

# GEO-Summit Italia 2024

## Conferencia: “Sustainable solutions for coastal erosion control”.

EFE VALPARAISO

4 - 7 June 2024 / Genova, IT





## Objetivo

La Conferencia tuvo como objetivo sensibilizar y promover el intercambio de conocimientos regionales e internacionales entre expertos en el diseño de medidas de mitigación, así como responsables de áreas afectadas por fenómenos de erosión recurrentes. El programa de la conferencia se centrará en la investigación de la erosión costera y las contramedidas de mitigación sostenibles, y cubrirá las últimas investigaciones y hallazgos científicos, desafíos y avances en la erosión costera hacia infraestructuras resilientes.

Under the patronage of:



Università  
di **Genova**

Organized by:



## Speakers



Prof. Dr. Giovanni Besio  
University of Genoa



Prof. Dr. Shinji Sato  
Kochi University of Technology



Eng. Marcus Evans  
Landmarc



Dr. Antonio Tomás Sampedro  
IHCantabria



Dr. Daniel C. Conley  
University of Plymouth



Prof. Dr. Renata Archetti  
University of Bologna



Prof. Dr. Michele Greco  
Università della Basilicata



Dr. Mohammad Heidarzadeh  
University of Bath



Dr. Davide Würthrich  
TU Delft



Etienne Abadie  
Ecocean

- Dr. Marco Bucci, City of Genoa, Italy
- Prof. Eng. Renata Archetti, University of Bologna, Italy
- Prof. Eng. Giovanni Besio, University of Genova, Italy
- Dr. Giovanni Cecconi, VeniceLab, Italy
- Dr. Daniel C. Conley, University of Plymouth, UK
- Eng. Marcus Evans, Landmarc, UK
- Dr. Mohammad Heidarzadeh, University of Bath, UK
- Prof. Shinji Sato, Kochi University of Technology, Japan
- Dr. Antonio Tomás Sampedro, IHCantabria, Spain
- Prof. Michele Greco, University of Basilicata, Italy
- Dr. Davide Würthrich, TU Delft, Netherlands
- Etienne Abadie, Ecocean, France

## Así subirá el **nivel del mar** en el futuro

Según dos escenarios de emisiones de gases de efecto invernadero



europapress.es

Fuente: IPCC

Gráfico con el aumento del nivel del mar en el futuro  
- EUROPA PRESS









Evento de marejadas el invierno del año 2022 obligo a suspender el tráfico de trenes desde y hacia el Puerto de Ventana.

Actualmente, en la región de Valparaíso, los trenes de carga transportan principalmente concentrado de cobre que proviene desde distintas faenas mineras hasta el Puerto de Ventanas, conectando con la subdivisión 7 de EFE, San Pedro-Ventanas. Para potenciar el modo ferroviario de carga, EFE también está realizando un proyecto para mejorar la eficiencia y seguridad de la vía. Es así como en este trazado ya se han rehabilitado cerca de 67 curvas que equivalen a 12,3 kilómetros.

