Erosione costiera e cambiamento climatico
Capire il passato > guardare al futuro

Conferenza Finale del Progetto MAREGOT

Martedì 26 e Venerdì 29 Maggio 2020

Adattamento al cambiamento climatico e all'erosione costiera: paesi a confronto

A *cura di Enzo* Pranzini

Interreg
UNIONE EUROPEA
MARITTIMO-IT FR-MARITIME
Fondo Europeo di Sviluppo Regionale
MAREGOT
MAnagement dei Rischi derivanti dall'Erosione costiera e azioni di

REGIONE LIGURIA

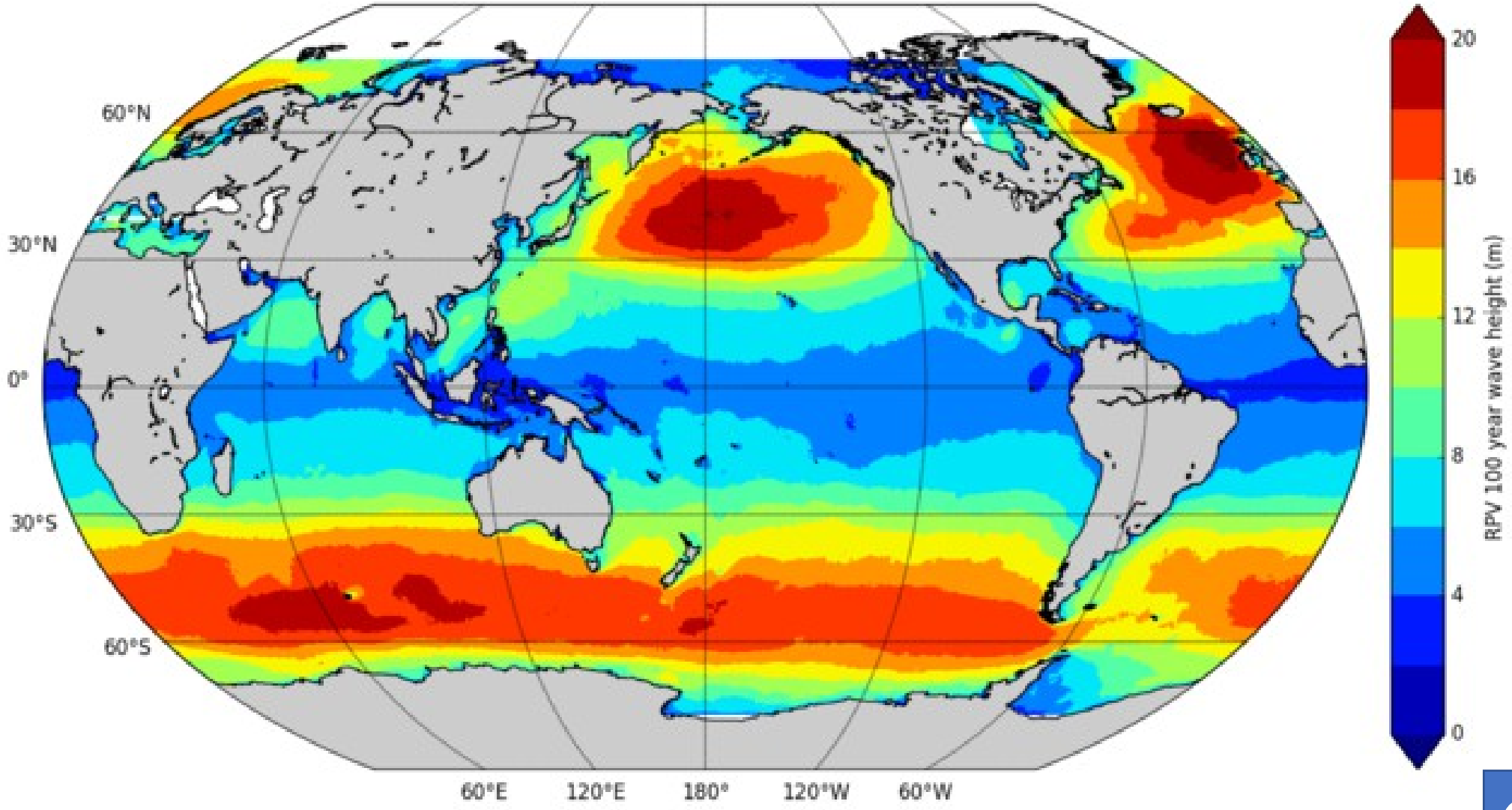
PARCO NAZIONALE DELLE CINQUE TERRE
Area Marina Protetta delle CinqueTerre

La cooperazione al cuore del Mediterraneo

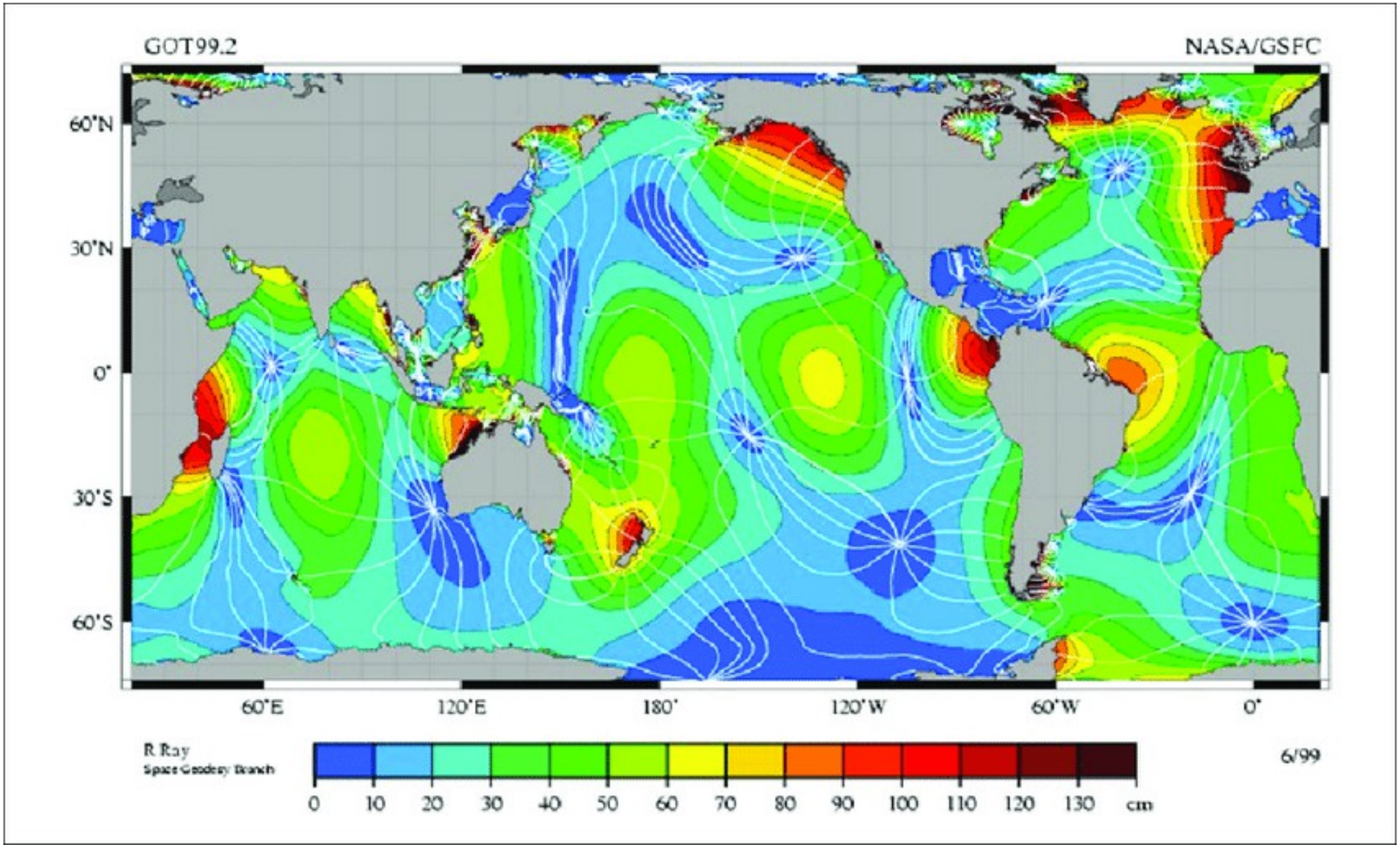
Il ??? % delle spiagge del mondo è in erosione


