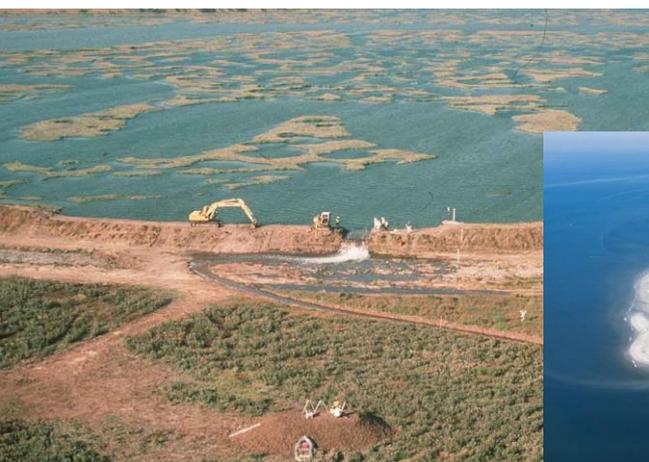
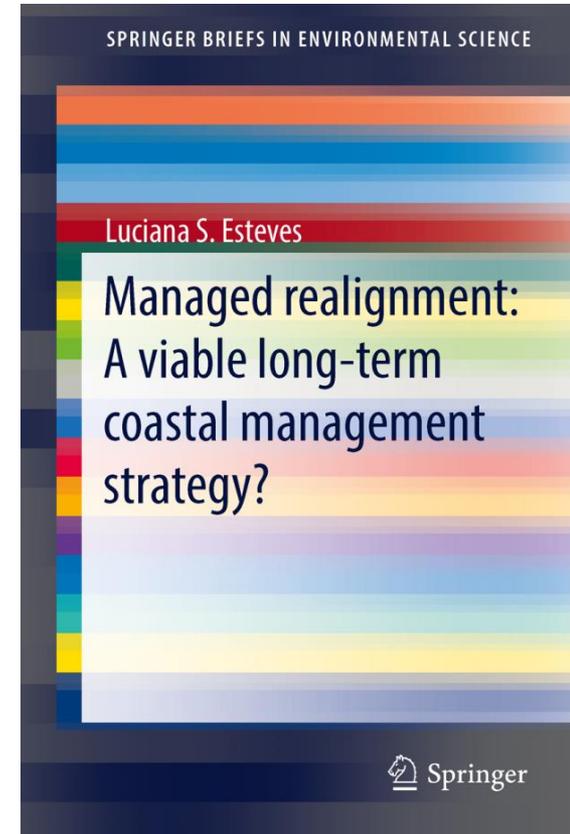


SOLUÇÕES EUROPEIAS PARA O GERENCIAMENTO COSTEIRO: REALINHAMENTO DA LINHA DE COSTA E SERVIÇOS ECOSISTÊMICOS COMBINANDO A GESTÃO DOS RISCOS DE EROSIÃO/ INUNDAÇÃO E A CRIAÇÃO DE HABITATS



O conteúdo

- Motivação
- A era da de-engenharia(?)
- Definição e conceitos
- Exemplos
- Obstáculos
- O futuro



Motivação

Informação

Riscos



Dawlish Warren



© 2014 Teignbridge District Council



ss breach in
glers Lane.

Nov 1908 damage
to sea wall at
Coastguards.

n platform.



1855



1908

1974



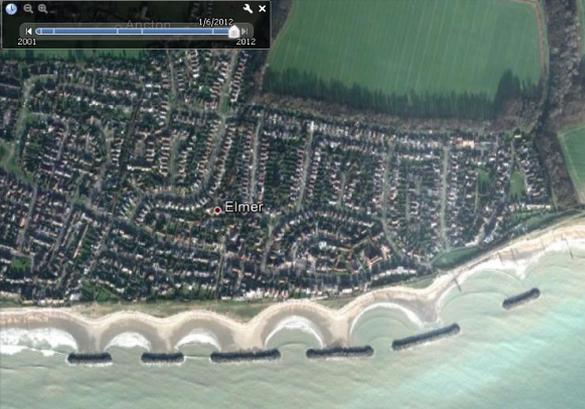
© Vagner Vidal/INS News Agency Ltd



© BNPS.CO.UK



A era da engenharia



- Mudanças climáticas
- Preocupações ambientais
- Sustentabilidade social e econômica