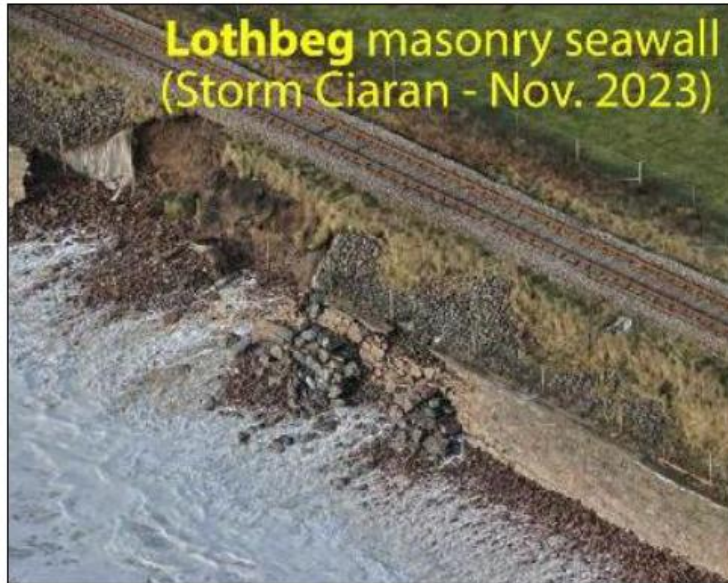


# Unprecedented pressure on coastal areas

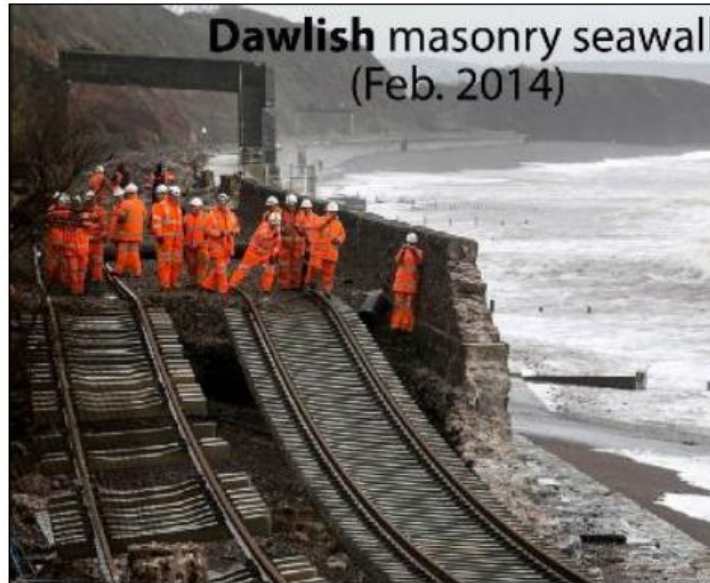


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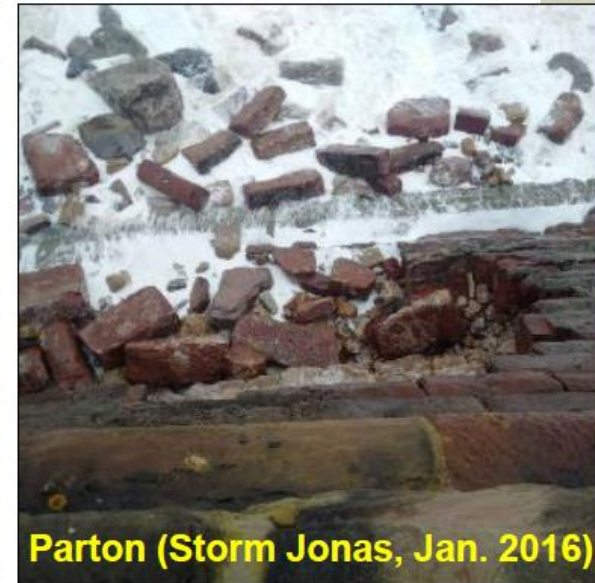
**BRUGG**  
Geobrugg