Autor unknown

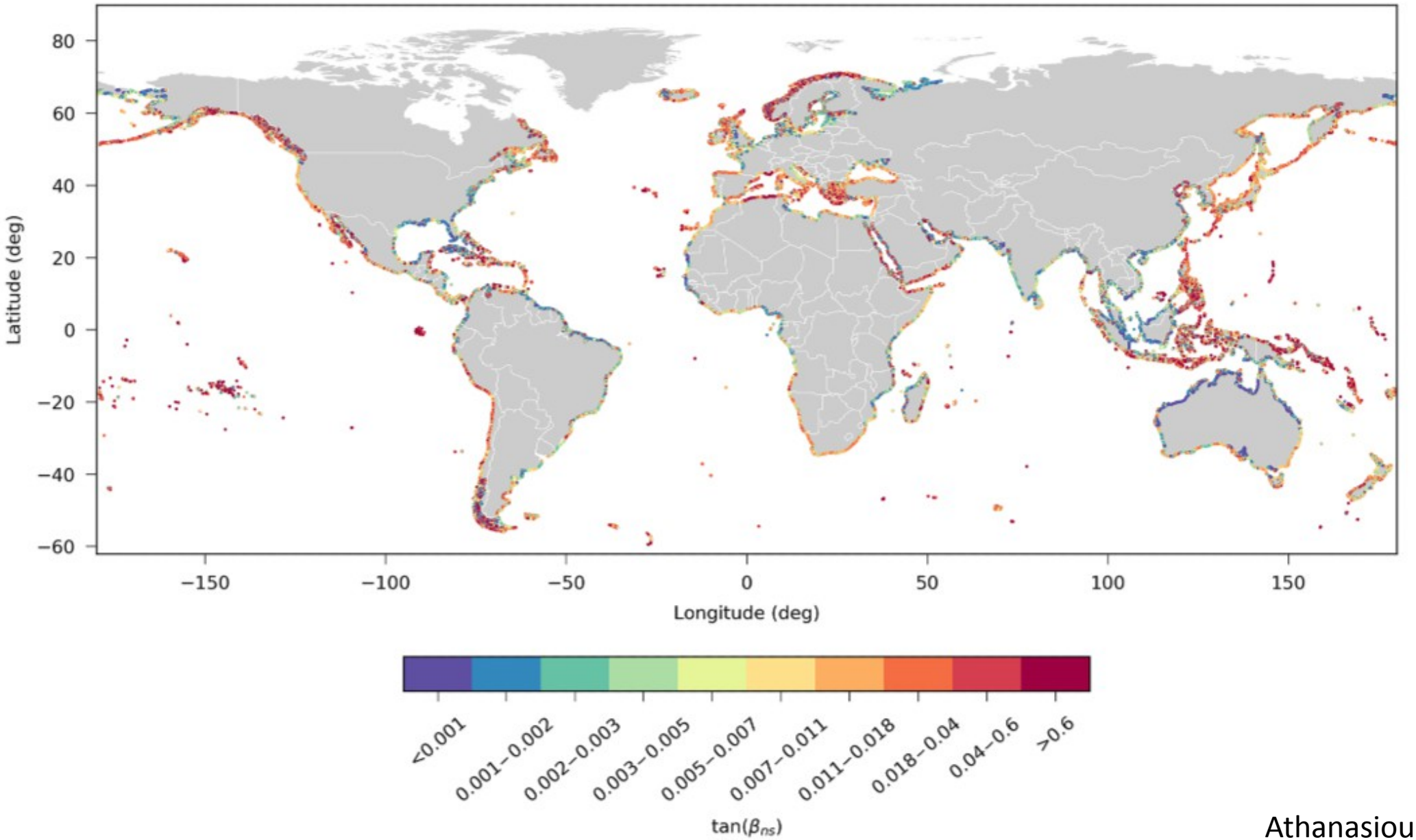
Esposizione al moto ondoso



Escurisione di marea

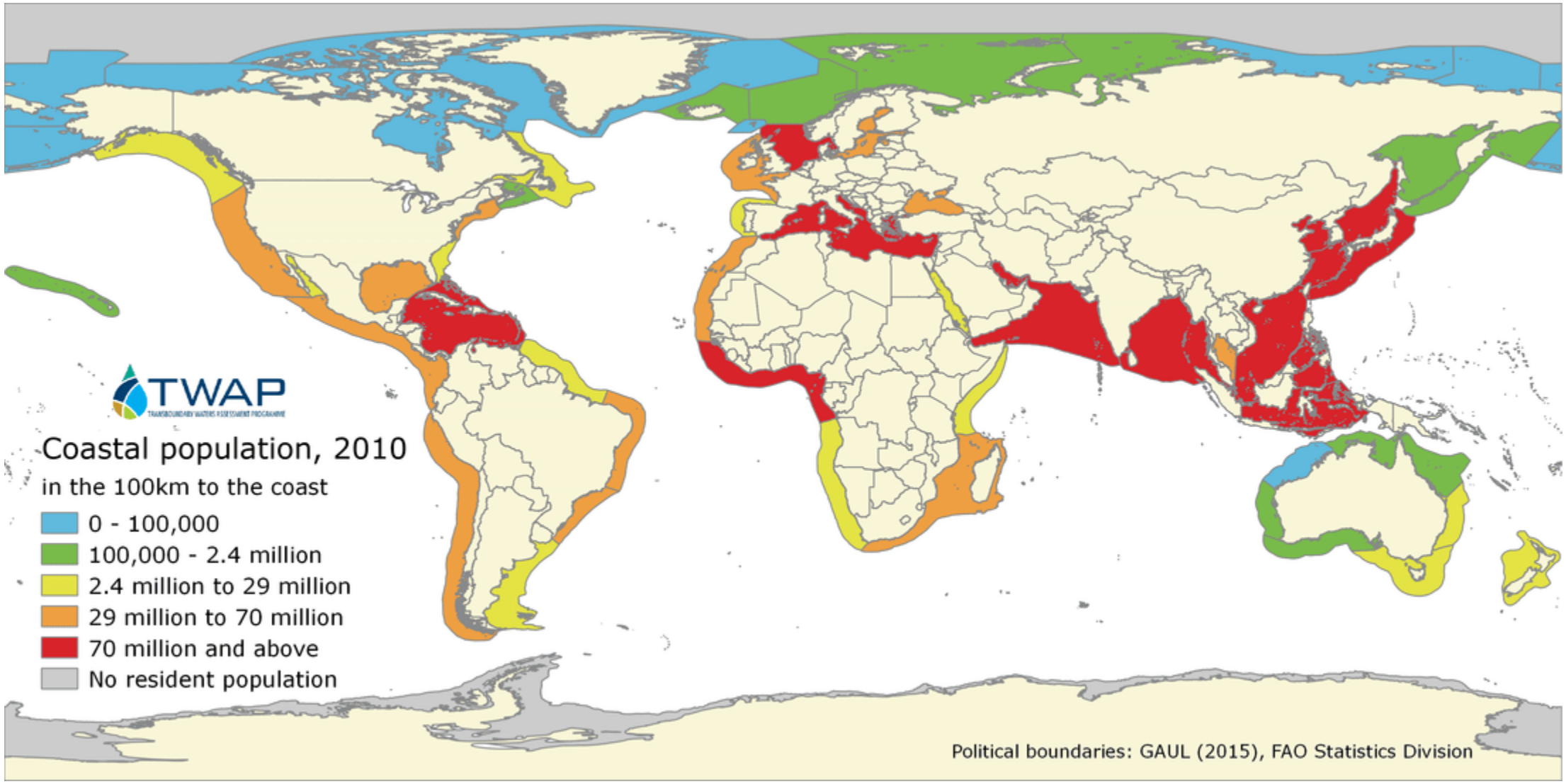


Pendenza dei fondali



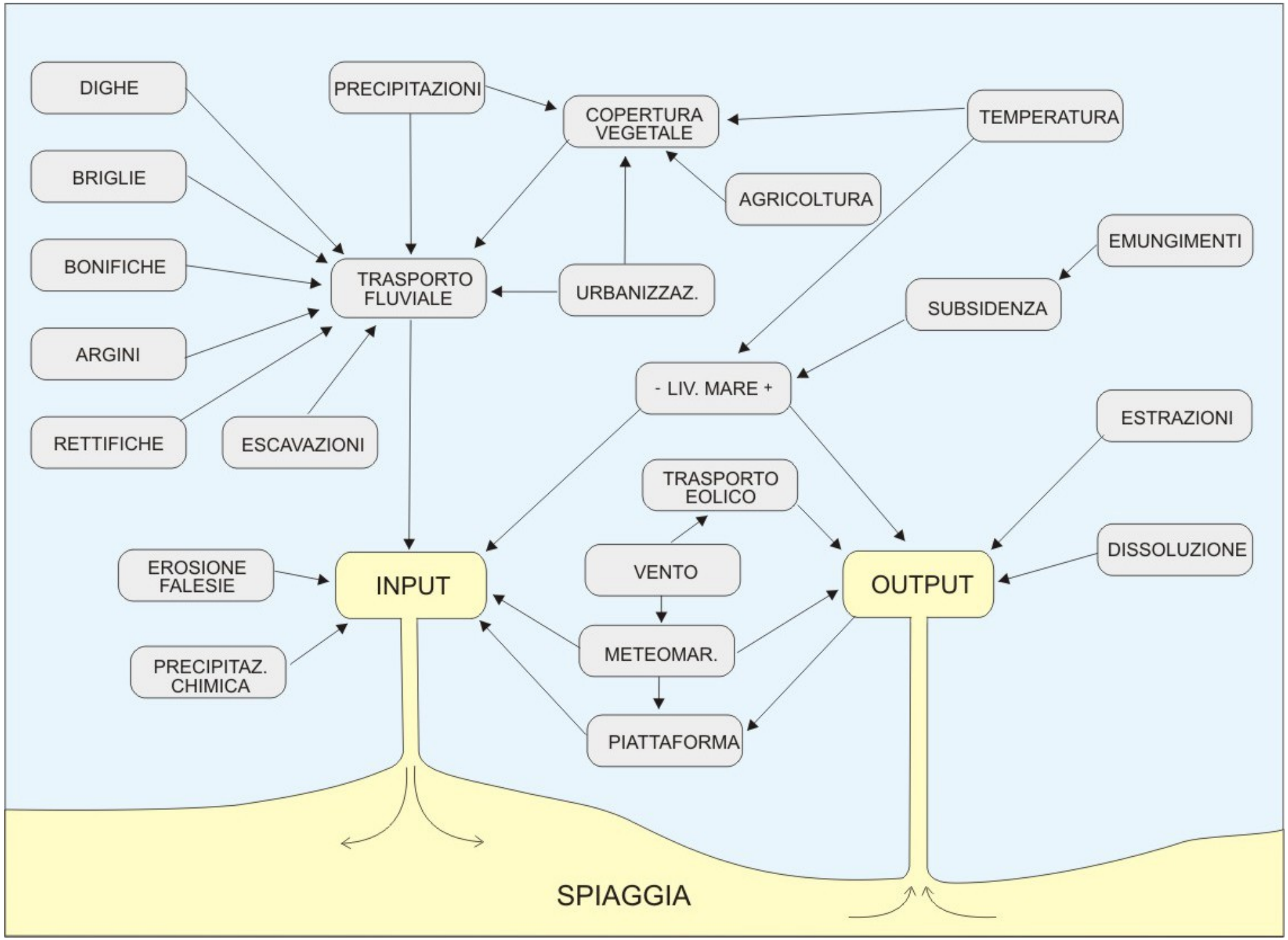
Athanasiou et al., 2019

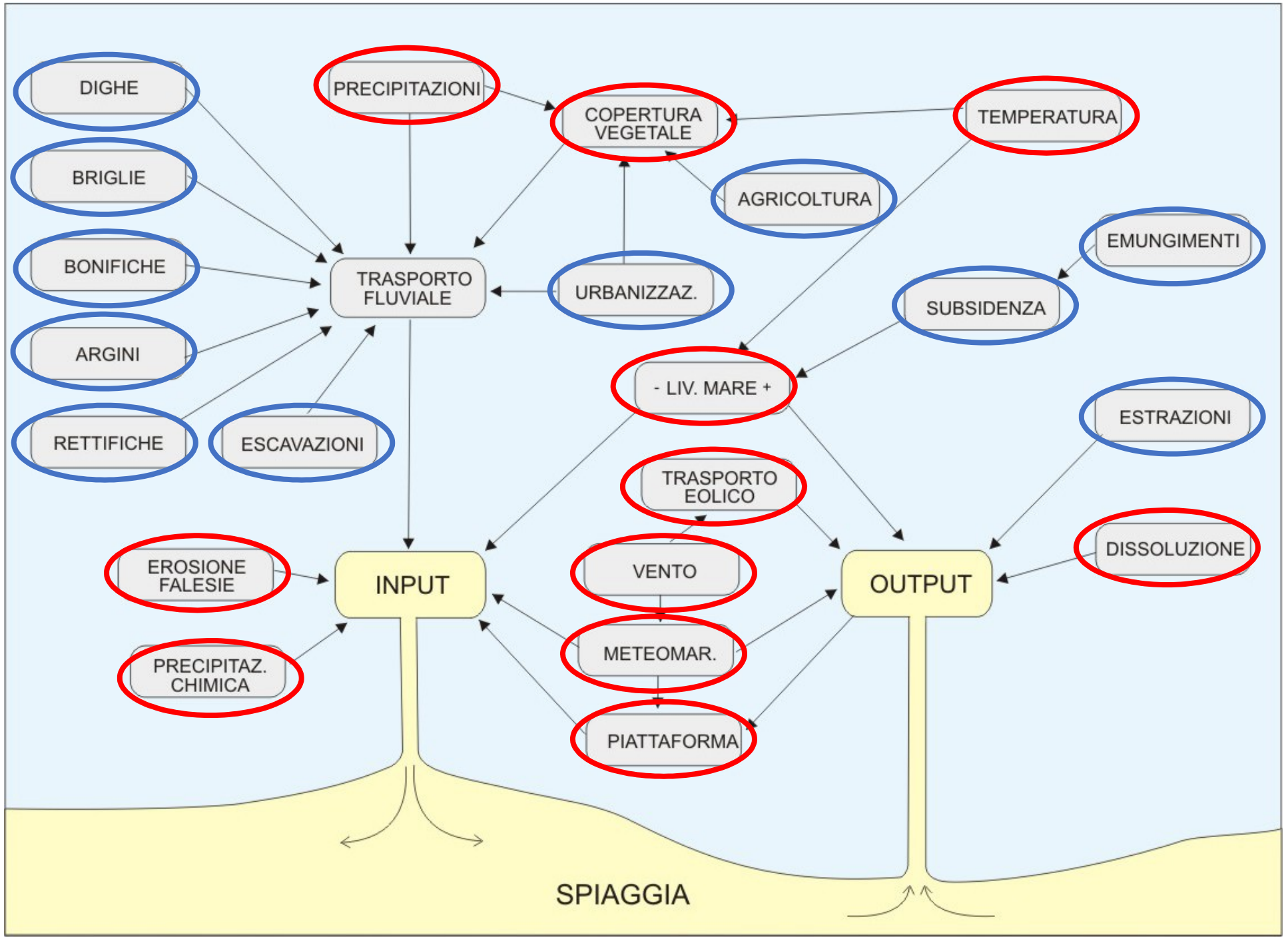
Densità della popolazione costiera



		Russia	Sweden	Estonia	Latvia	Lithuania	Poland	Denmark	Germany	Netherlands	Belgium	Great Britain	Ireland (N&S)	France	Spain	Portugal	Italy	Slovenia	Croatia	Bosnia Herzegovina	Montenegro	Albania	Greece	Bulgaria	Romania	Ukraine
Seawall	concrete																									
	bricks																									
	stones																									
	wood																									
	fibreglass																									
	gabions																									
Revetment (interlocking blocks)	natural stones																									
	concrete blocks																									
	gabions																									
Rubble mound or Rip-rap																										
Island platforms	stones																									
	stones + concrete																									
Surfing reefs																										
Detached breakwaters, emerged	rocks																									
	concrete																									
Detached breakwaters, submerged	rocks																									
	concrete																									
Groins	emerged																									
	submerged																									
	mixed (e+s)																									
	permeable																									
Sediment bypassing																										
Beach nourishment with marine aggregates	sand																									
	gravel																									
Beach nourishment with terrestrial aggregates	sand																									