Alternativas que trazem múltiplos benefícios

Estratégias de longo prazo

Prestação de serviços ecossistêmicos

Coastal squeeze

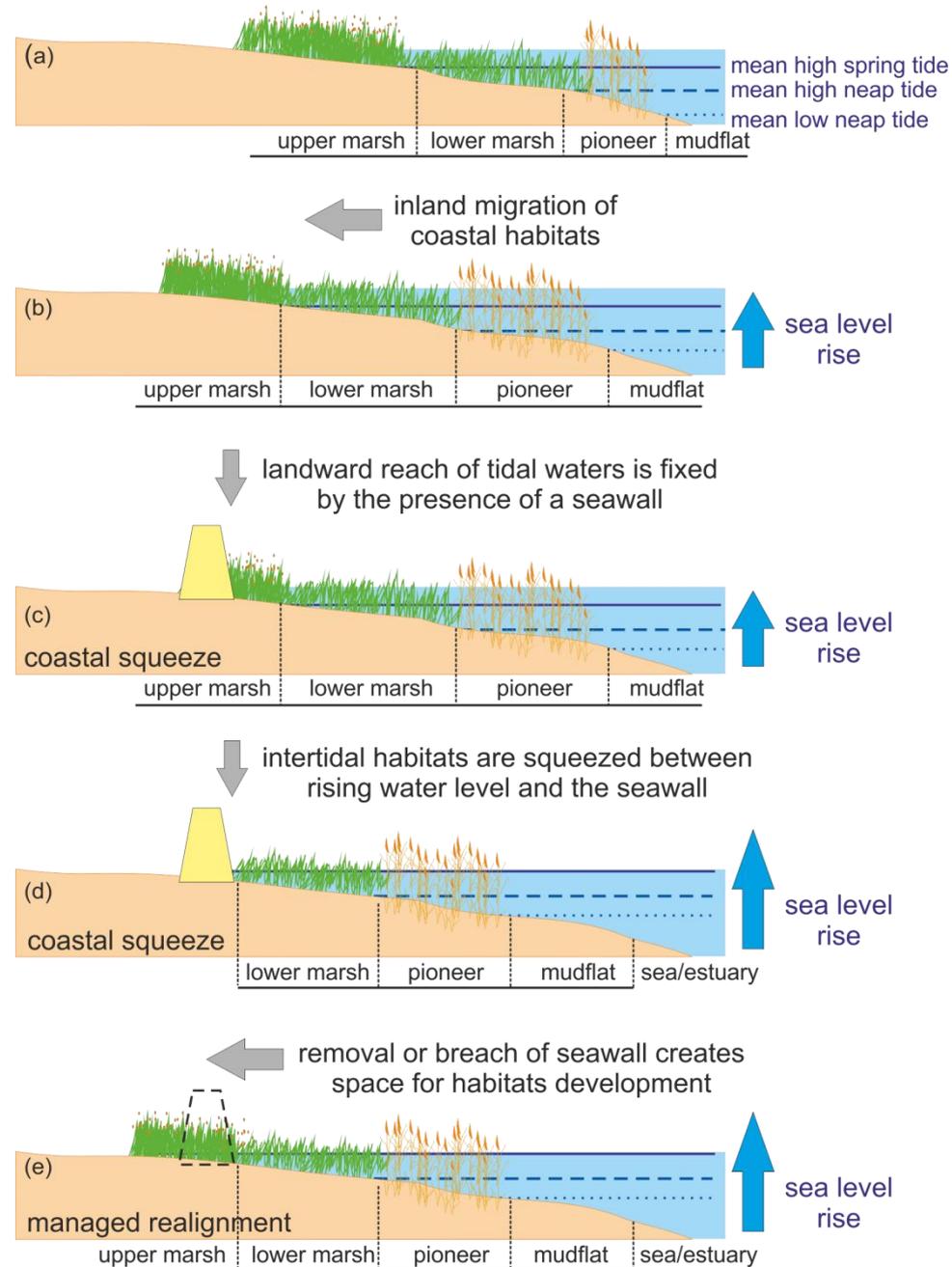
EU Birds Directive

EU Habitats Directive

Natura 2000

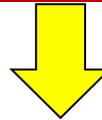
Special Areas of Conservation (SAC)

Special Protection Areas (SPA)



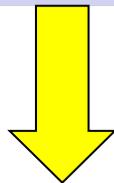
Policy-driven changes in the approach to erosion and flood risk management

EU Birds Directive + Habitats Directive + Floods Directive



National policies - Making Space for Water (2005) priorities:

1. to reduce the threat to people and property and
2. to enhance sustainability by adopting measures that deliver the greatest **environmental** and socio-economic benefits (i.e. ecosystem services).



Shoreline Management Plans

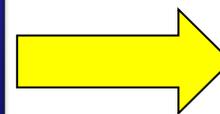
0-20 yrs

20-50 yrs

50-100 yrs

Managed realignment

A shift from traditional hard engineering



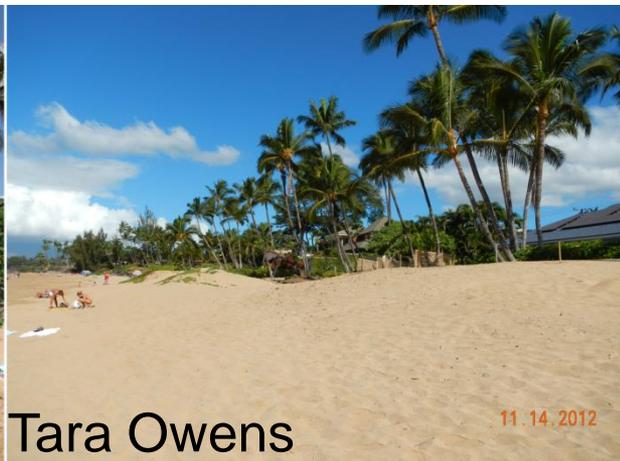
Looking into the future???

A era da de- engenharia



**+850 represas foram removidas nos
ultimos 20 anos nos EUA**

A era da de-engenharia



Photos: Tara Owens

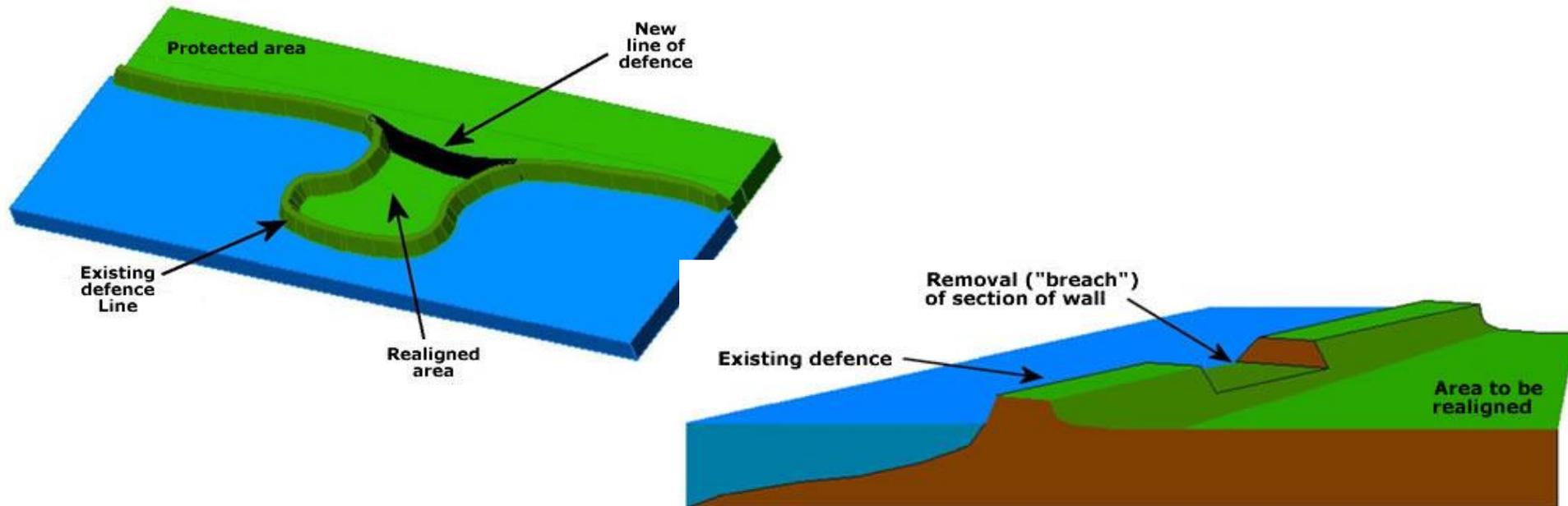


Definição de 'managed realignment'

...the deliberate process of realigning river, estuary and/or coastal defences

- *retreating to higher ground,*
- *constructing a set-back line of defence,*
- *shortening the overall defence length to be maintained,*
- *reducing wall or embankment heights or*
- *widening a river flood plain.*

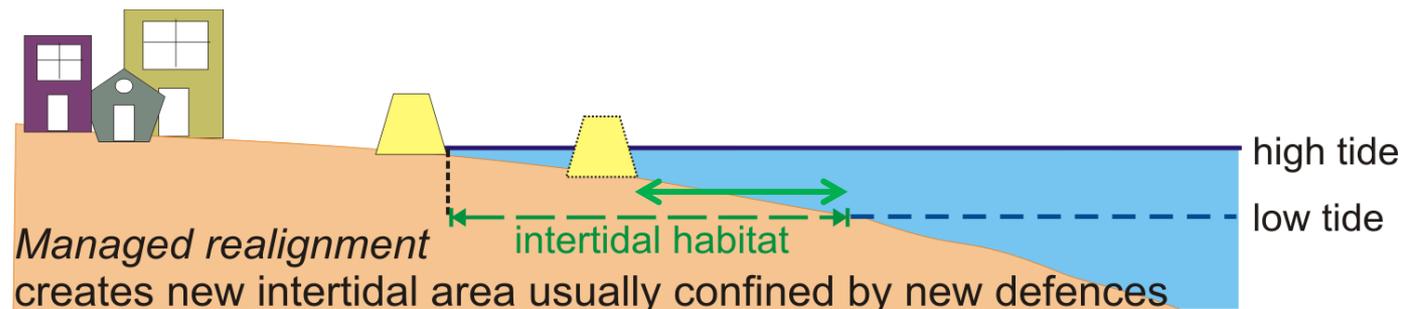
(Defra, 2002, p.1).