**Lothbeg** masonry seawall  
(Storm Ciaran - Nov. 2023)



**Dawlish** masonry seawall  
(Feb. 2014)



**Parton** (Storm Jonas, Jan. 2016)

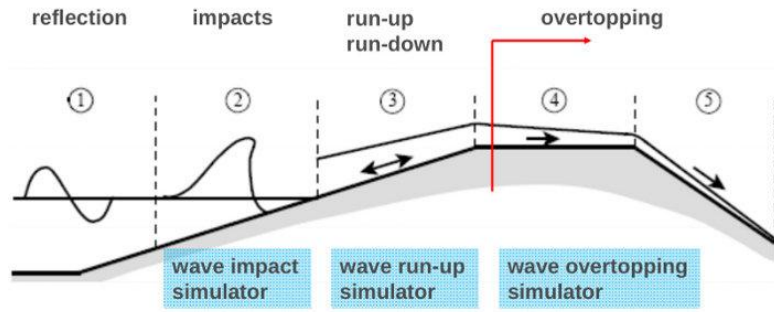


**Chesil Beach** (Storm in Feb 2014)

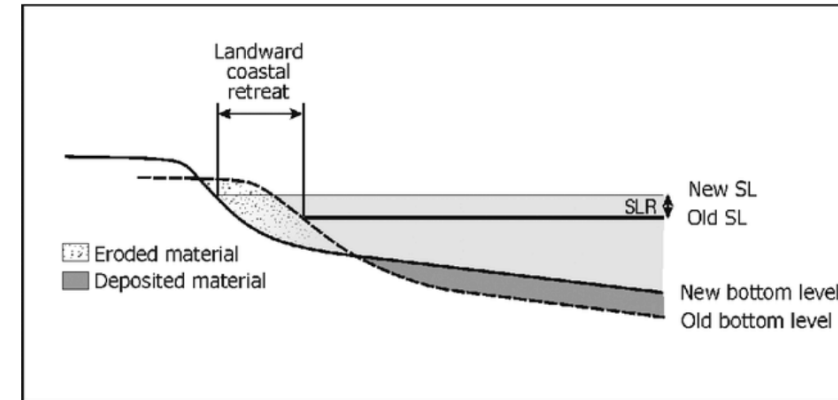


←  
**Parton** (Storm  
Ciara/Denis,  
Jan. 2020)

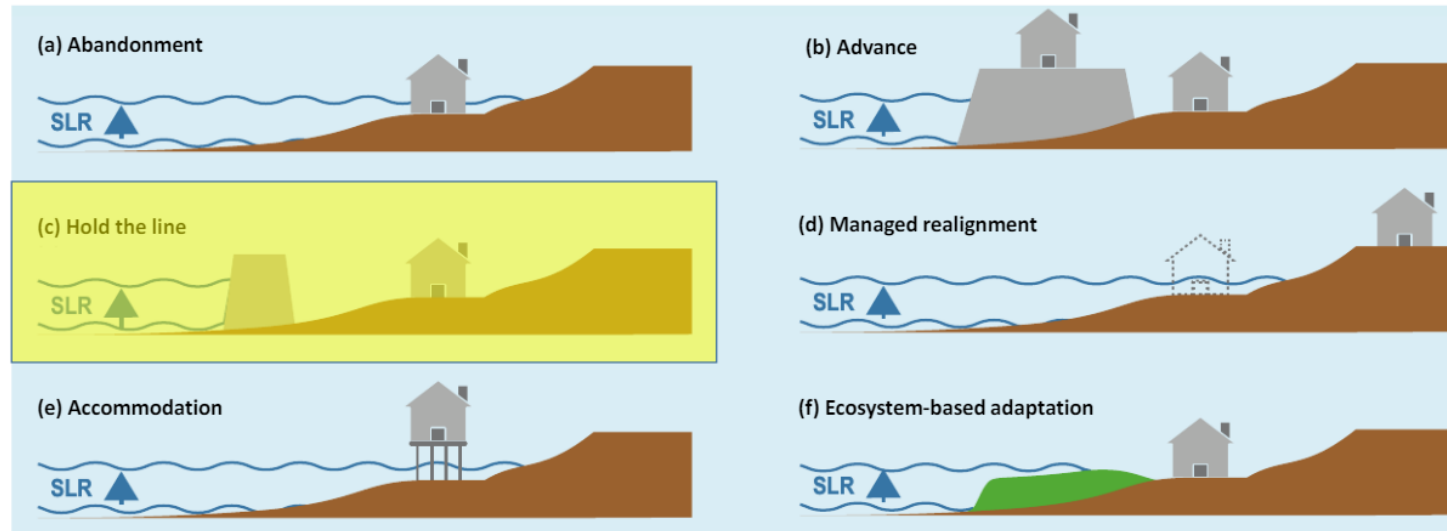
## Wave-structure interaction processes



## Bruun's Rule



## Coastal Management Strategies





# Gray and green coastal defense methods



## Gray methods (fully structural)

- Sea wall
- Groin
- Breakwater
- Rock armour

## Hybrid methods

- Vegetated rock armour
- Use of natural materials (sandbags for groins etc.)
- Sea wall with salt marsh