	gravel																									
Nearshore nourishment																										
Dunes	reconstruction																									
	stabilisation																									
	construction																									
Beach dewatering	horizontal drains																									
	vertical drains																									
Wave attenuators	floating																									
	fixed																									
Bitumen coatings																										
Configurational dredging																										
Posidonia planting	natural																									
	artificial																									
Others: Sediment recycling,Tyres, Dikes, Wire		T							D									W	W				S			

Frequent Moderately present Infrequent Experiment Absent


DIGHE
PRECIPITAZIONI
COPERTURA VEGETALE
TEMPERATURA
BRIGLIE
AGRICOLTURA
BONIFICHE
TRASPORTO FLUVIALE
URBANIZZAZ.
EMUNGIMENTI
SUBSIDENZA
ARGINI
- LIV. MARE +
RETTIFICHE
ESCAVAZIONI
ESTRAZIONI
TRASPORTO EOLICO
EROSIONE FALESIE
INPUT
VENTO
OUTPUT
DISSOLUZIONE
METEOMAR.
PRECIPITAZ. CHIMICA
PIATTAFORMA
SPIAGGIA


DIGHE
PRECIPITAZIONI
COPERTURA VEGETALE
TEMPERATURA
BRIGLIE
AGRICOLTURA
BONIFICHE
TRASPORTO FLUVIALE
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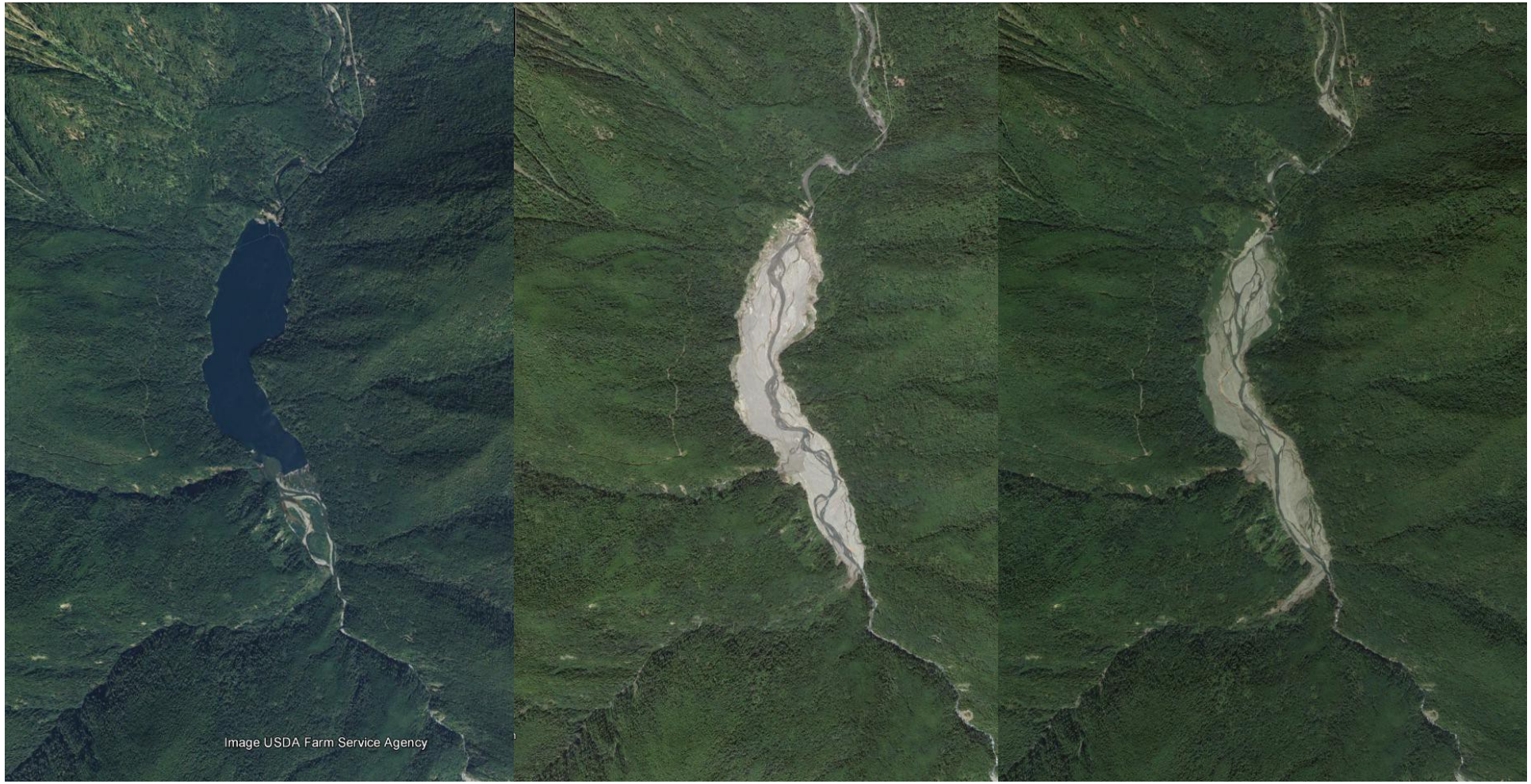
EROSIONE FALESIE
INPUT
VENTO
OUTPUT
DISSOLUZIONE
METEOMAR.
PRECIPITAZ. CHIMICA
PIATTAFORMA
SPIAGGIA


Buoni
Agricoltura
Argini fluviali
Taglio di meandri
Nei bacini idrografici
Urbanizzazione
Stabilizzazione dei versanti
Riforstazione
Dighe
Briglie
Escavazioni in alveo
Bonifiche
Cattivi
Sulla costa
Sunsidenza:
estrazione gas/petrolio
estrazione di acqua
edifici
Escavazione sabbia
Porti
Moli guardiani

Washington (USA)