O objetivo

(Defra, 2002, p.1).

- *“Reduce costs by shortening the overall length of defences to be maintained;*
- *Increase the efficiency and long term sustainability of flood and coastal defences by recreating habitats and using their flood and storm buffering capacity;*
- *Provide other environmental benefits through re-creation of natural habitats; or*
- *Provide replacement habitats in or adjacent to a European designated site to compensate for habitat loss as a result of reclamation or coastal squeeze.”*



Terminologia

- Uso inconsistente da terminologia
- Preferencias regionais
- Modificações ao longo do tempo

- managed realignment
- coastal realignment
- managed retreat
- set back
- de-embankment
- depoldering
- regulated tide exchange (RTE)
- controlled reduced tide (CRT)



O que é '*managed realignment*' (realinhamento costeiro planejado)?

- It is a soft engineering approach aiming to promote (socio-economic, environmental and legal) **sustainability** of coastal erosion and flood risk management by creating **opportunities** for the realisation of the **wider benefits** provided by the natural **adaptive capacity** of coastlines that are allowed to **respond more dynamically** to environmental change.
- '*managed*' refers to take purposefully actions, to plan, implement and monitor projects
- '*realignment*' refers to the position of the shoreline and/or the line of defences.

(Esteves, 2014)

Types of managed realignment

Removal, breach or realignment of existing defences (UK)

Controlled tidal restoration

- a) *Regulated tidal exchange*: tidal flow into embanked areas is controlled through culverts and sluices (UK, France).
- b) *Controlled reduced tide*: linked to flood control areas (Belgium, Netherlands, Germany).

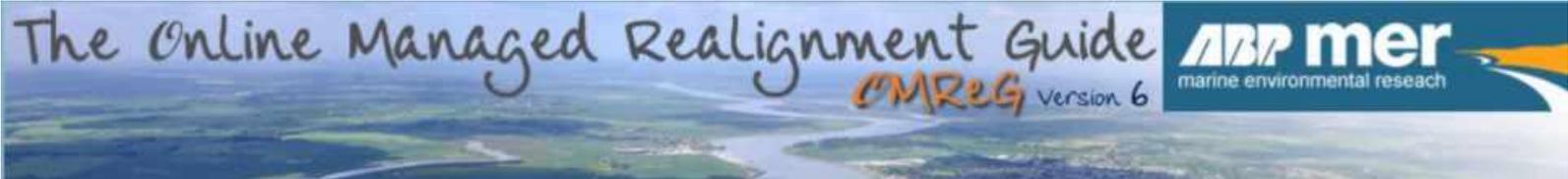
Managed retreat: relocation of structures and people at risk to areas of lower risk (USA, recent strategies in NZ, AU, France).

Unmanaged intertidal habitat restoration: habitat restoration without human intervention (southern Europe).



Bournemouth University

Managed realignment in Europe



Total: 54 projects (2,217 ha)