## Green methods (fully non-structural)

- Shore nourishment
- Salt marsh
- Sand engine
- Vegetation

- Long-term solutions
- Powerful barriers (protect the coast)
- Minimum/moderate maintenance
- Require minimum space
- More expensive
- High emissions
- Limit access to the coast

- Reasonable cost
- Minimum emissions
- Require large space at the coast
- Require frequent maintenance
- Inefficient against powerful waves

# Can we improve revetments to be less carbon-emissive and stronger?



## Rock armour revetment



- High emission
- Vulnerable to storms
- High maintenance costs

## Concrete revetment



- Ultra-high emission
- Strong to storms
- Low maintenance costs
- Higher runup and overtopping

## Tetrapod revetment



- High emission
- Vulnerable to storms
- High maintenance costs

## Timber revetment



- Moderate emission
- Vulnerable to storms
- High maintenance costs
- Higher runup and overtopping



## Some of the alternative revetments:



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**BRUGG**  
Geobrugg 

They are less carbon-emissive, but are they stronger and efficient? We need to find out.

**Gabion mattresses / baskets**



**Rock bags / sandbags**

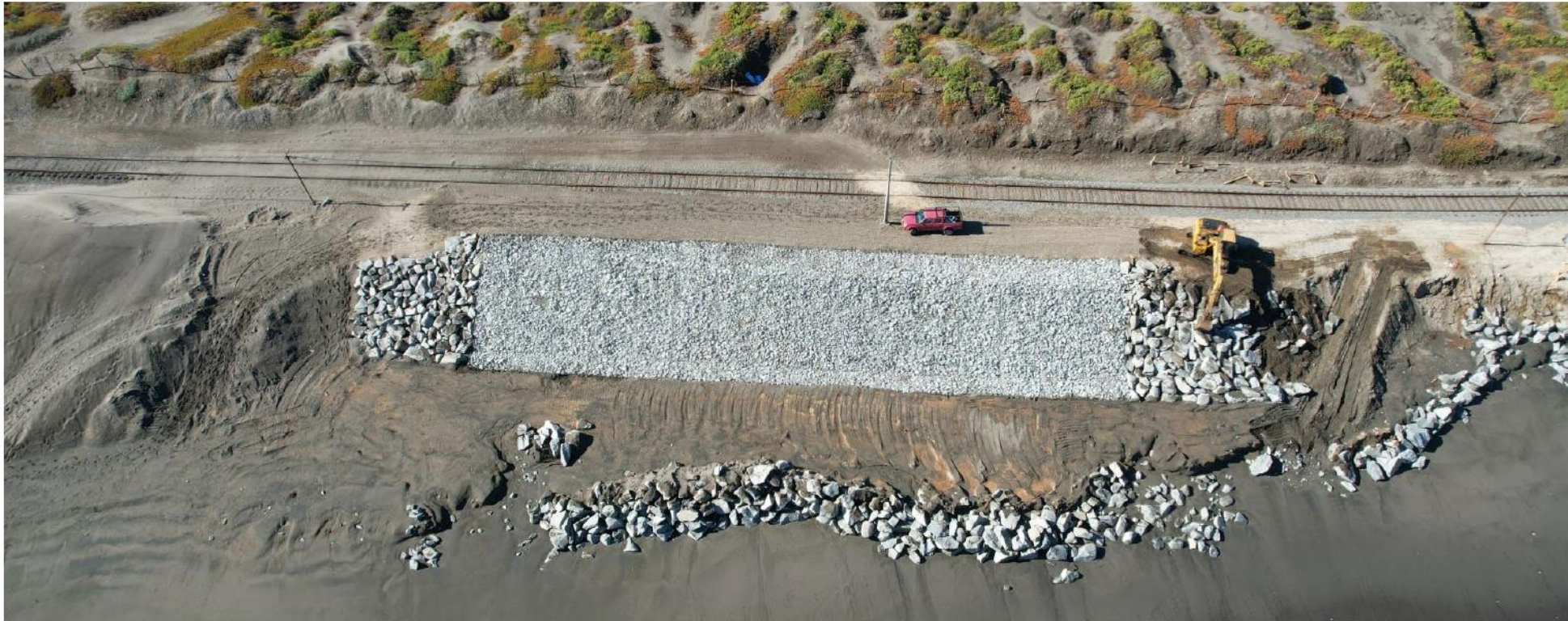


**TECCO® Cell revetment**





## RITOQUE, MAY 2024



07.06.2024

Geobrugg Group

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<https://www.efe.cl/con-sistema-de-ingenieria-inedito-en-chile-implementan-enrocado-para-evitar-erosion-por-el-oleaje-en-sector-de-punta-piedra/>



## TECCO® CELL



### Versatility

- Designs can accommodate beach access and planting of local vegetation.
- Cell moves with changing beach levels, stable over time
- Modular design allows system to be dimensioned to suit local needs

### Performance

- Wave energy dissipated as water passes through cells helping to prevent erosion behind the cell and beach drawdown/ scouring in front.
- Excellent design life, no corrosion / abrasion in over 8 years

### Environment

- No components / materials to be released into the ocean and stainless-steel material can be 100% recycled
- No need for ongoing maintenance, very long lifetime
- Utilises locally available fill material

### Financial Savings

- Well competitive vs traditional rock armour
- Ongoing annual savings as literally no maintenance necessary