Google Earth
Image USDA Farm Service Agency
N
3 km



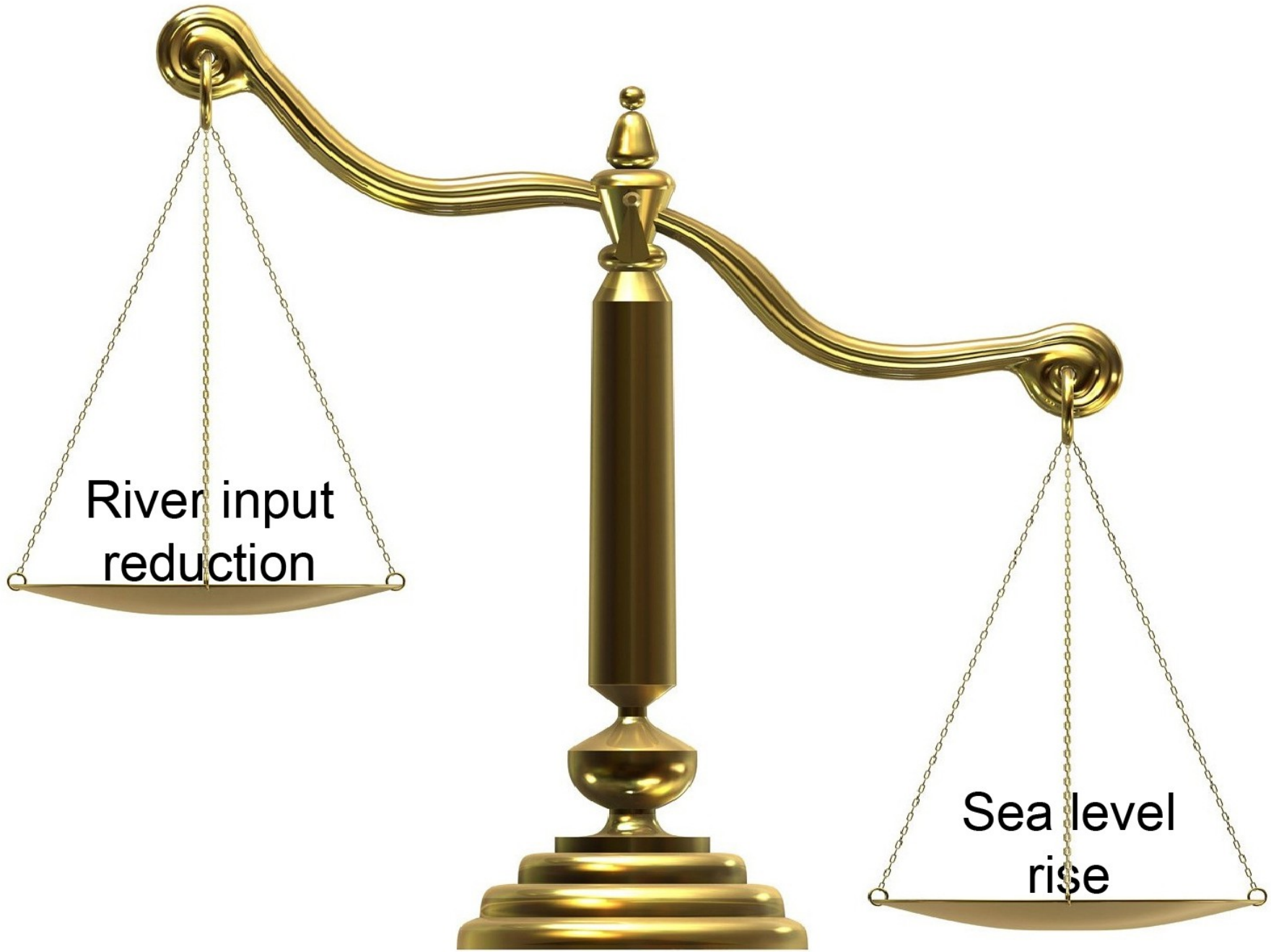
Dic 2012

Lug 2013

Lug 2016

Set 2012 Lug 2013 Lug 2016

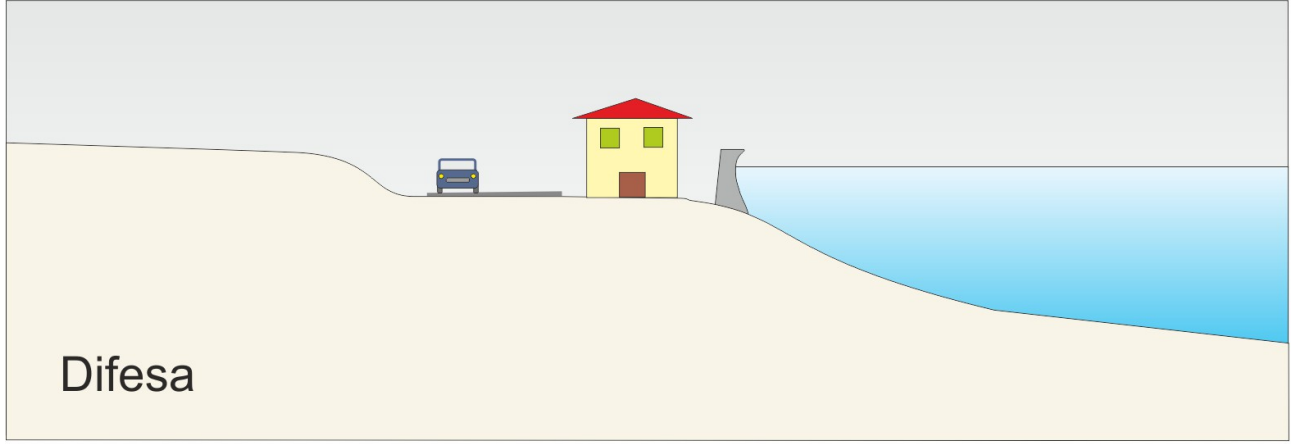

Set 2012
Lug 2016
Google Earth
Image © 2020 Maxar Technologies
N
800 m

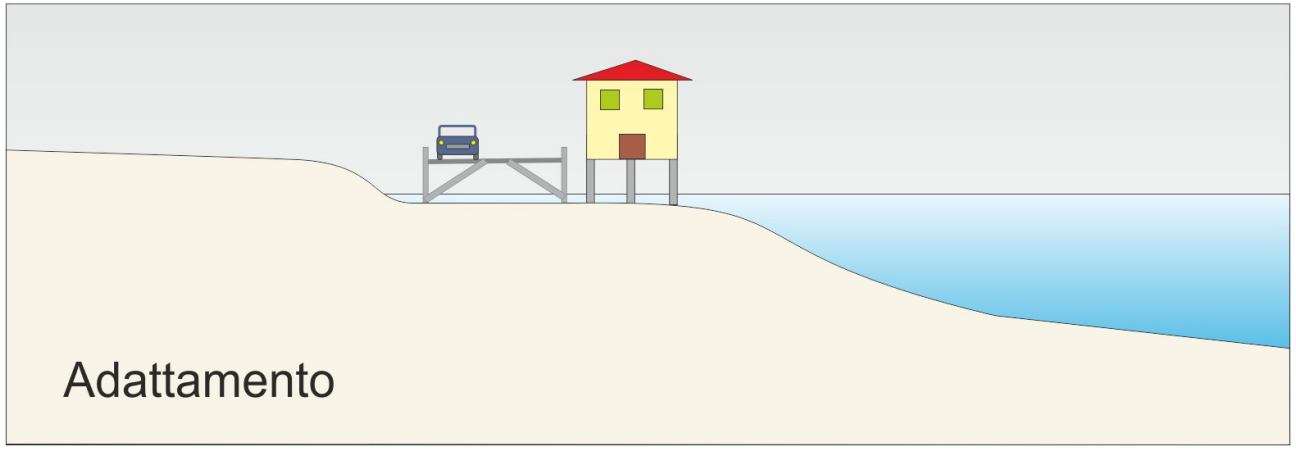

River input reduction
Sea level rise

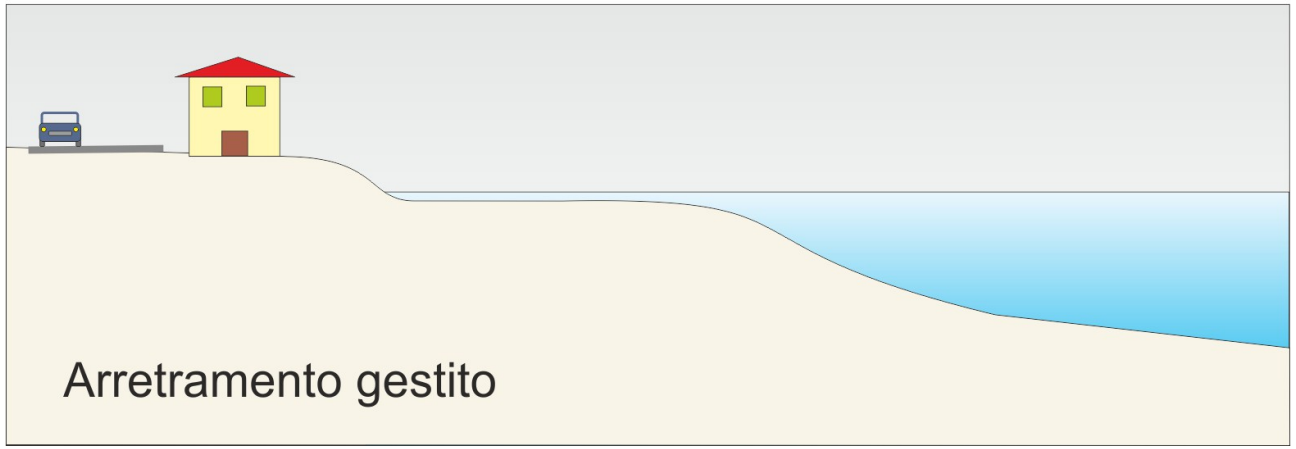
Innalzamento del livello del mare (globale)

Riduzione dell’input sedimentario (regionale)

Interruzione del trasporto litoraneo (locale)


Difesa


Adattamento


Arretramento gestito

eurosion

LIVING WITH
COASTAL
EROSION
IN EUROPE

SEDIMENT AND SPACE FOR SUSTAINABILITY

- the long term costs and benefits of coastal erosion mitigation measure which would make it possible to select the most cost-effective scenario and if needed propose areas where retreat should be managed.

RI
FROM THE
EUROSION
STUDY

European Commission

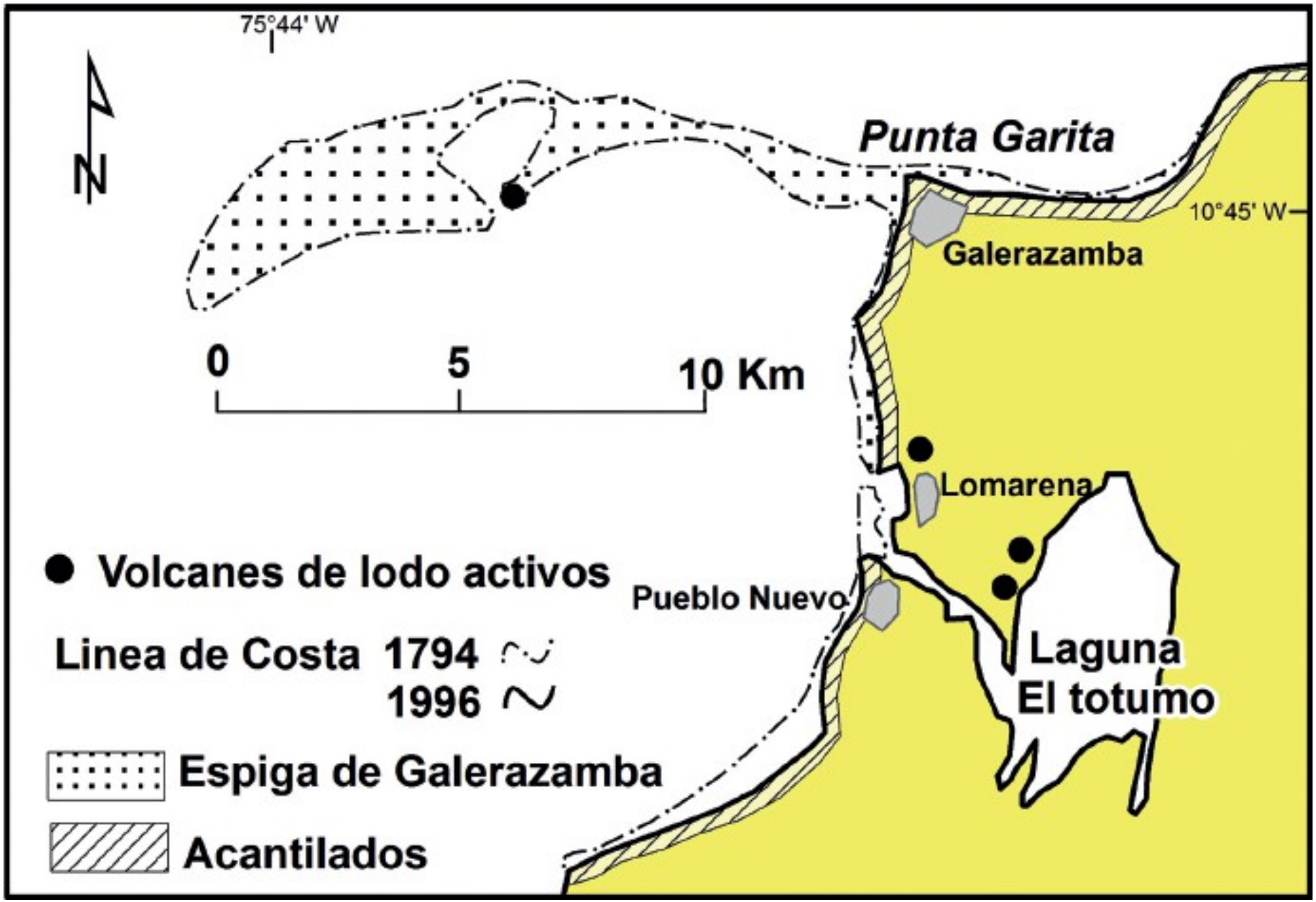
- Una stima a lungo termine dei costi e dei benefici delle misure di mitigazione dell'erosione costiera dovrebbe essere resa utile per selezionare gli scenari con miglior rapporto costo - efficacia e, se necessario, proporre aree dove l'arretramento della linea di riva potrebbe essere gestito.

eurosion

VIVERE CON
L'EROSIONE
COSTIERA

TENIBILITA'

Colombia


75°44' W
N
Punta Garita
10°45' W
Galerazamba
0
5
10 Km
Lomarena
Volcanes de lodo activos
Pueblo Nuevo
Linea de Costa 1794
1996
Laguna
El totumo
Espiga de Galerazamba
Acantilados

Fino agli anni 1950s uno spit proteggeva il Villaggio di Amanzaguapos (Galerazamba, costa caraibica della Colombia).
Fra il1947 e il 1954 la costa arretra di 300 m, restringendo e tagliando lo spit.
Nel 1954, il Villaggio venne arretrato e spostato a nord-east e battezzato “Pueblo Nuevo”.
Fra il 1964 e il 1974, lo spit subì ulteriori erosioni e la parte meridionale sparì nel1984.
Nel 1985 Pueblo Nuevo venne arretrato ulteriormente di 100 m.