2 Removal of defence

14 Breach of defence

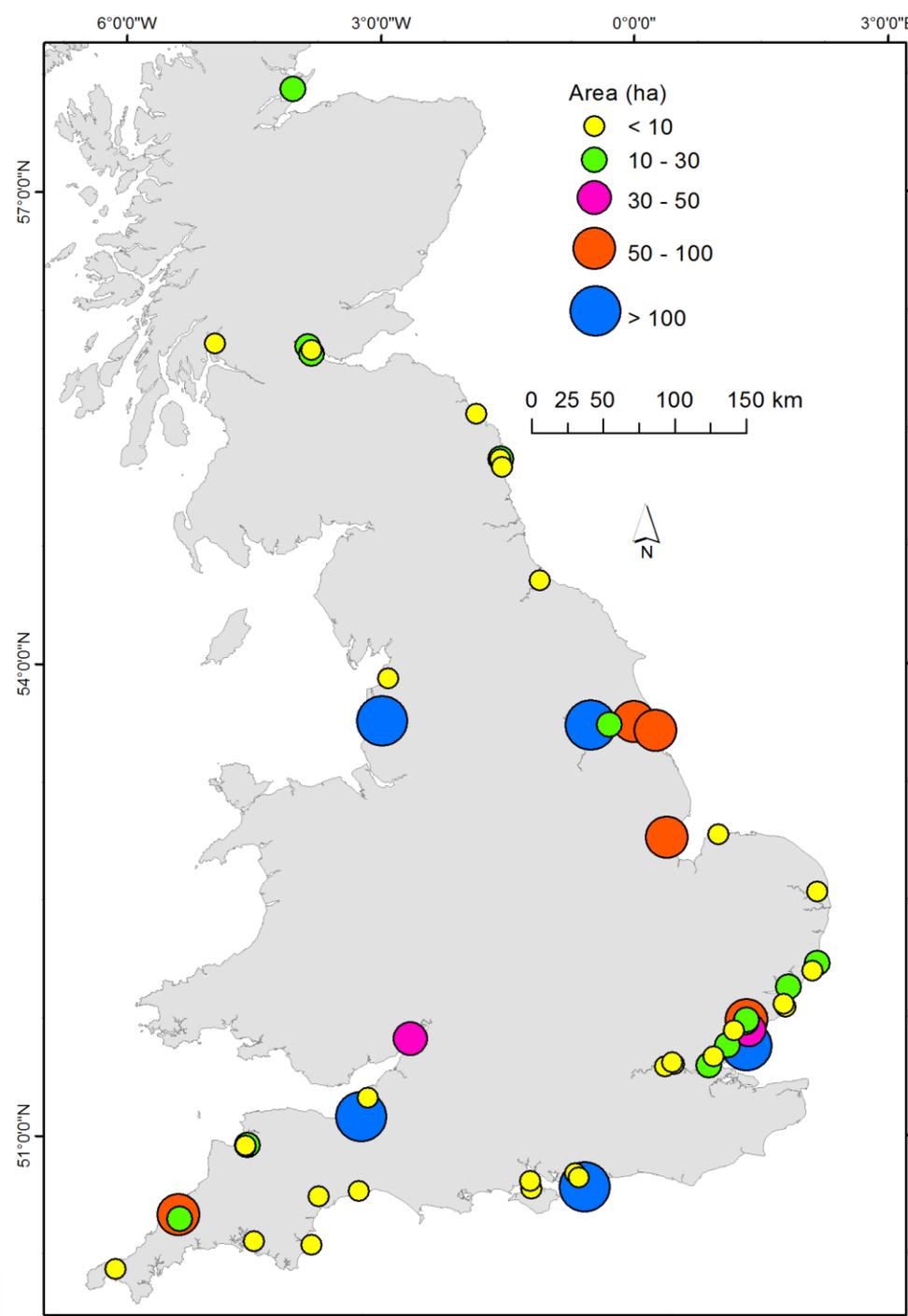
18 Regulated tidal exchange

20 Realignment of defence

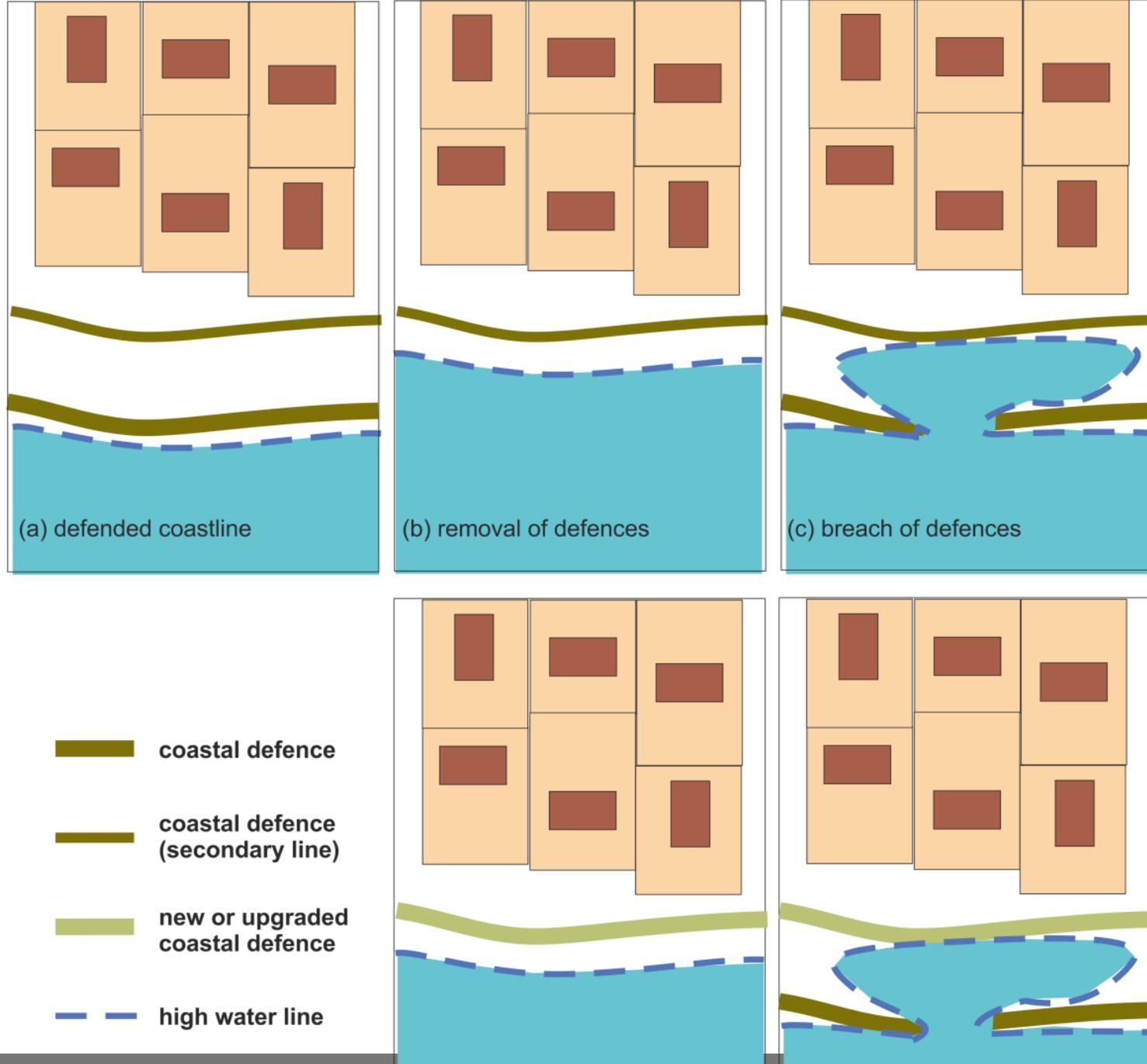
Great majority: small size and low-lying.

Flood defences were in poor conditions at all sites.

About 80% of all projects are within or adjacent to conservation areas of European importance.



Removal, breach and realignment of defences



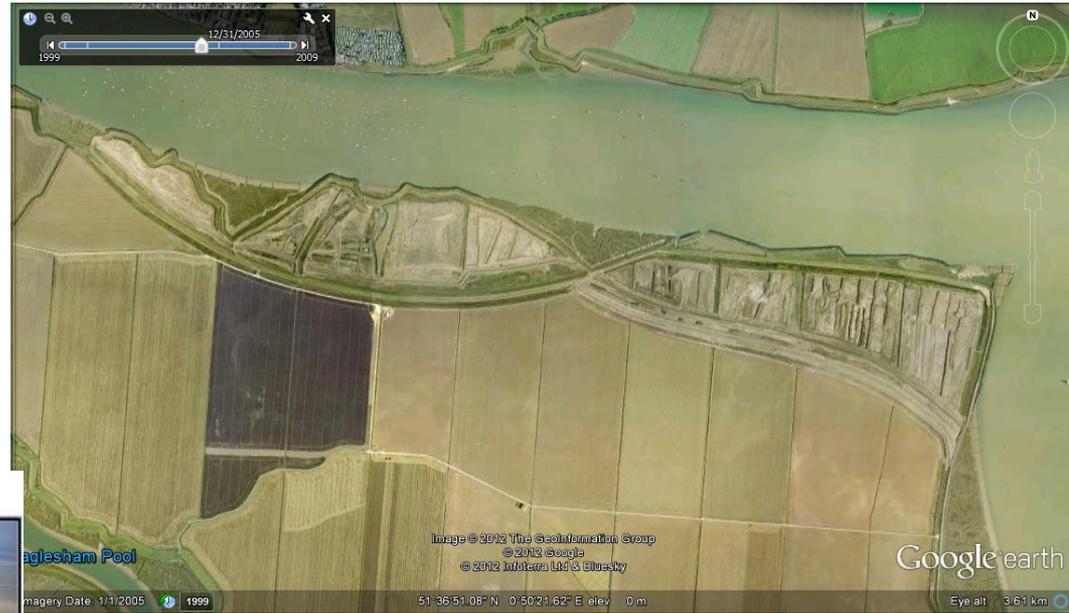
Realignment of the seawall at Littlehaven Beach in 2013 was an integral part of the local regeneration plan to increase the aesthetic and amenity value of the beach frontage, in addition to improvement of coastal protection