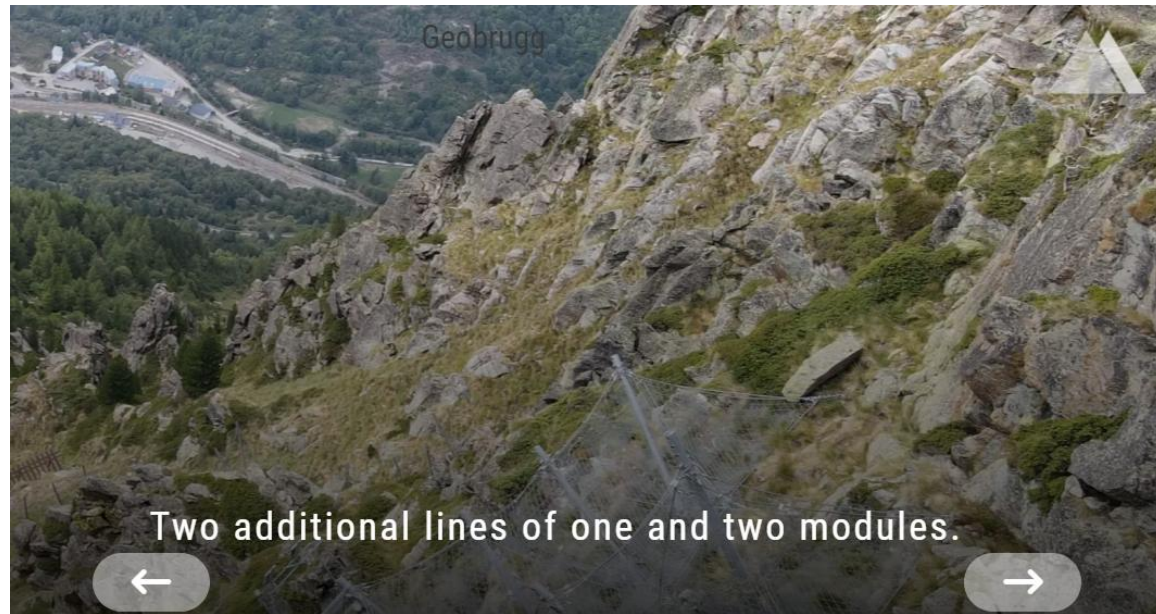








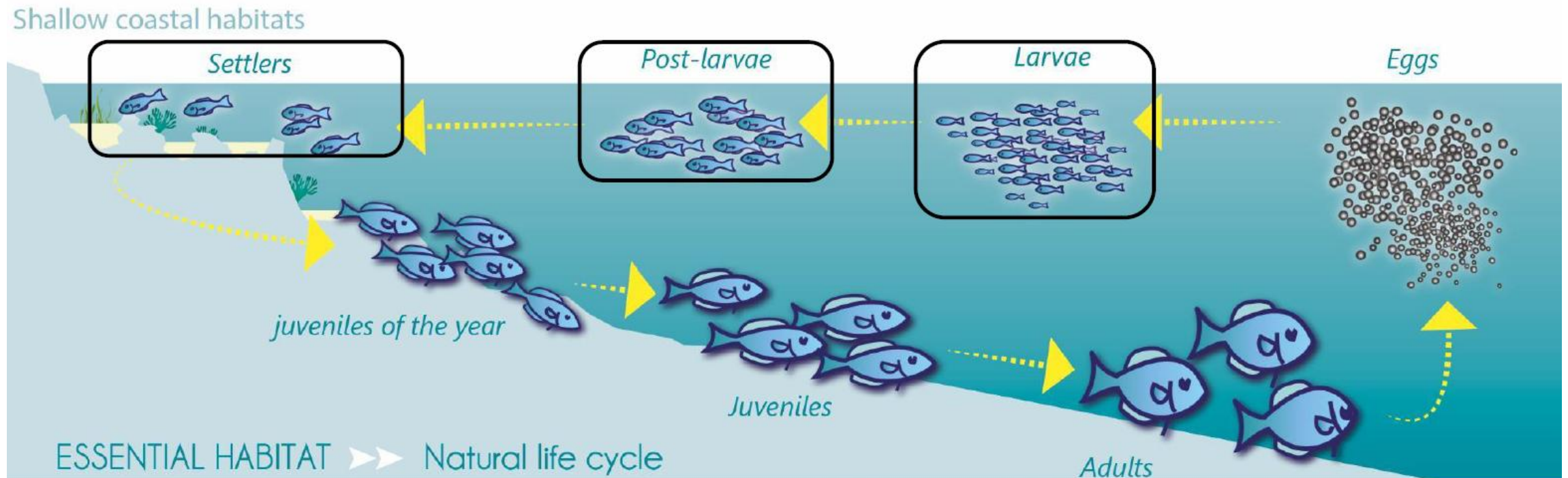








## Ecocean expertise is dedicated to early life history stage (ELHS) of fish



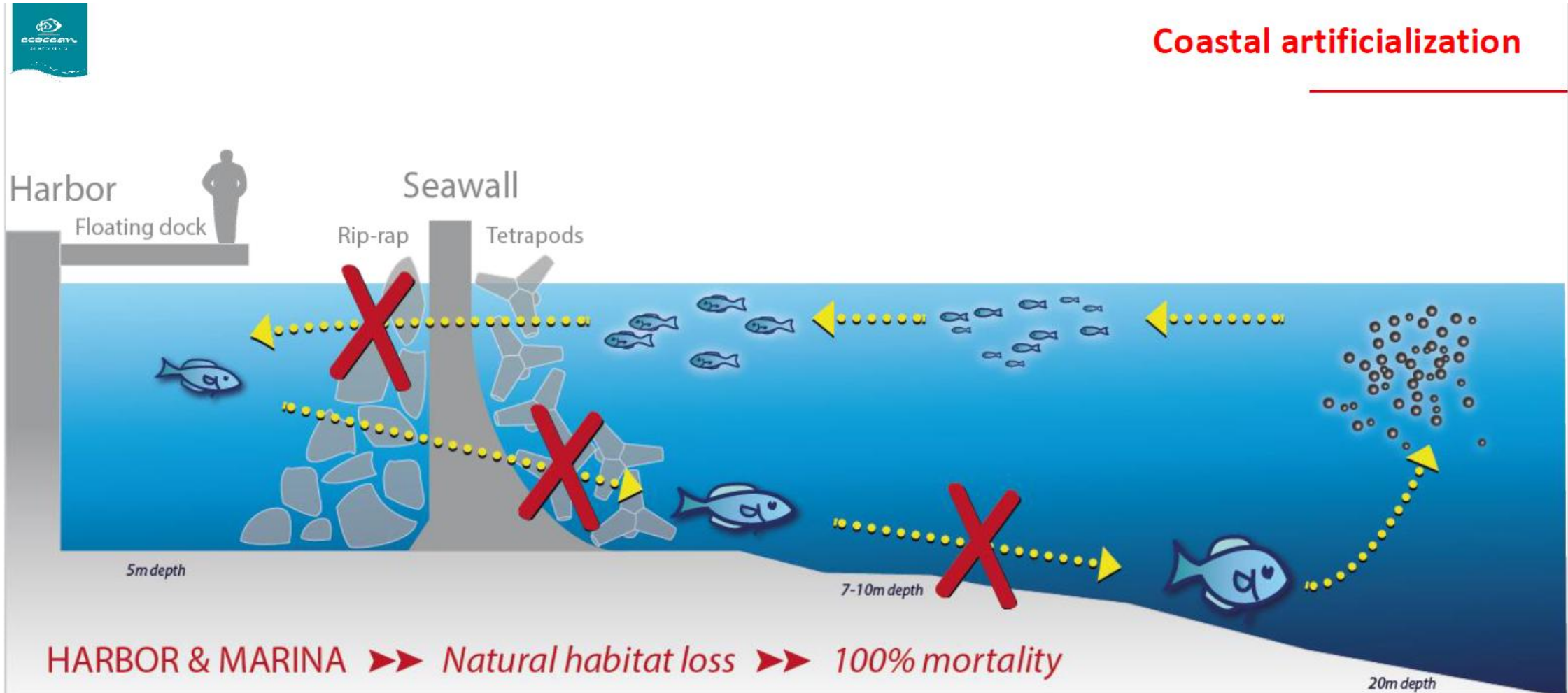
⇒ Shallow coastal areas (0-20m) are essential habitats

⇒ ELHS of fishes, crustaceans, mollusks come from the open sea

⇒ All these animals seek for habitat where to settle and grow => natural behavior



