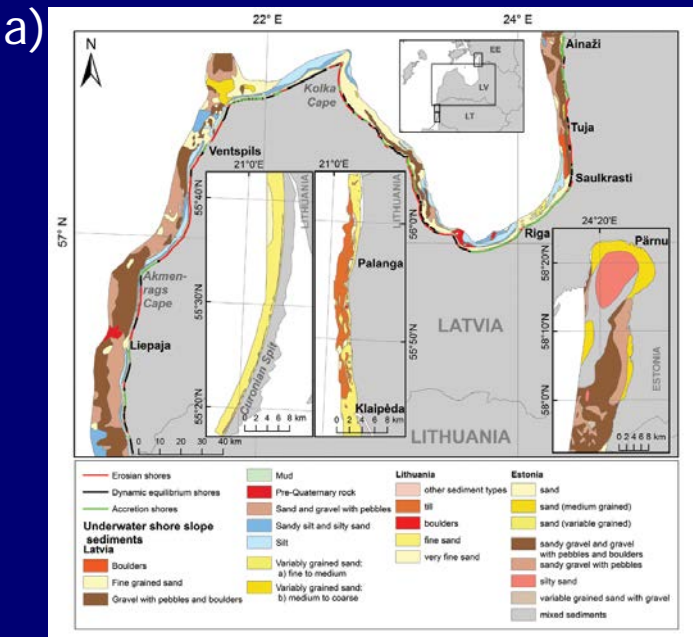
Suitable for detailed impact studies and local management plans for vulnerable areas.