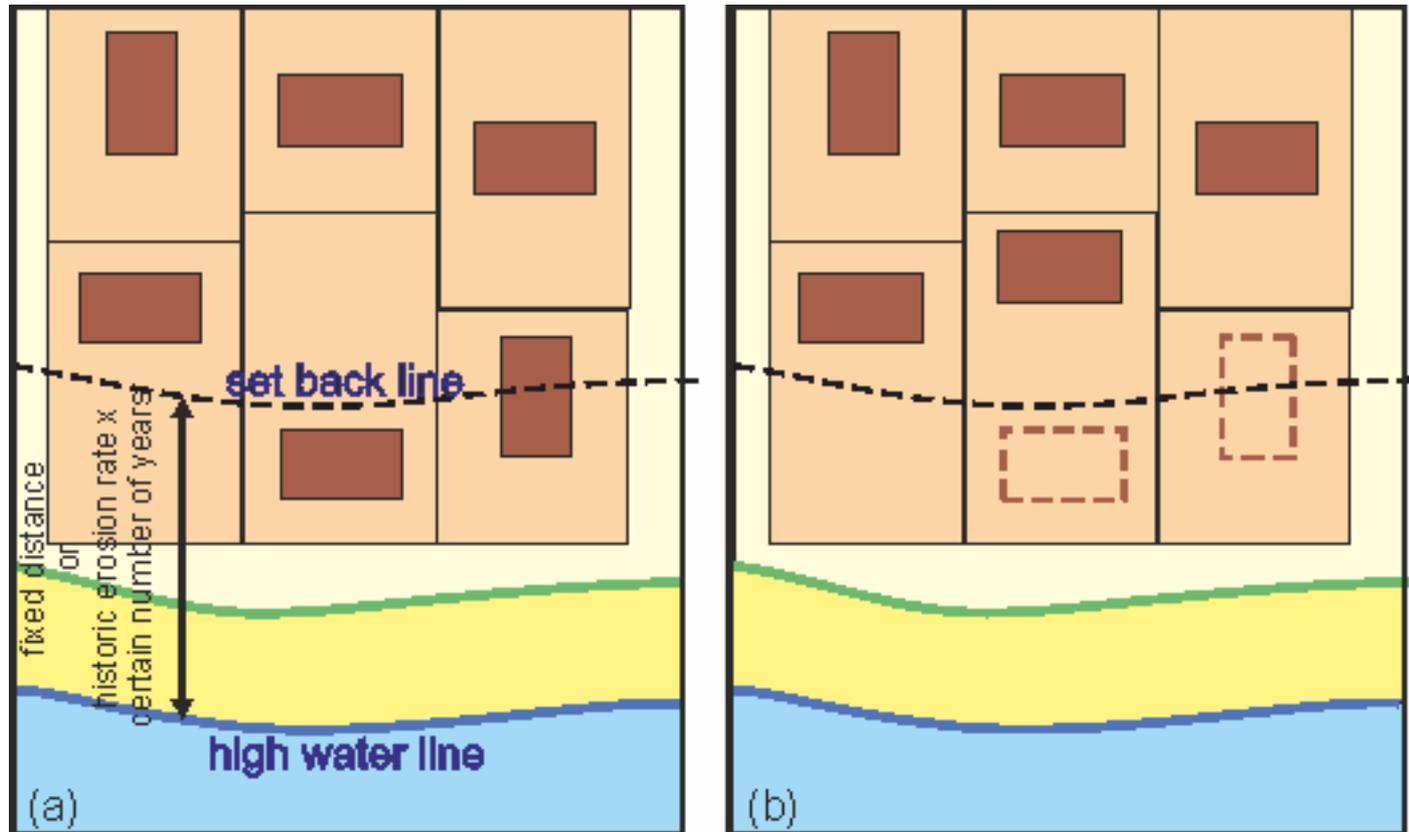
Photo from Steve Burdett, courtesy of Royal HaskoningDHV.

Making Space for Water (UK)

AERIAL VIEW ON DAY OF FINAL BREACHING (JUNE 2006) © ABPMER



Managed retreat – Set back line



Set back line - Maui



USA – set back lines and managed retreat

Texas Open Beaches Act (free and unrestricted access to intertidal land, which is owned by the state)

16 Mar 2010



2 Dec 2010

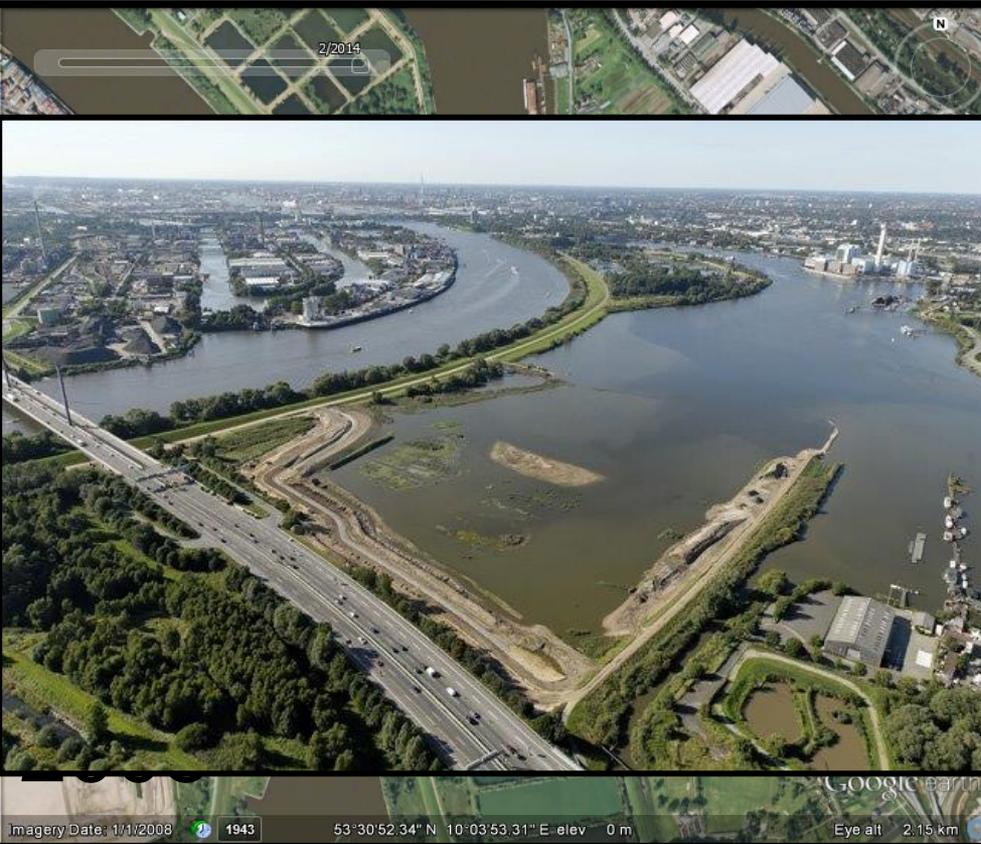


1 Nov 2010



Cities and Climate Change – Hamburg, Germany (primary focus on flood water storage)

