CIRIA Council Meeting

17 April 2024

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Research spotlight

Greening coastal infrastructure, Offshore infrastructure and new Geospatial Community of Practice

Jack Young

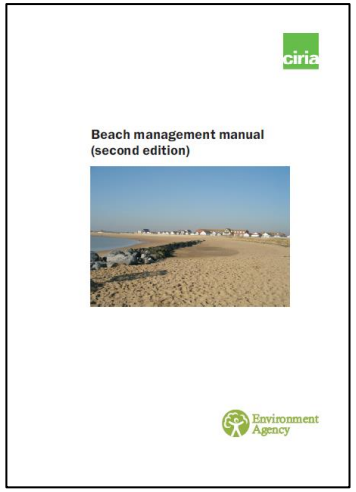
Project Manager

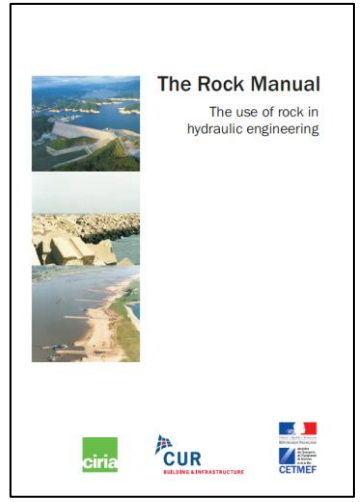
CIRIA

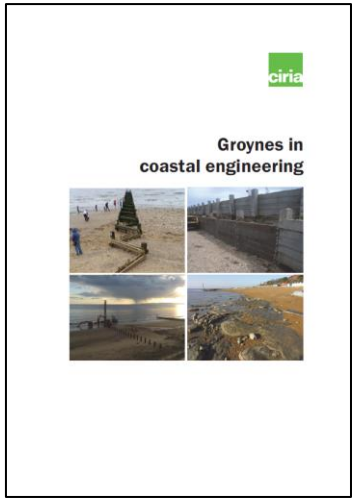
CIRIA coastal portfolio

Best-practice guidance

- Rock manual (1991)
- Beach management manual (2010)
- Old waterfront walls (2015)
- Coastal and marine environmental site guide (2015) and pocket-book (2016)
- Groynes in coastal engineering (2020)







Other research initiatives

- European Marine Sand and Gravel Group (EMSAGG)
- MARine INFrastructure EFFects (MARINEFF)