New York (USA)


Sorry, author unknown

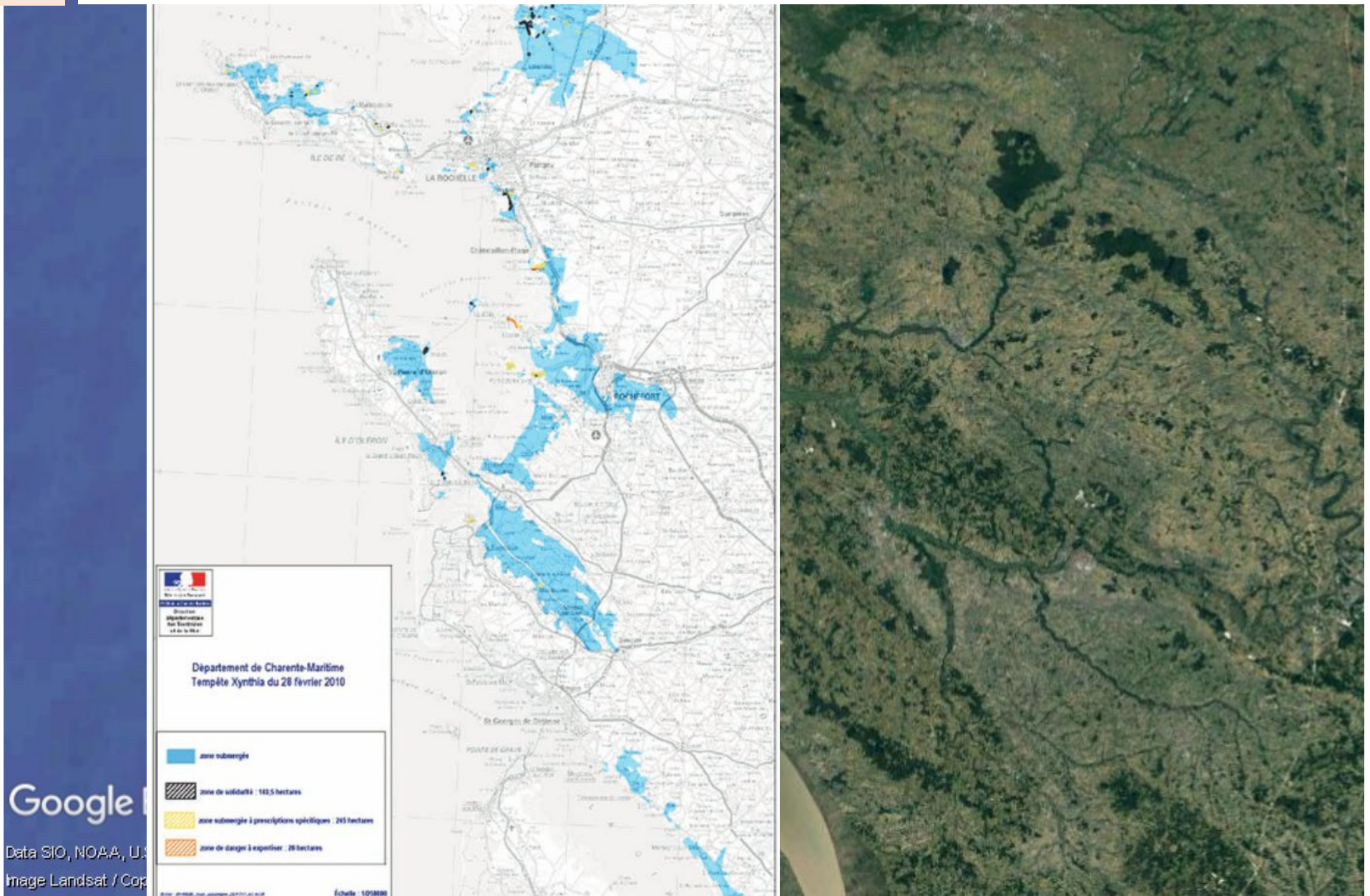
Dopo i ripascimenti degli anni 1970’s i visitatori sono stati:
1978 8 million
1983 21 million
2016 35 million

Miami

Negli Stati Uniti vengono finanziati unicamente progetti di ripascimento per i quali il ritorno ‘economico’ è almeno 2.5 volte il costo dell’intervento

Francia

28 febbraio 2010: Xynthia si abate sulla costa atlantica della Francia, fra la Gironda e l'estuario della Loira: più di 50.000 ha allagati e 47 persone morte



La Faute-sur-Mer

472 – 800 abitazioni da delocalizzare

Gran Bretagna

Fairnbourne

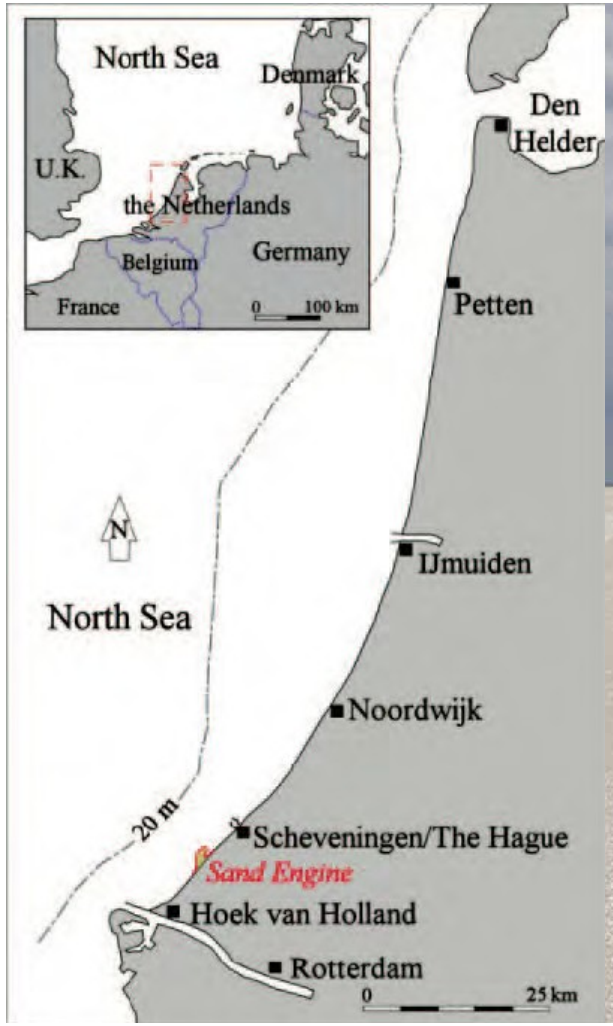
The Guardian

‘This is a wake-up call’: the villagers who could be Britain’s first climate refugees

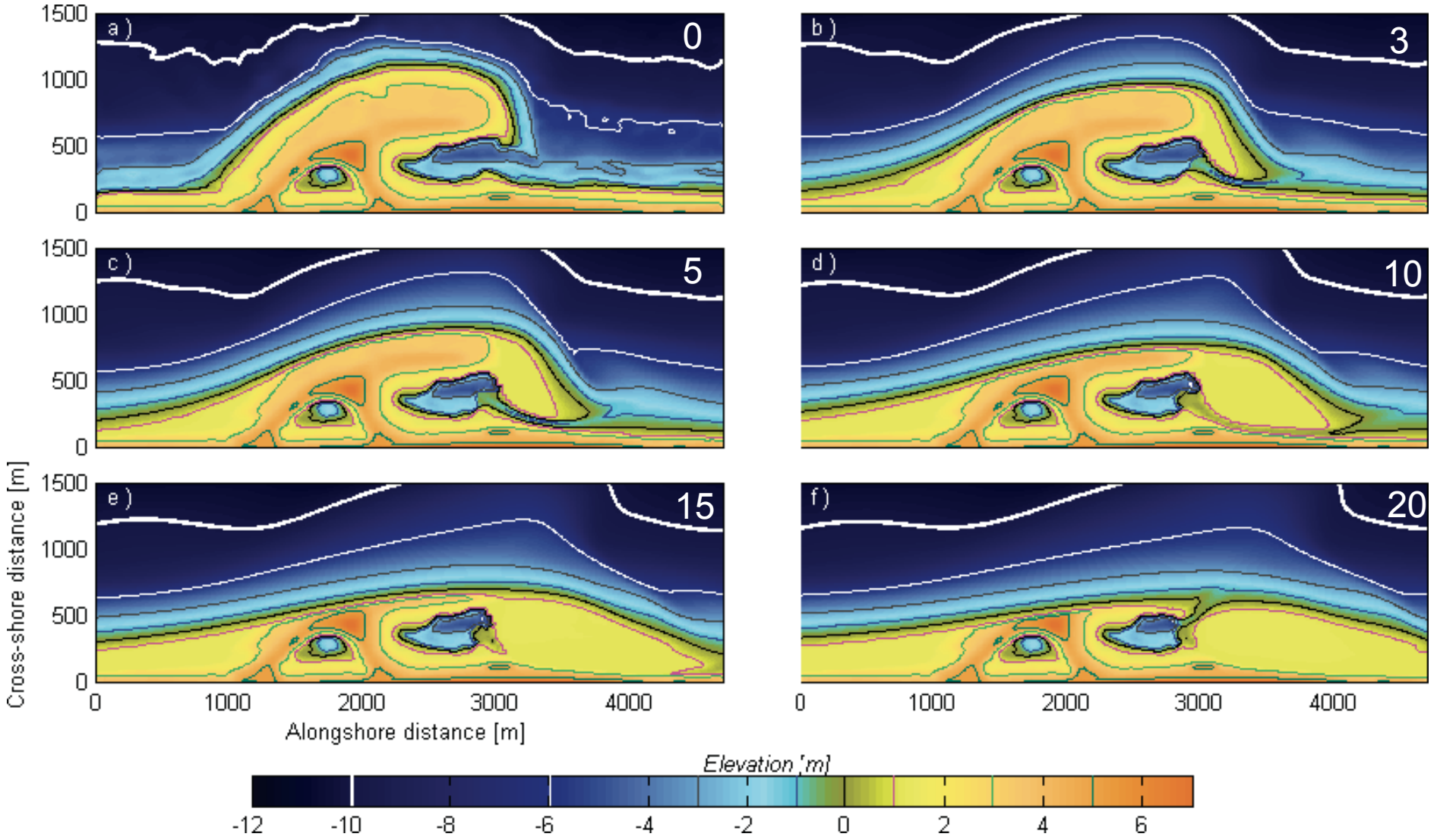
In 26 years – or sooner, if forecasts worsen or a storm breaches the sea defences – a taskforce led by Gwynedd council will begin to move the **850 residents** of Fairbourne out of their homes. The whole village – **houses, shops, roads, sewers, gas pipes and electricity pylons** – will then be dismantled, turning the site back into a tidal salt marsh.