River Elbe - Hamburg

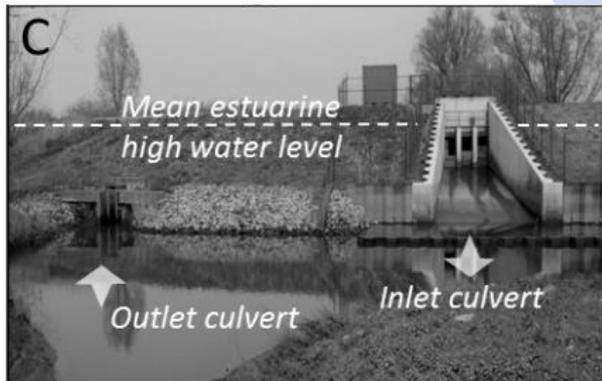
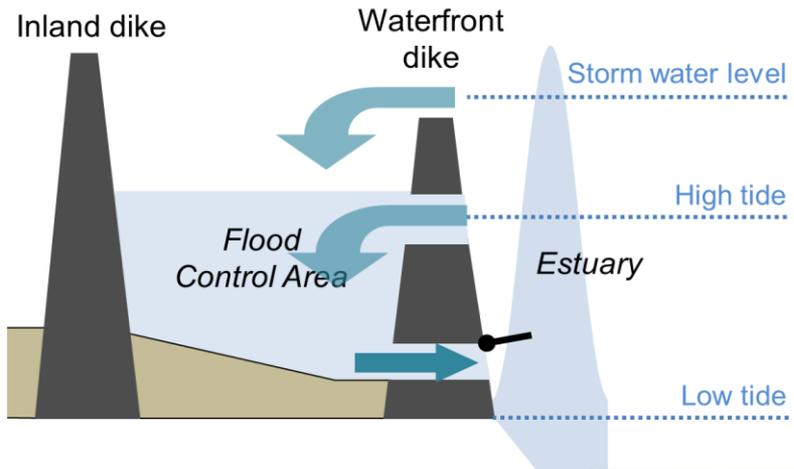


30 ha to create a tidal space + recreation

Examples of realignment of defences

Sigma Plan – Flanders, Belgium

Controlled reduced tide (CRT) projects and 512 km of enhanced dikes mainly in the Scheldt estuary



National Strategy for the Integrated Management of the Shoreline, France

- By 2020 all local authorities must develop plans to relocate coastal activities and structures from high risk areas
- Land purchase by the *Conservatoire du Littoral*



The Polder de Sébastopol (Vendée, France), reclaimed from the sea in 1856, had tidal flows restored into the embanked area through regulated tidal exchange since 1999. Photo by Jacques Oudin, courtesy of Communauté de Communes de île de Noirmoutier.

- *Regulated tidal exchange (RTE)*

The Delta Programme - Room for River and Building with Nature, The Netherlands

Integrates flood protection, freshwater availability and spatial planning.

The *Sand Motor* project (during construction in 2011) - through shoreline realignment, it creates space for a more dynamic response to waves and tides providing opportunities for environmental, social and economic benefits (e.g. enhanced biodiversity, areas for recreation and improved natural coastal defence).



Photos courtesy of Rijkswaterstaat.

At De Kerf the dune ridge was artificially breached to increase biodiversity and coastal dynamics.



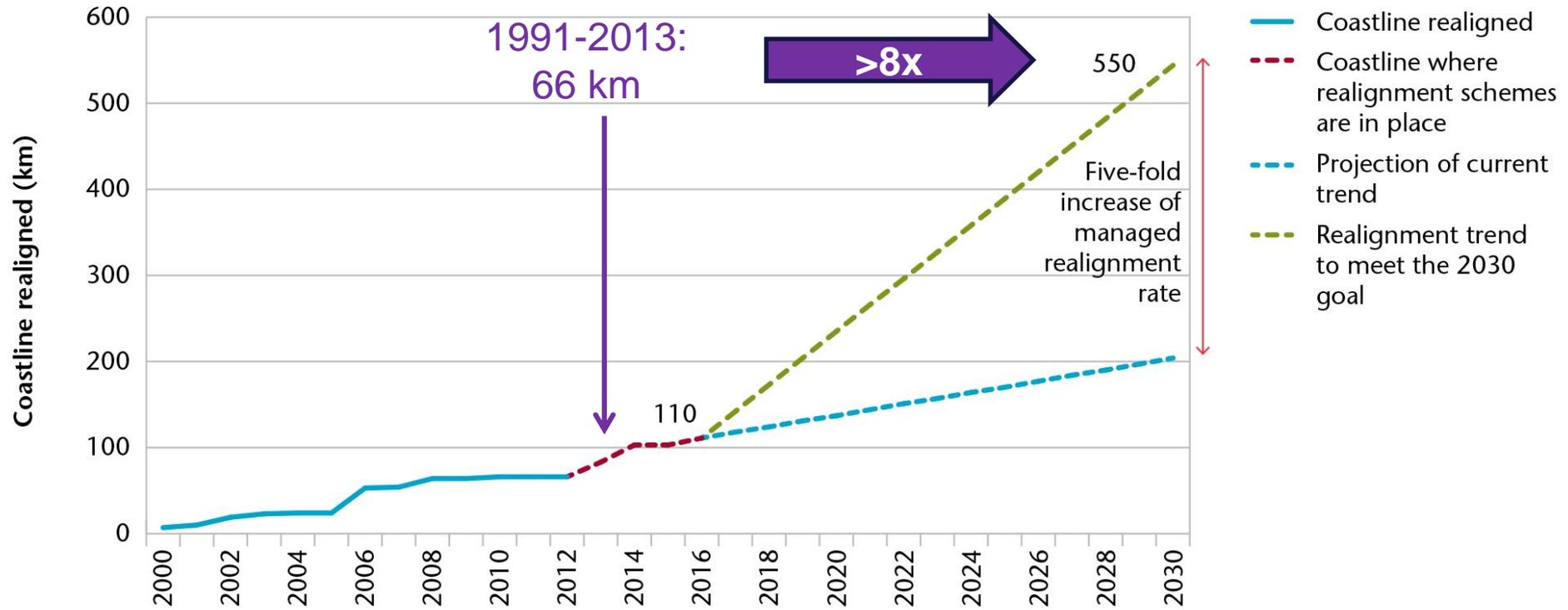


Primary and secondary characteristics of the five managed realignment methods of implementation

	Removal	Breach of defences	Realignment	Controlled tidal restoration		Managed retreat
				RTE	CRT	
Extended sections of coastal defences are removed	primary	n/a	secondary			
Coastal defence is artificially breached						
Defence is allowed to breach naturally						
Project involves new line of defence or upgrading existing defences						
Sluices and culverts restore a controlled tidal flow						
Project involves flood control areas						
Planned removal of people and assets at risk						
Primary and secondary (short-term) outcomes						
Creation of habitat						
Improved flood risk management	*	*		*		
Other ecosystem services						
Climate change adaptation						
Potential for application in						
Urban areas	low to moderate					
Areas of low occupation						high
Rural areas						

* Improved flood risk depends on the habitat that will be created and therefore it should be considered either a secondary outcome or a long-term primary objective.