EMSAGG

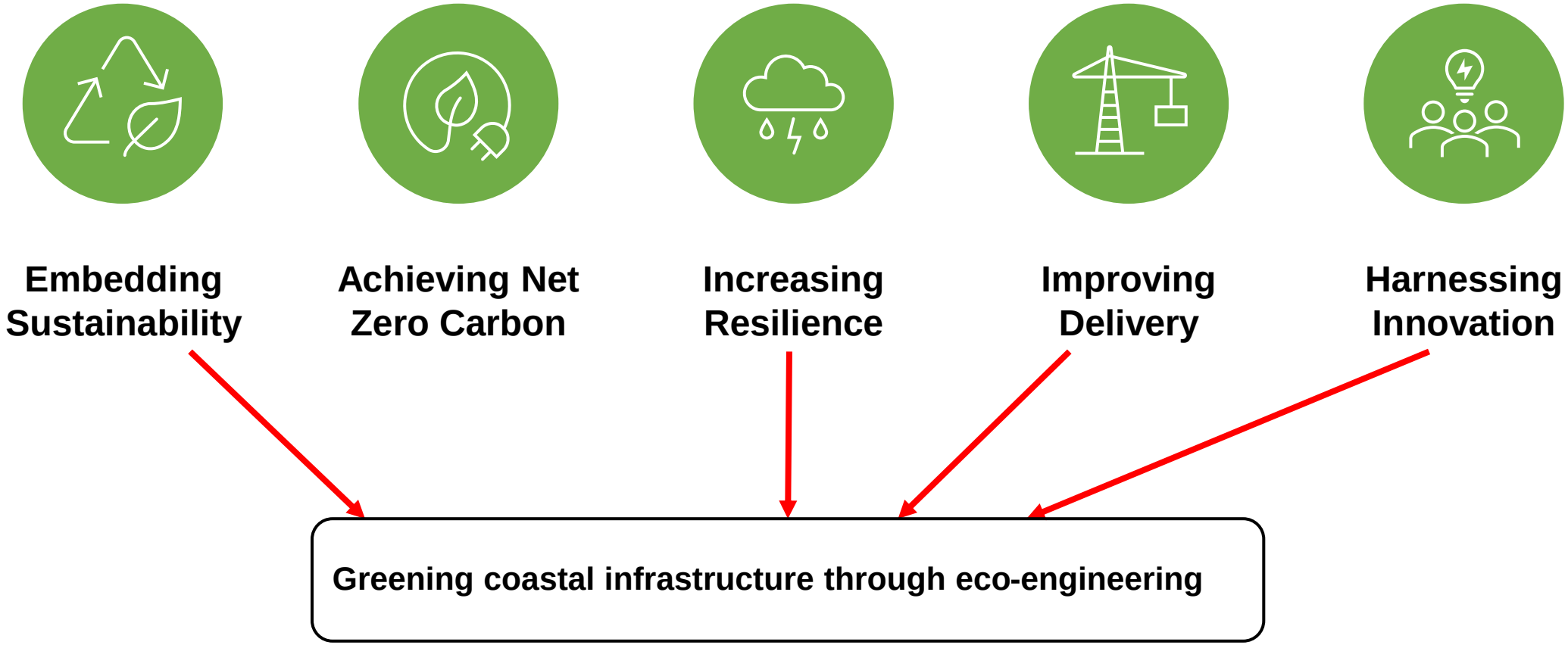
MARINEFF
MARine INfrastructures EFFects

Greening coastal infrastructure through eco-engineering

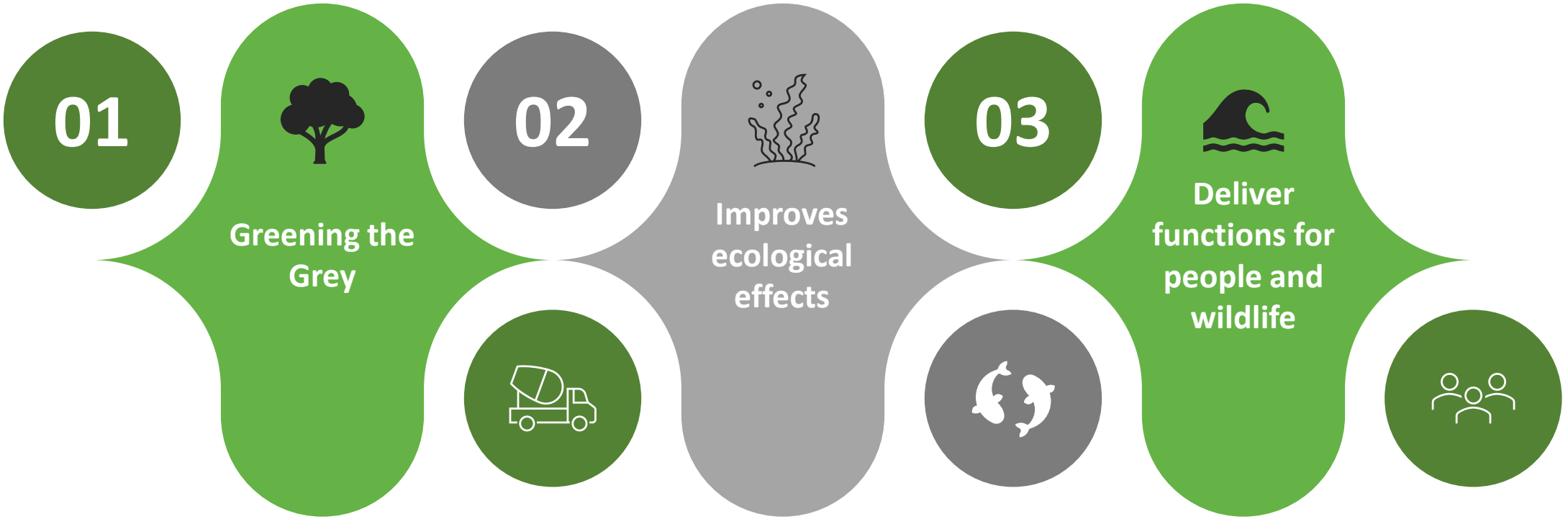
P3216

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

CIRIA's research strategy



What is eco-engineering?