## Coastal artificialization



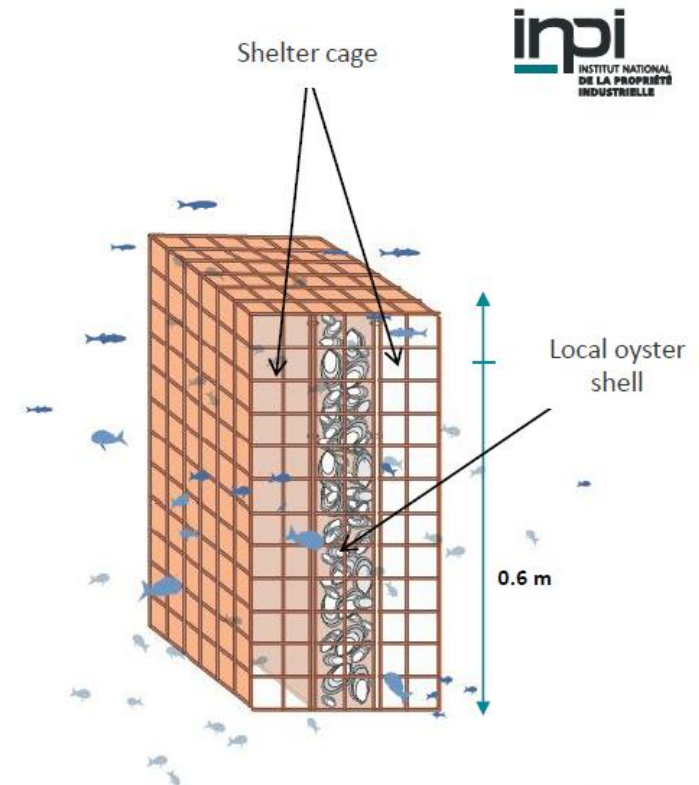
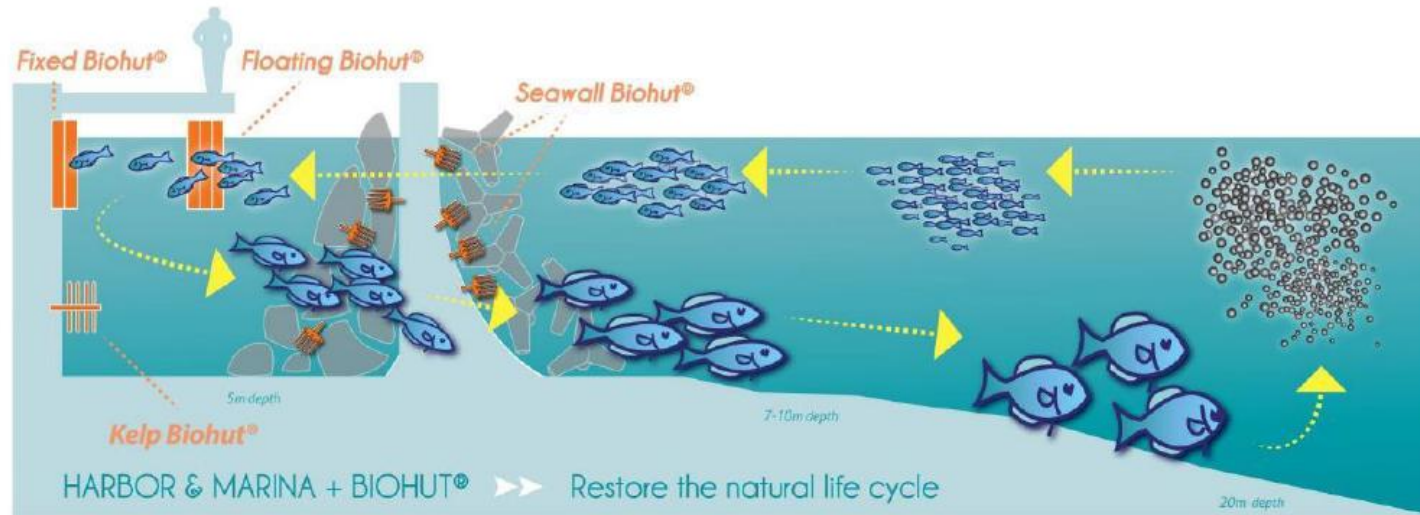
⇒ Artificialization is often located on shallow water coastlines (ports, canals, cities)

⇒ Human infrastructures have an impact on available habitats for biodiversity -> loss of natural mechanisms





## Biohut artificial nursery habitat



⇒ Adapted and diversified natural food associated with an efficient shelter => essential nursery criteria

⇒ Biohut artificial habitats can have a positive impact on the marine biodiversity





## Other solutions for energy facilities



Blue Oracle OCG Data – 30 km offshore



Floating photovoltaic - Netherlands



BoB Observation buoy – 16km offshore







# Gracias

EFE VALPARAISO

Junio 2025