Shoreline Management Plans in England and Wales envisage realignment along 550 km (10% of the coastline length) by 2030 and 15% by 2050



Committee on Climate Change (2013), <http://www.theccc.org.uk/charts-data/adaptation-indicators/coastal-indicators/length-of-coastline-realigned-km/>

Obstáculos



- Disponibilidade de terra
- Alto custo inicial
- Aceitação pública
- Mensagens inconsistentes
- Falta de conhecimento sobre a evolução de longo-termo
- Falta de evidência dos benefícios adquiridos

Recreated habitats are not as good as natural ones

Small areas (<30 ha) have < 50% of the species

Biodiversity increases at sites >100 ha and with the largest range of elevations between mean high water of neap and spring tides (Wolters *et al.*, 2005).

Infauna abundance in MR mudflats one order of magnitude lower (Mazik *et al.*, 2010).

When compared with natural systems, the functioning of re-created saltmarshes was found to be “**significantly impaired**” affecting their ability to deliver ecosystem services (Spencer and Harvey 2012).

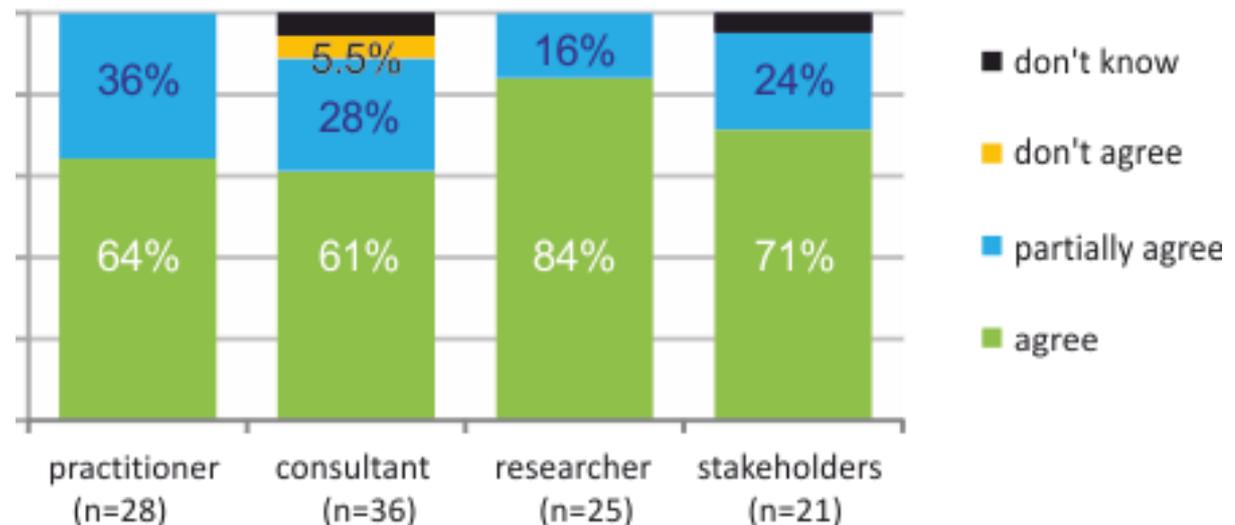


Managed realignment and ecosystem services

The great value of MR is related to its multiple functions and the ecosystem services the created habitats can provide (e.g. Luisetti *et al.*, 2011).

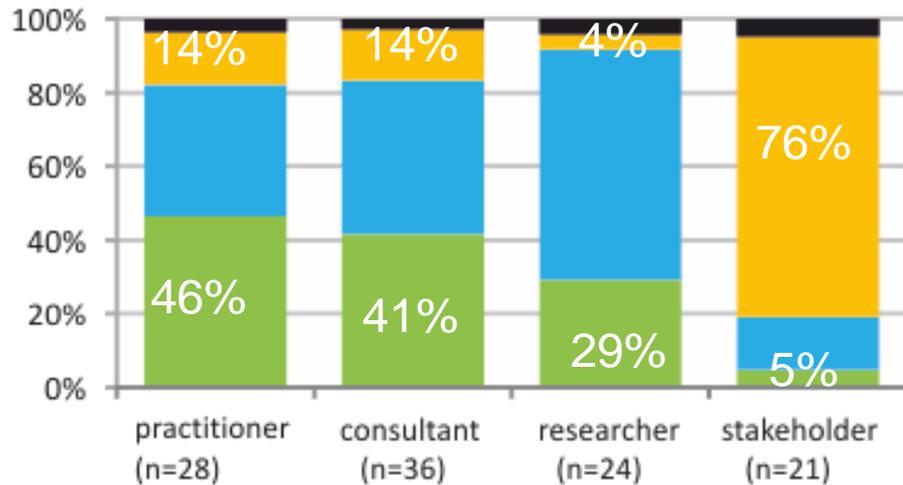
The provision of these services depends on the size, shape, adjacent environments, connectivity with water and other factors (Schleupner and Schneider, 2013).

Better understanding about long-term evolution of the sites is needed.

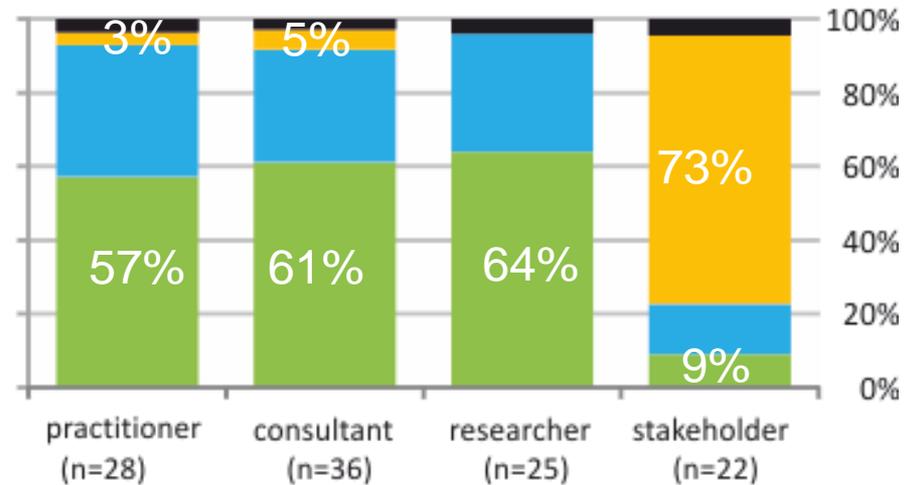


Public perception

It is a promising strategy to reduce flood risk and the costs to maintain coastal defences.

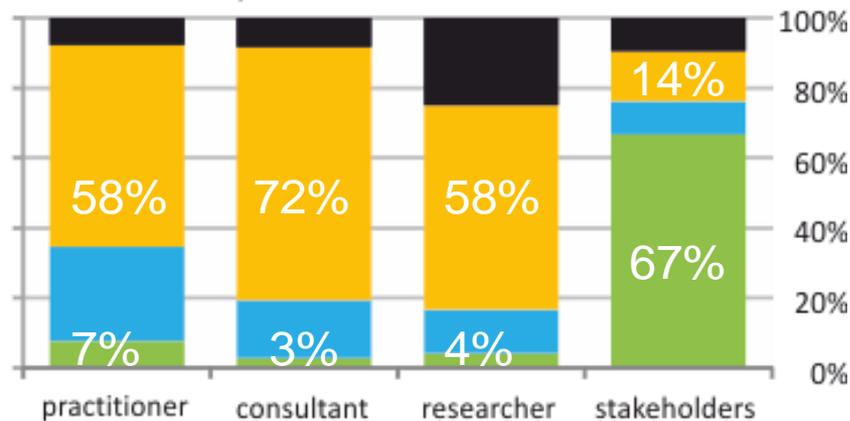


It is a good mechanism to deliver sustainable flood risk management with added environmental benefits.