Context

- Follows CIRIAs strong legacy of environmental and water projects
- Number of recent academic and industry trials in coastal settings
- Well researched and clear evidence base
- Chance to increase awareness for coastal developers
- Guide will focus on coastal methods

Drivers

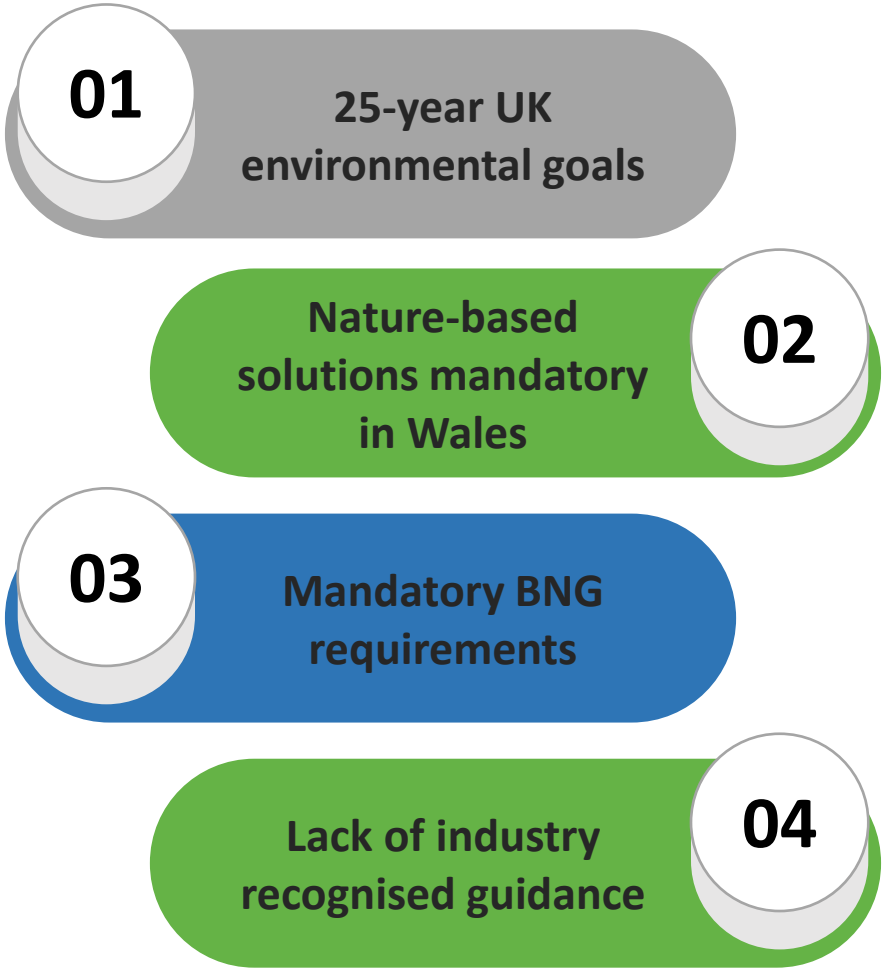
ENVIRONMENT PLAN 2018

Various goals including:

- Improve national water quality in coastal and marine regions
- Achieve cleaner and more plentiful water
- Reverse observed reduction in marine biodiversity and restore it where possible.

ENVIRONMENT ACT 2021

Biodiversity net gain (BNG) of 15% for new developments made mandatory in February 2024.



COASTAL MANAGEMENT

As of 2021, Welsh coastal asset management plans are obligated to consider nature-based solutions where possible.

SPACE TO COLLABORATE

No consolidated guidance in this sector and chance to highlight the various innovations available today.

A few examples…

Artificial rockpools

- Encouraged retention of water and further algae growth
- Resulted in oysters colonising the rockpools and local waters
- Oysters = healthy water!
- Winner of a 2021 BIG Award

Image from Marineff – May 2021 Newsletter

Images from Marineff

A few examples…

Breakwater blocks

- Large concrete blocks with a variety of textures encouraging settlement of aquatic flora and fauna
- Introducing a new habitat
- Less greening the grey – but can be used alongside developments to improve the overall ecological value of a project