Cleveleys

Olanda


North Sea
Denmark
U.K.
the Netherlands
Belgium
Germany
France
0 100 km
Den Helder
Petten
IJmuiden
N
North Sea
Noordwijk
20 m
Scheveningen/The Hague
Sand Engine
Hoek van Holland
Rotterdam
0 25 km


21.500.000 m3

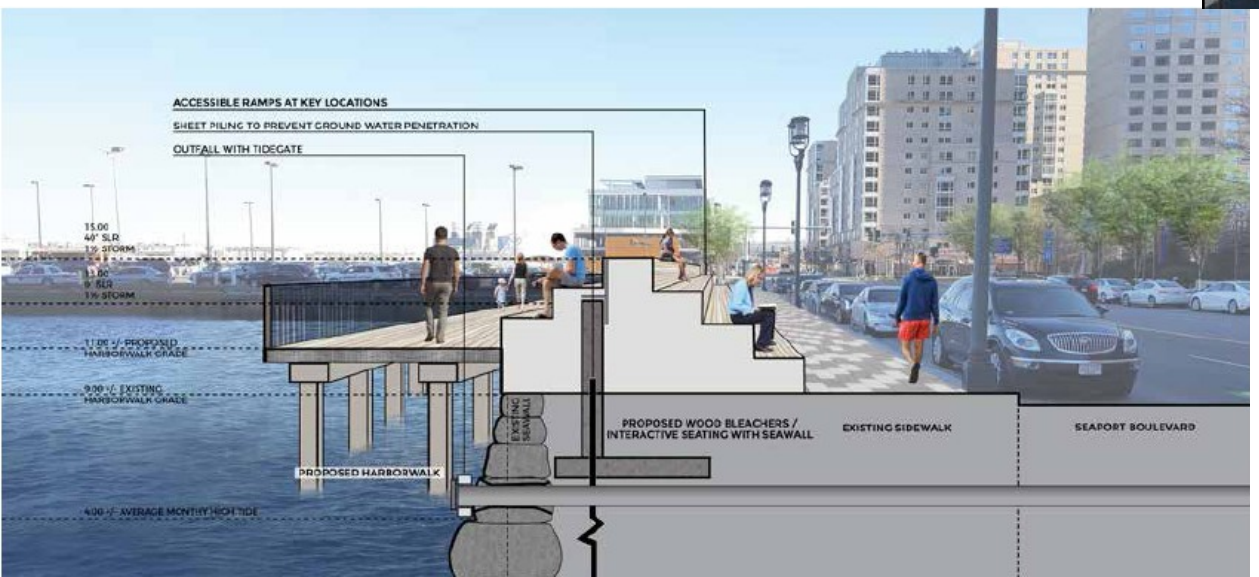

a)
0
b)
3
c)
5
d)
10
e)
15
f)
20
1500
1000
500
0
Cross-shore distance [m]
0
1000
2000
3000
4000
Alongshore distance [m]
Elevation [m]
-12
-10
-8
-6
-4
-2
0
2
4
6

An oyster reef in the Eastern Scheldt estuary will dissipate wave energy and trap sediment in its landward side, halting the erosion of the tidal flats locally

Boston


FLOODPROOF BUILDING
VERTICAL SEAWALL
RAISED HARBORWALK
CONSTRUCTED GROUND
LIVING SHORELINE
BEACH AND DUNES

Long-term coastal resilience solutions in Fort Point Channel could build on the proposed near- and mid-term solutions to further enhance resilience and enjoyment of the area. The footbridge and accompanying recreational area in the center of the channel are intended as examples only and are not included in project cost estimates.

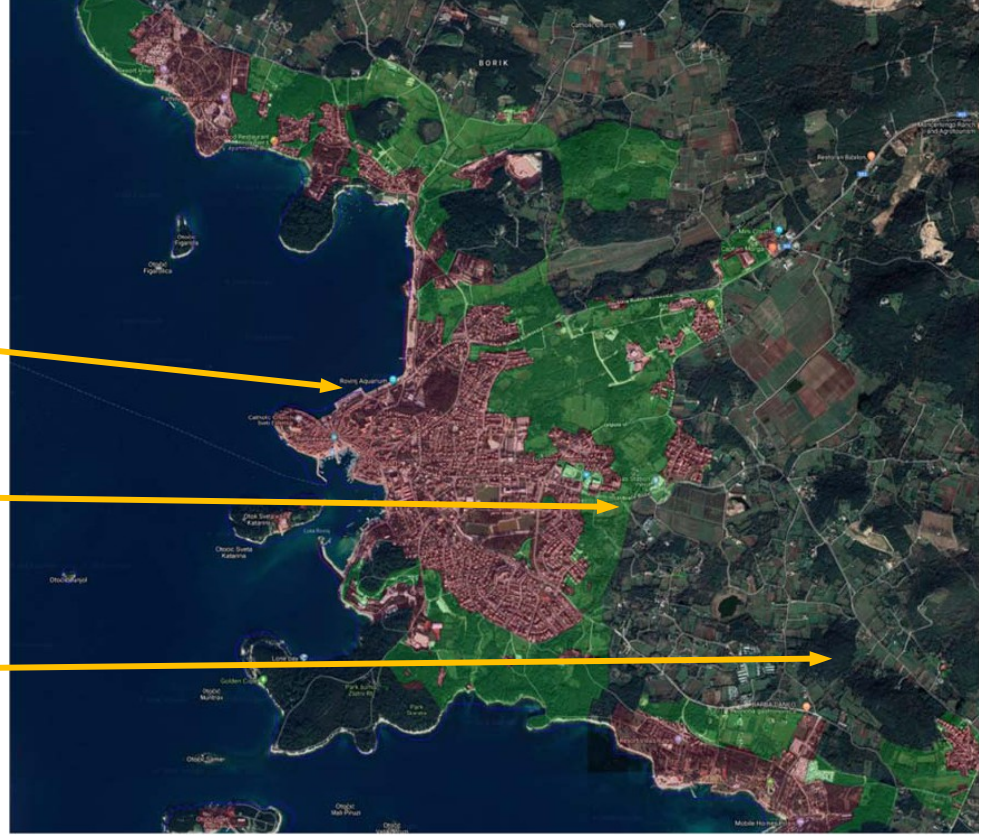


Croazia

Developed

Undeveloped but approved for future development

Undeveloped and not approved for future development

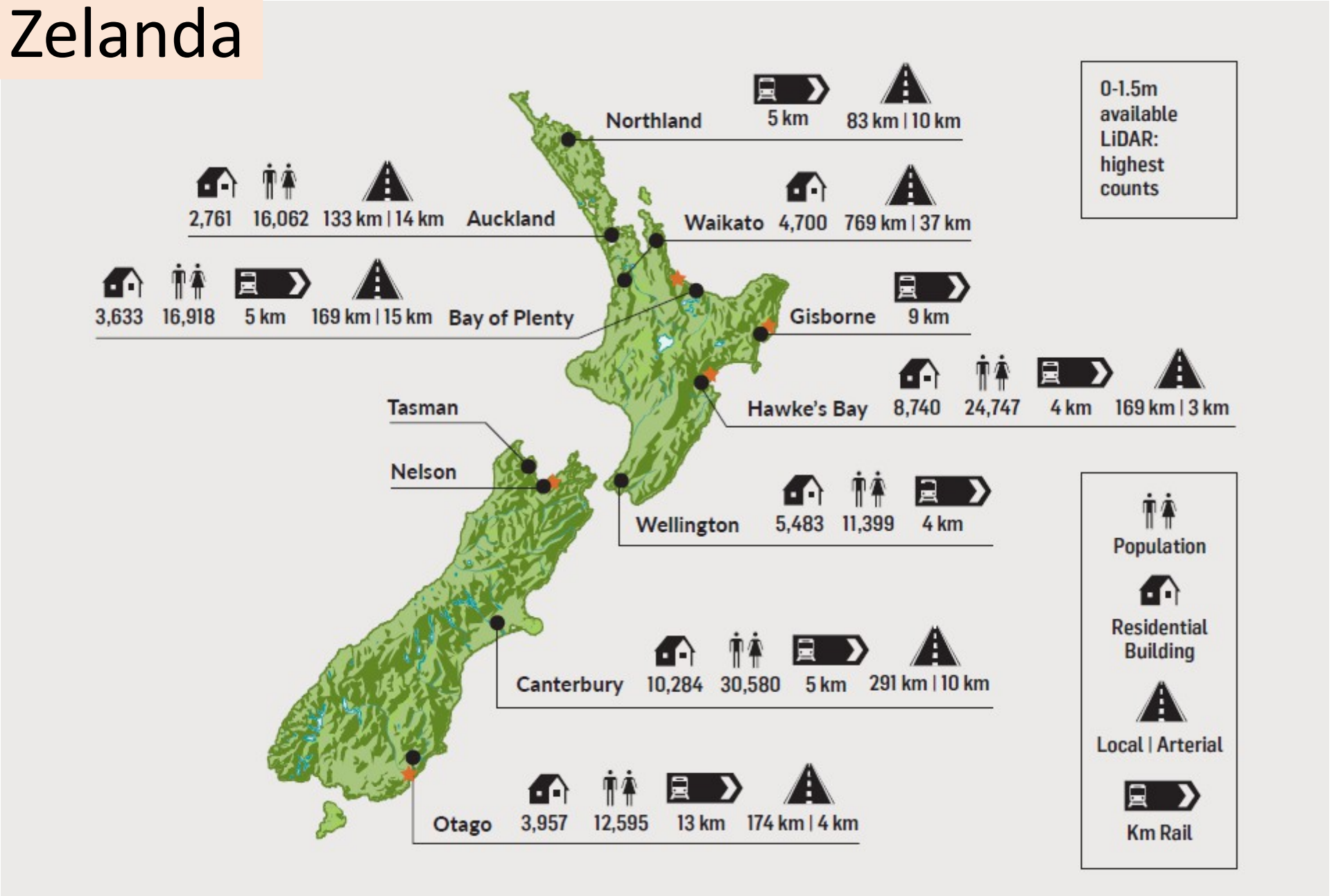


DIVA (Dynamic Interactive Vulnerability Assessment)

Lincke et al., 2020
The effectiveness of setback zones for adapting to sea-level rise in Croatia

Rogoznica (Croazia)

Nuova Zelanda



Clifton - Recommended Pathway

UNIT L: CLIFTON – PATHWAY 5				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Sea wall	→	**Sea wall**	→	**Managed Retreat**