It is too expensive for what it can offer.

- don't know
- don't agree
- partially agree
- agree



Medmerry 01/04/2014 (by John Akerman)





Bournemouth University

320 ha

Cost £15.5m

7 km of new defences

>115 years of current maintenance costs

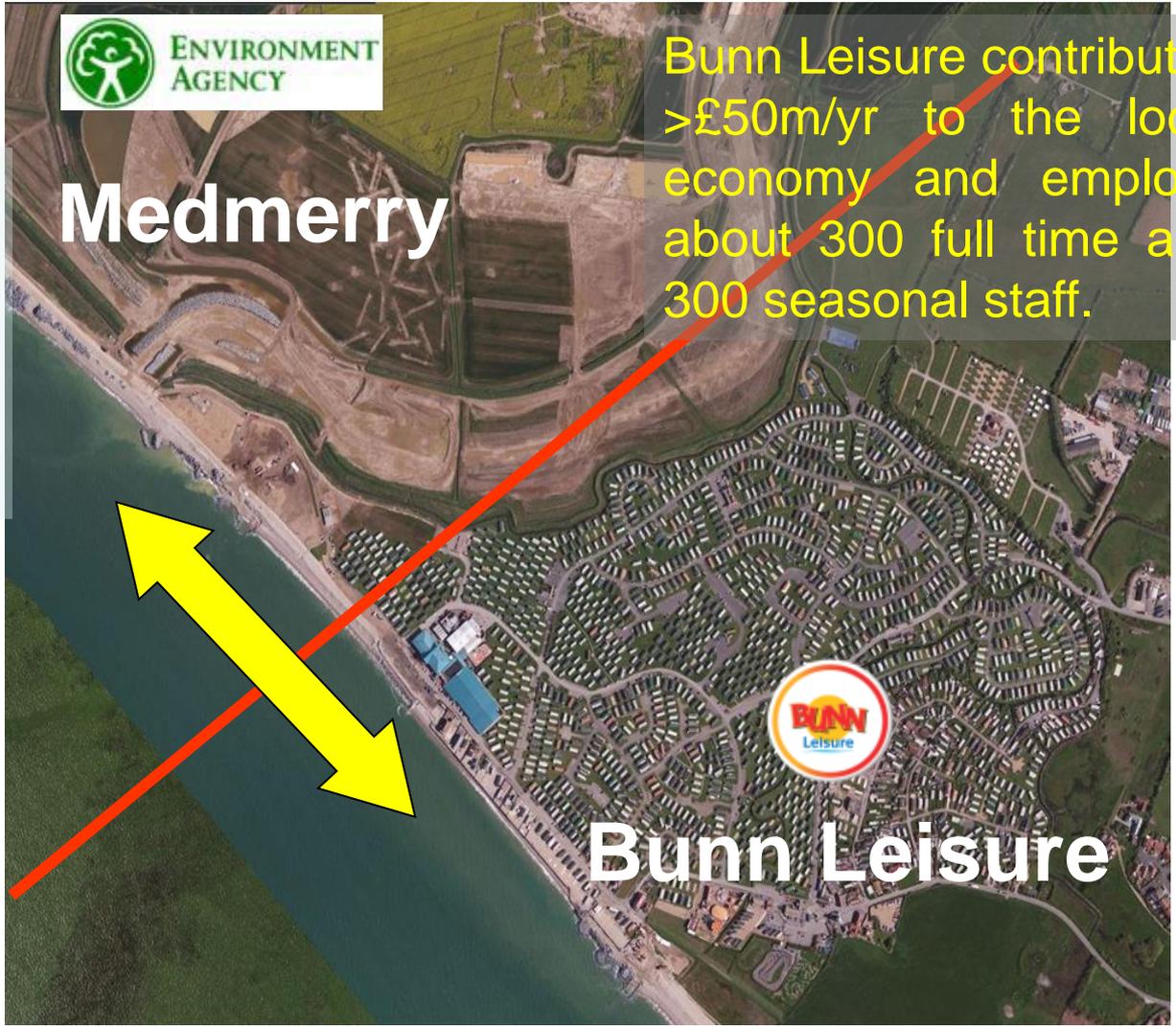


Medmerry



Medmerry

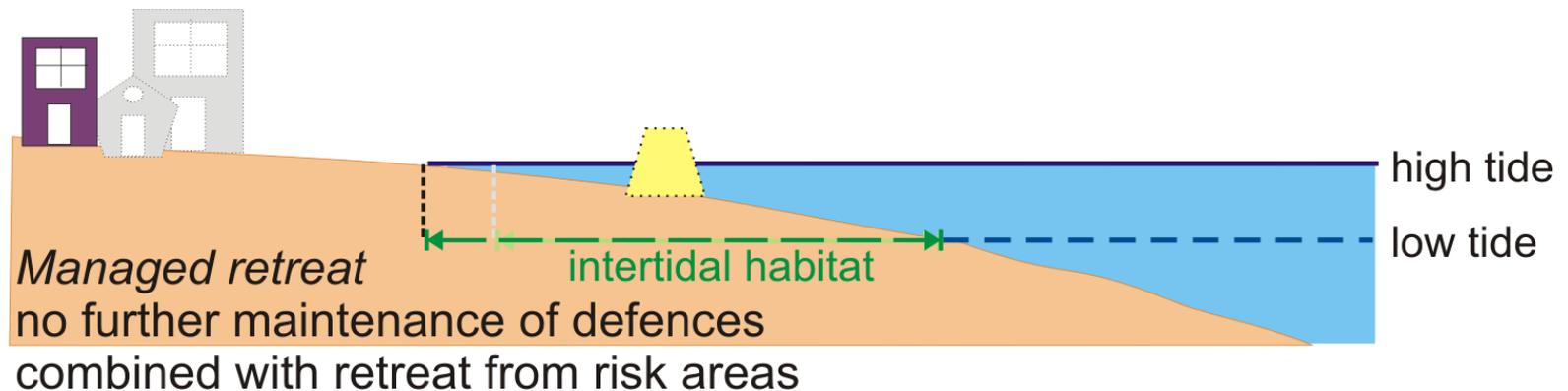
Bunn Leisure contributes >£50m/yr to the local economy and employs about 300 full time and 300 seasonal staff.



Bunn Leisure

Managed realignment + managed retreat

The only safe climate-proof response at all temporal and spatial scales is to reduce the number of people and assets at risk.



Educação + Planejamento de longo prazo

Uso de recursos de forma mais eficiente

Criação de áreas verdes/azuis

Reduz numero de pessoas e propriedades em risco

Mais informações disponíveis no livro

SPRINGER BRIEFS IN ENVIRONMENTAL SCIENCE

Luciana S. Esteves

Managed realignment:
A viable long-term
coastal management
strategy?

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