Project goals

HIGHLIGHT METHODS

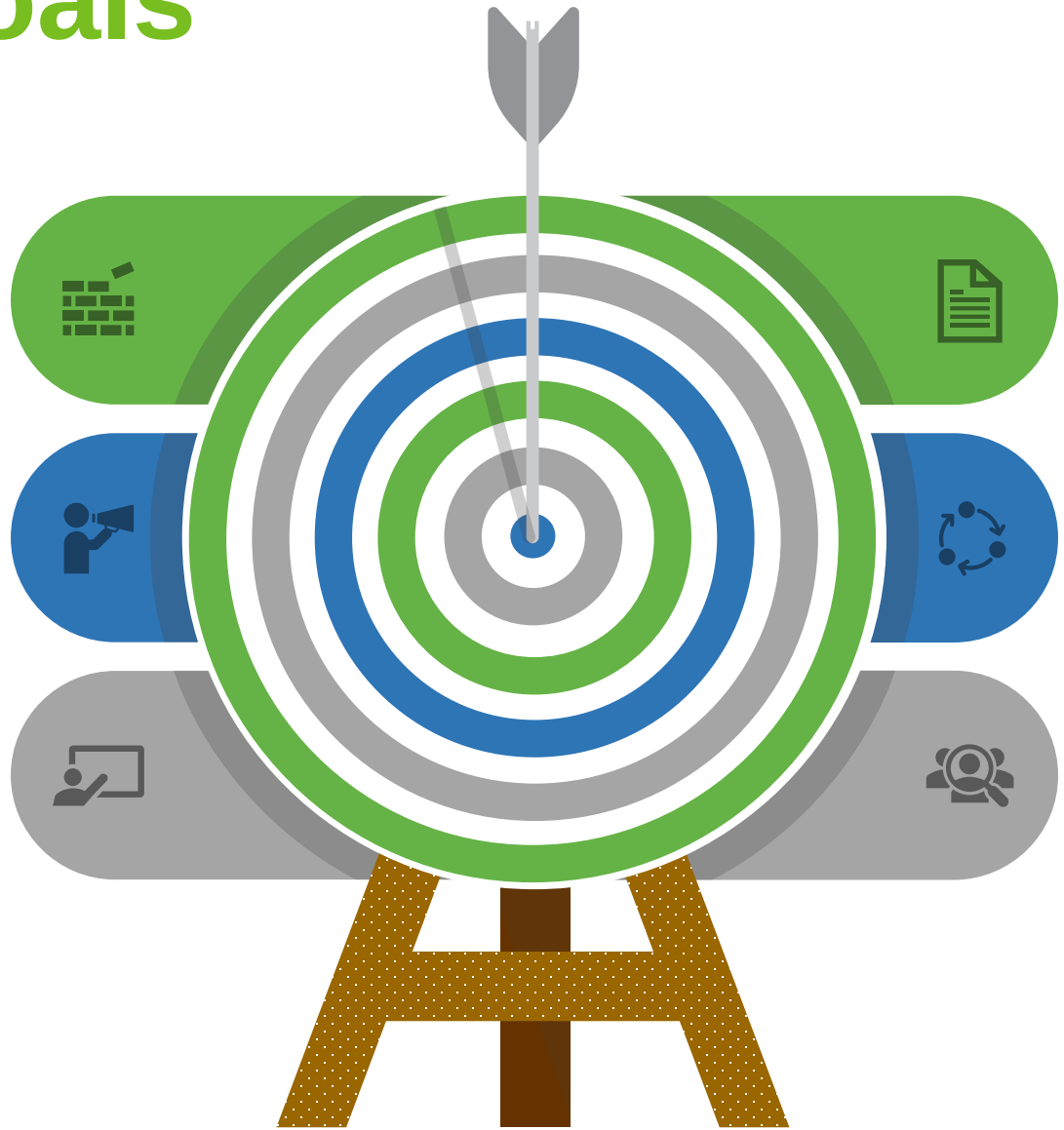
Build upon CIRIA and NERCs collaboration in 2017 to further highlight the art of the possible in coastal eco-engineering.

RECOMMENDATIONS

Provide recommendations based on typical UK coastal settings, ecosystems and asset types.

BUSINESS CASES

Detail considerations for preparing effective business case for including eco-engineering in coastal management plans, including drivers of cost and pricing.



PROVIDE EVIDENCE

Contextual and environmental analysis on the design and application of methods.

ASSET LIFECYCLE

Discuss the design, materials, and wholelife asset monitoring and maintenance.

TARGET AUDIENCE

Aimed at stakeholders involved in the design, construction, management, planning, regulation and operation of coastal infrastructure.

Who is involved?