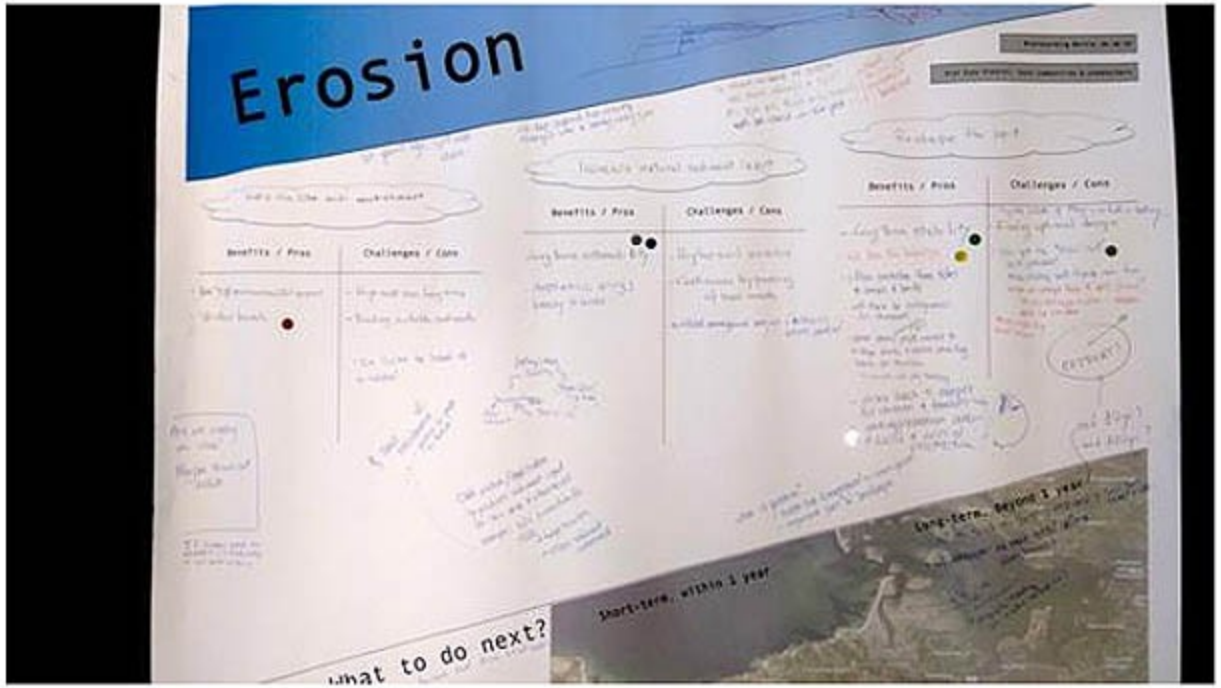
Short term - extended seawall to protect assets

Medium Term - an upgrade of the seawall required to account for sea level rise and erosion at the toe of the structure

Long term - an acceptance that managed retreat is the most practical option.


Carraholly
Westport Industrial P
Westport Quay
Murrisk
Google Earth
© 2020 Google
Image © 2020 Maxar Technologies
Image © 2020 CNES / Airbus


Rural
Eugene Farrell @DoctorDune - Oct 1
Great turn out in #Murrisk #Westport and surrounding areas to discuss #climate #adaptation and issues of #vulnerability and #opportunity. International #coastal and #rural #development experts @MauraFarrelNUIG . Hosted by @GeogNUIG and support from @SeaShoreNUIG students.

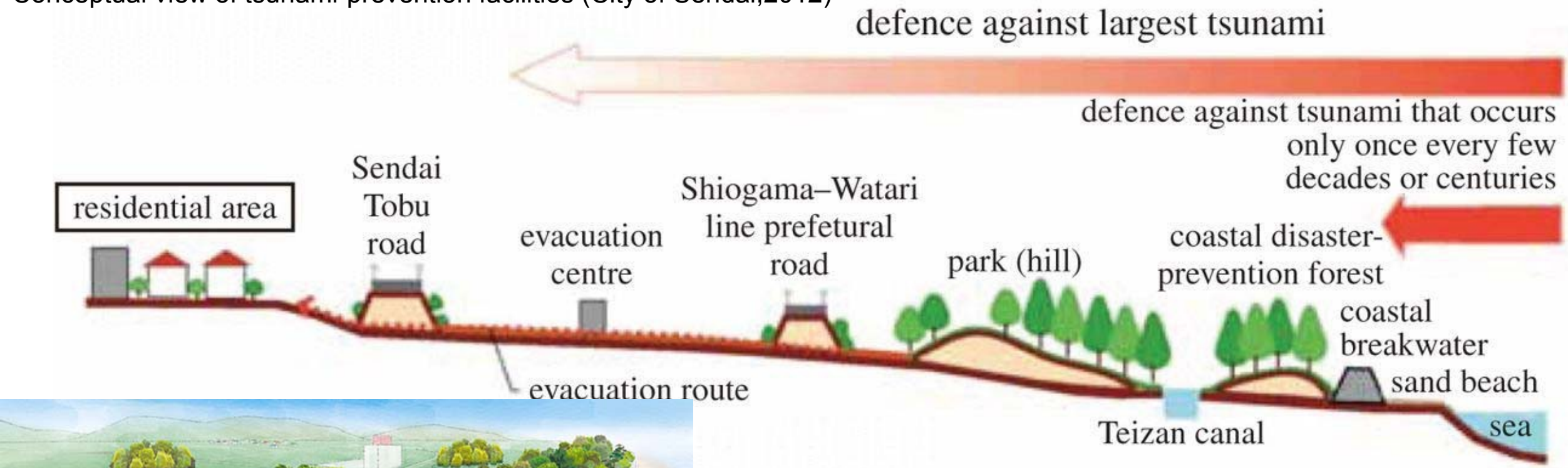

Erosion
Benefits / Pros
Challenges / Cons
Benefits / Pros
Challenges / Cons
Benefits / Pros
Challenges / Cons
Long-term, beyond 1 year
Short-term, within 1 year
what to do next?


Rural

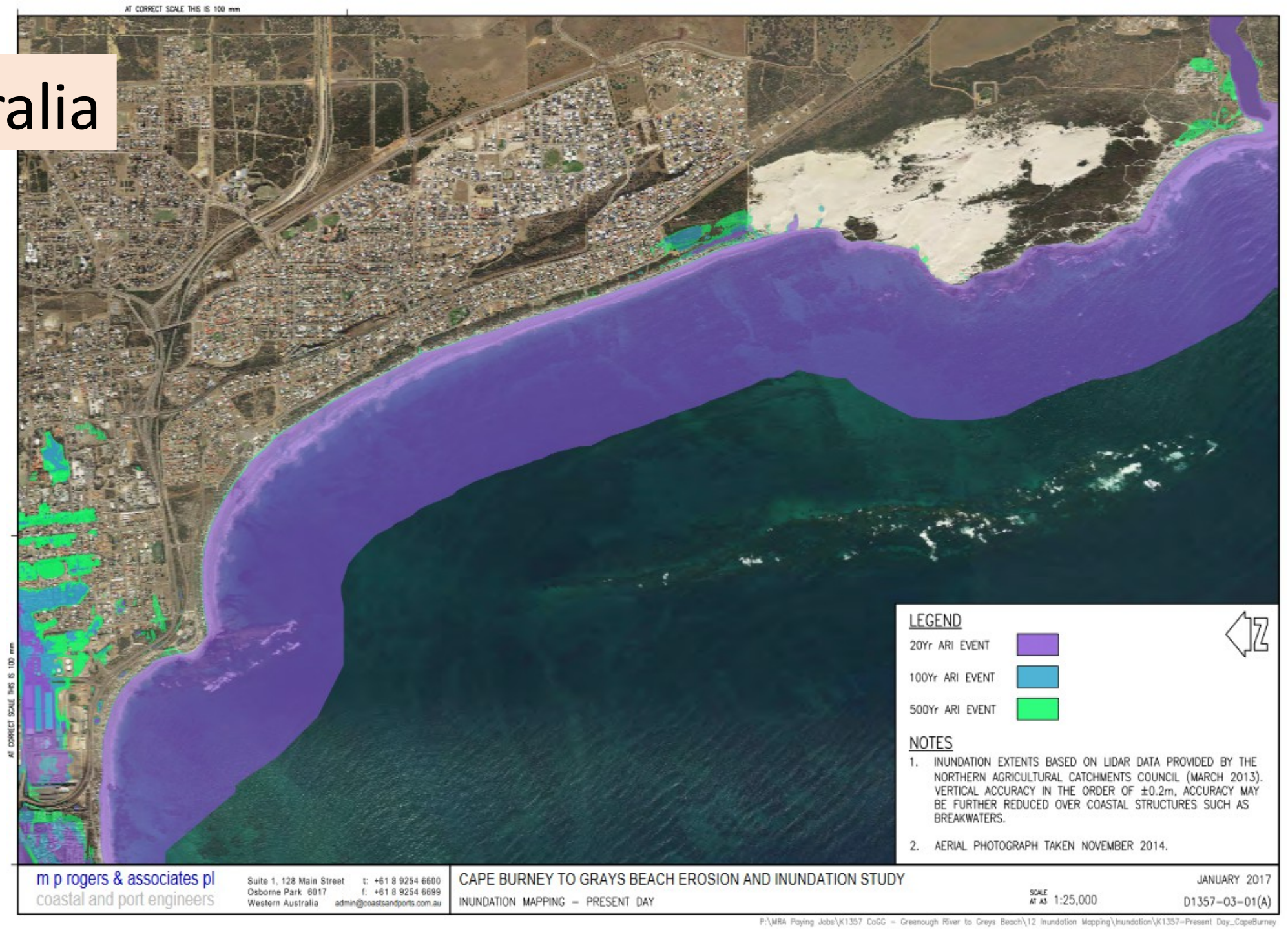
Giappone

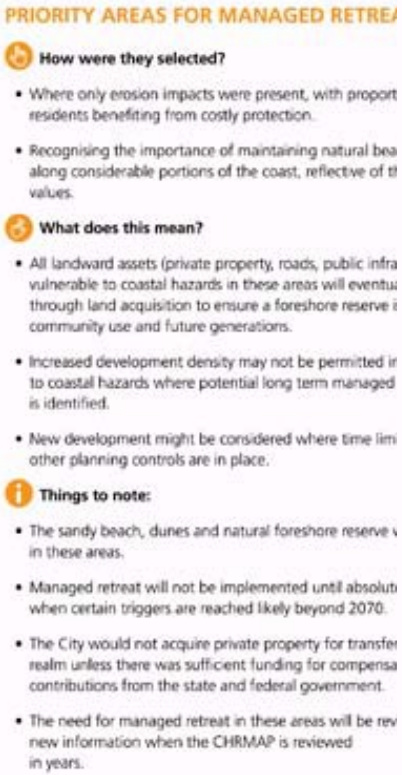
Kesennuma wall

Conceptual view of tsunami-prevention facilities (City of Sendai,2012)



Australia


AT CORRECT SCALE THIS IS 100 mm
AT CORRECT SCALE THIS IS 100 mm
LEGEND
20Yr ARI EVENT
100Yr ARI EVENT
500Yr ARI EVENT
NOTES
1. INUNDATION EXTENTS BASED ON LIDAR DATA PROVIDED BY THE NORTHERN AGRICULTURAL CATCHMENTS COUNCIL (MARCH 2013). VERTICAL ACCURACY IN THE ORDER OF ±0.2m, ACCURACY MAY BE FURTHER REDUCED OVER COASTAL STRUCTURES SUCH AS BREAKWATERS.
2. AERIAL PHOTOGRAPH TAKEN NOVEMBER 2014.
m p rogers & associates pl
coastal and port engineers
Suite 1, 128 Main Street
Osborne Park 6017
Western Australia
t: +61 8 9254 6600
f: +61 8 9254 6699
admin@coastsandports.com.au
CAPE BURNEY TO GRAYS BEACH EROSION AND INUNDATION STUDY
INUNDATION MAPPING – PRESENT DAY
SCALE AT A3 1:25,000
JANUARY 2017
D1357-03-01(A)
P:\MRA Paying Jobs\K1357 CoGG - Greenough River to Greys Beach\12 Inundation Mapping\Inundation\K1357-Present Day_CapeBurney


PRIORITY AREAS FOR MANAGED RETREA

How were they selected?