DECADAL MANAGEMENT TIMEFRAMES



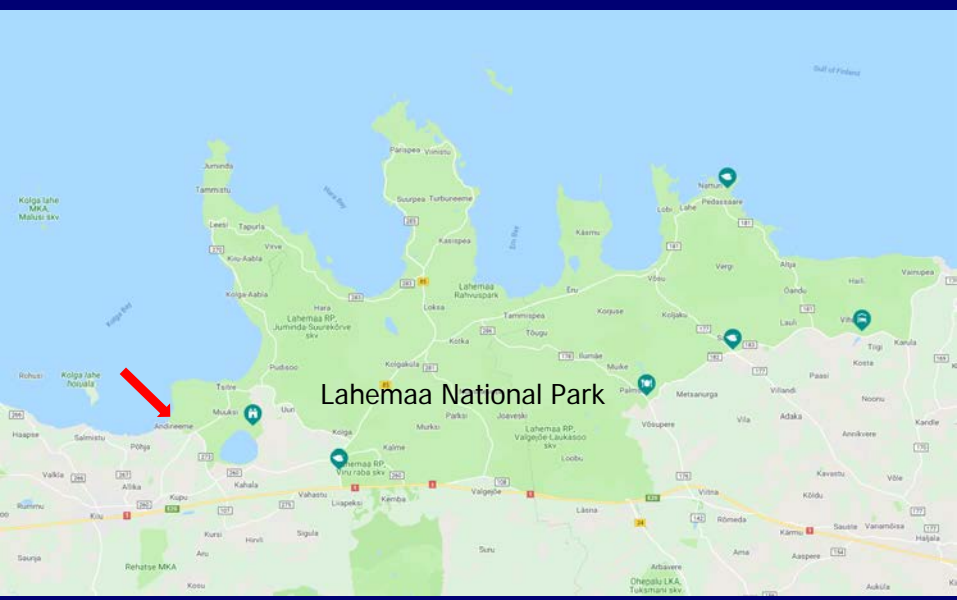
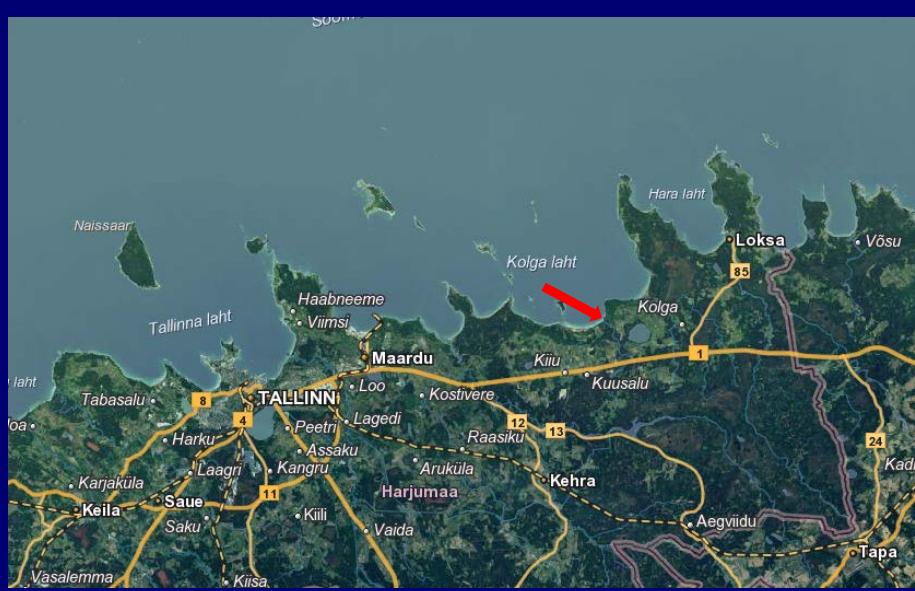
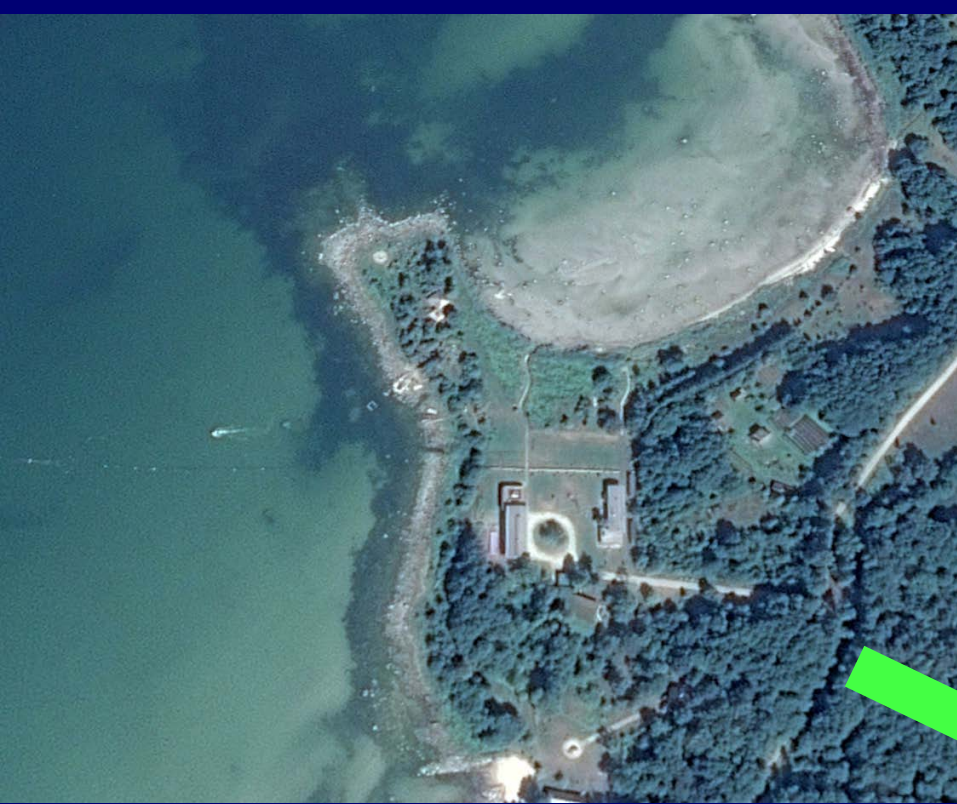




a) and c) Viška and Soomere (2013); b) Soomere et al (2013)



Sources: www.portofklaipeda.lt and Google Earth



Conclusions

- We are moving from REACTIVE to PROACTIVE coastal management.
- We can no longer use 'lack of knowledge' as an excuse for poor coastal management.
- Coastal management, as a set of actions, is legitimately an important earth system driver.
- Effective coastal management needs to work within Values Systems.
- For management of the physical coast, sediment budget and morphodynamic approaches are effective.