- Where only erosion impacts were present, with proport residents benefiting from costly protection.
- Recognising the importance of maintaining natural bea along considerable portions of the coast, reflective of t values.

What does this mean?

- All landward assets (private property, roads, public infra vulnerable to coastal hazards in these areas will eventu through land acquisition to ensure a foreshore reserve i community use and future generations.
- Increased development density may not be permitted ir to coastal hazards where potential long term managed is identified.
- New development might be considered where time lim other planning controls are in place.

Things to note:

- The sandy beach, dunes and natural foreshore reserve v in these areas.
- Managed retreat will not be implemented until absolut when certain triggers are reached likely beyond 2070.
- The City would not acquire private property for transfe realm unless there was sufficient funding for compensa contributions from the state and federal government.
- The need for managed retreat in these areas will be rev new information when the CHRMAP is reviewed in years.

PRIORITY AREAS FOR MANAGED RETREAT

How were they selected?

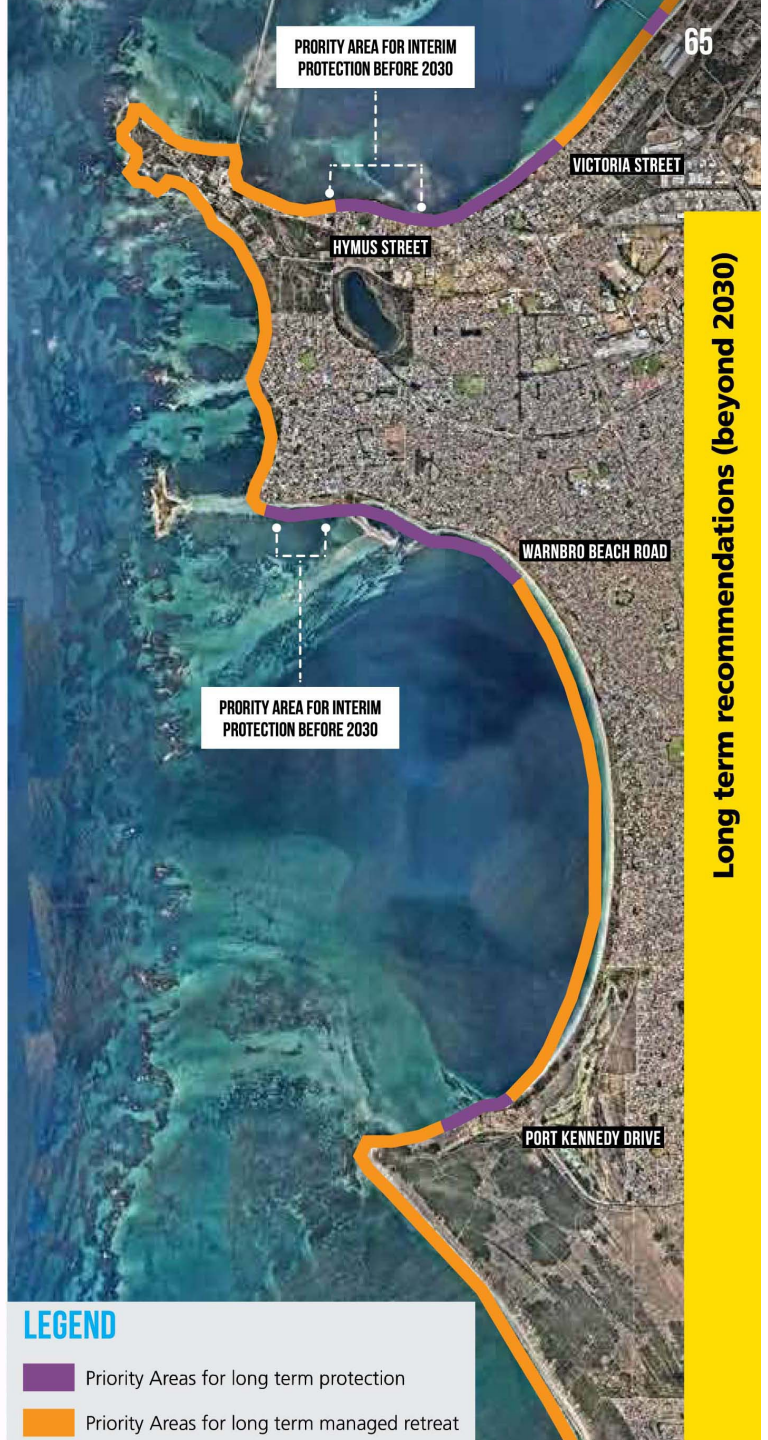
- Where only erosion impacts were present, with proportionately fewer residents benefiting from costly protection.
- Recognising the importance of maintaining natural beach environments along considerable portions of the coast, reflective of the community's values.

What does this mean?

- All landward assets (private property, roads, public infrastructure) vulnerable to coastal hazards in these areas will eventually be retreated through land acquisition to ensure a foreshore reserve is retained for community use and future generations.
- Increased development density may not be permitted in areas vulnerable to coastal hazards where potential long term managed retreat is identified.
- New development might be considered where time limited approvals or other planning controls are in place.

Things to note:

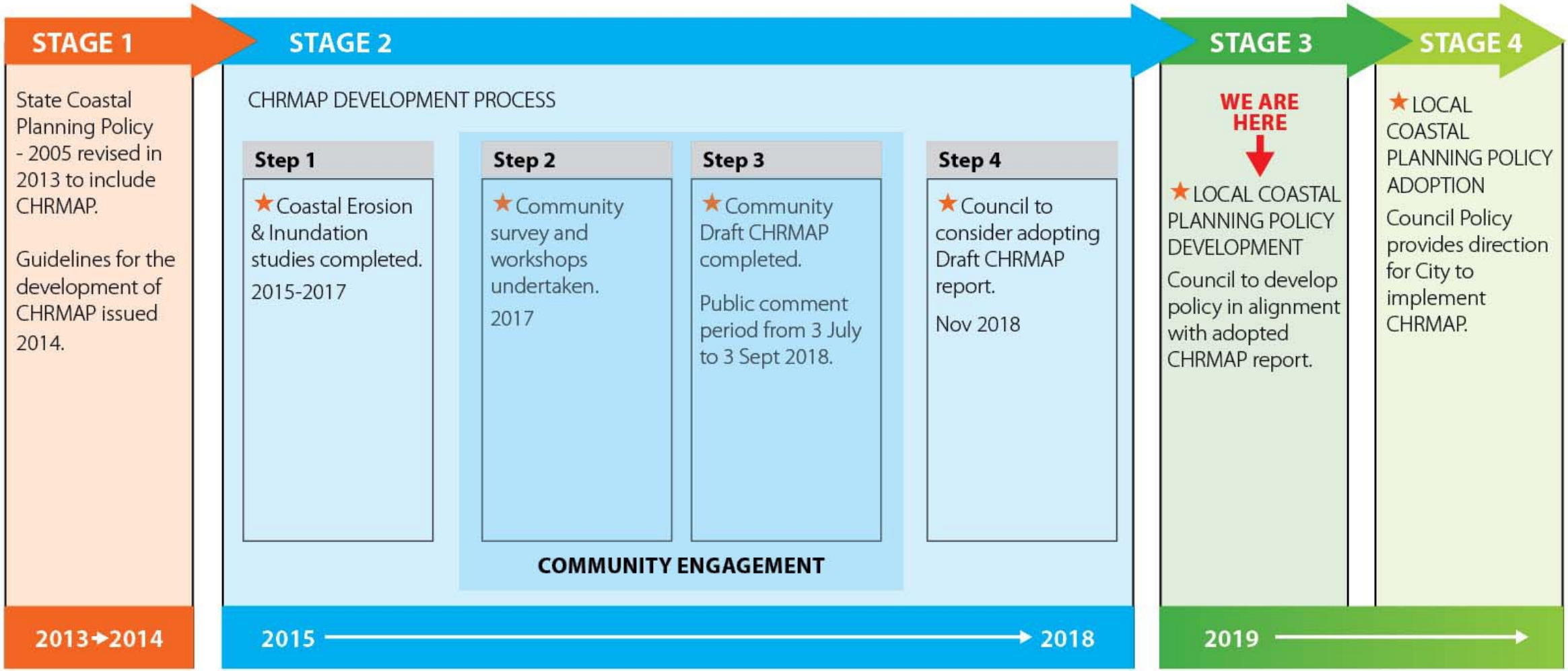
- The sandy beach, dunes and natural foreshore reserve will be preserved in these areas.
- Managed retreat will not be implemented until absolutely necessary, when certain triggers are reached likely beyond 2070.
- The City would not acquire private property for transfer to the public realm unless there was sufficient funding for compensation, with contributions from the state and federal government.
- The need for managed retreat in these areas will be revised relative to new information when the CHRMAP is reviewed in years.



Western Australian Planning Commission

WA Planning Commission and City of Greater Geraldton Process of
Adapting to Coastal Erosion & Inundation Risk

City of Greater Geraldton a vibrant future



★CHRMAP process undertaken in accordance with the WA State Planning Policy No. 2.6 State Coastal Planning Policy (SPP2.6)

Coastal Hazard Risk Management and Adaptation Planning (CHRMAP).

In particular, Clause 21.04–6 of the scheme aims to "**discourage** individual landowners adjacent to the coast from constructing their own sea wall barriers in an attempt to minimise impacts from erosion and coastal processes" (Bass Coast Shire Council 2017).

Additionally, applications to construct or carry out works on land below 5 m AHD must be accompanied by a **vulnerability assessment** prepared by a qualified specialist, in accordance with State approved guidelines, to the satisfaction of the responsible authority. Since amendment C82 came into operation, there have been no cases where a landowner has appealed against coastal hazard requirements

Development applicants may apply to construct coastal protection works on private land. However, the Code advises applicants that approval is difficult to achieve and proponents or future landowners will be responsible in **perpetuity for maintenance and renewal**. Under the new Act, applicants will be required to prepare a cost-benefit analysis that provides a full cost attribution analysis (New South Wales Government 2016a) and would be responsible for any **beach renourishment** required as a consequence of any loss of beach resulting from the protection works.

Robb et al., 2


Grrrr.azie!