Author Team

hr wallingford

Royal HaskoningDHV
Enhancing Society Together

HAEDES
ENGINEERING SOUL. FROM SOURCE TO SEA

Steering Group

ABP ASSOCIATED BRITISH PORTS

ARC Marine

ARUP

AUTODESK

CST CLEVELAND STEEL & TUBES LTD

THE CROWN ESTATE

Environment Agency

EXO Engineering

GEOBRUGG BRUGG
Safety is our nature

KML Keynvor MorLift Ltd

KIER

MACCAFERRI

MOTT MACDONALD

NATURAL ENGLAND

Cyfoeth Naturiol Cymru
Natural Resources Wales

THE Plastic Piling Company

RAMBOLL

reefy
Innovation for nature

Scottish Government
Riaghaltas na h-Alba
gov.scot

University of Salford MANCHESTER

University of Glasgow

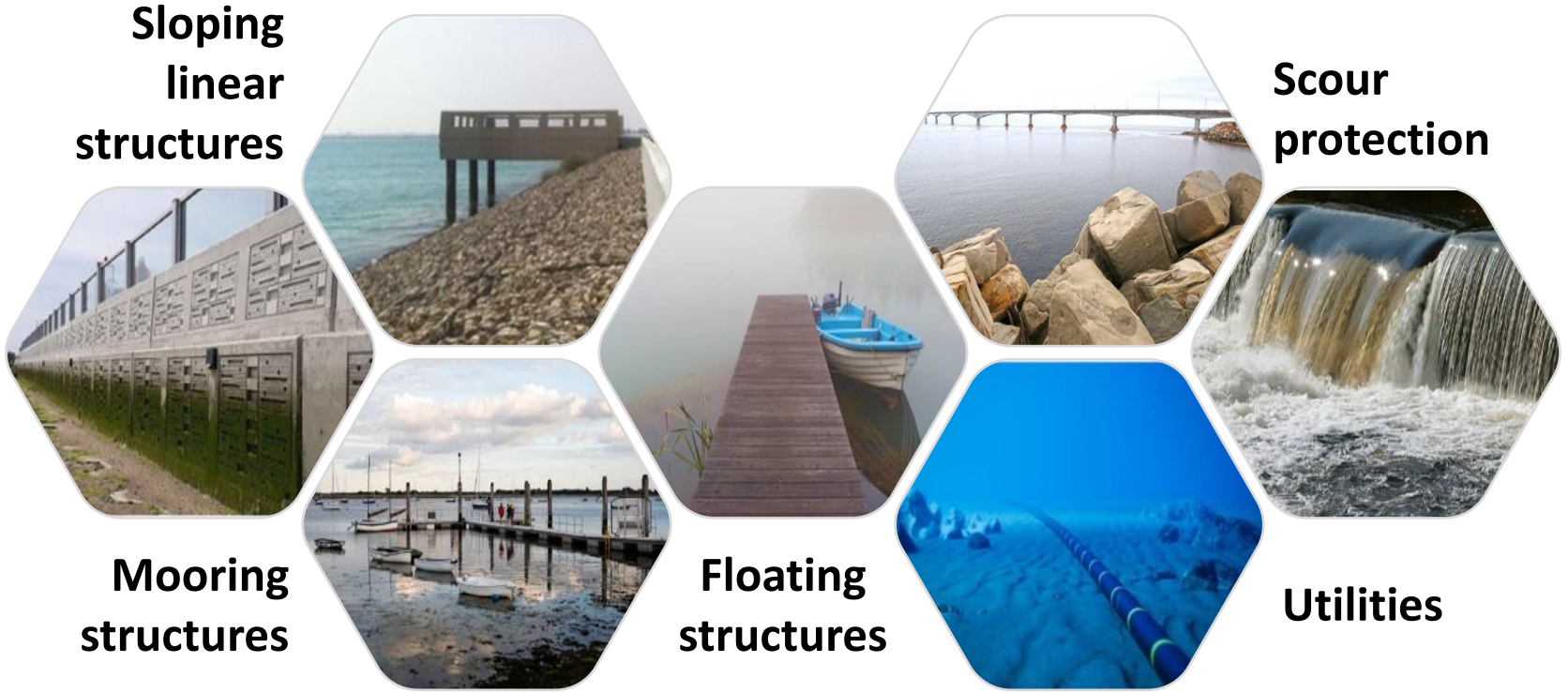
VolkerStevin

WSP

What's covered?

Chapters 1 - 2 Overview & Context	What is eco-engineering?
Chapter 3 Environmental & natural processes	Where to adopt eco-engineering techniques?
Chapter 4 Coastal and estaurine grey assets	When to apply eco-engineering techniques?
Chapter 5 Techniques	Which eco-engineering techniques to apply?
Chapter 6 Design considerations	How to apply eco-engineering techniques?
Chapter 7 Business case	Why use eco-engineering approaches?
Chapter 8 Case studies	What examples are out there?
Chapter 9 Gaps & Recommendations	What next?

Asset types


Sloping linear structures
Scour protection
Vertical linear structures
Tidal river barriers
Mooring structures
Floating structures
Utilities

Eco-engineering techniques

Textured surfaces

Water retention structures

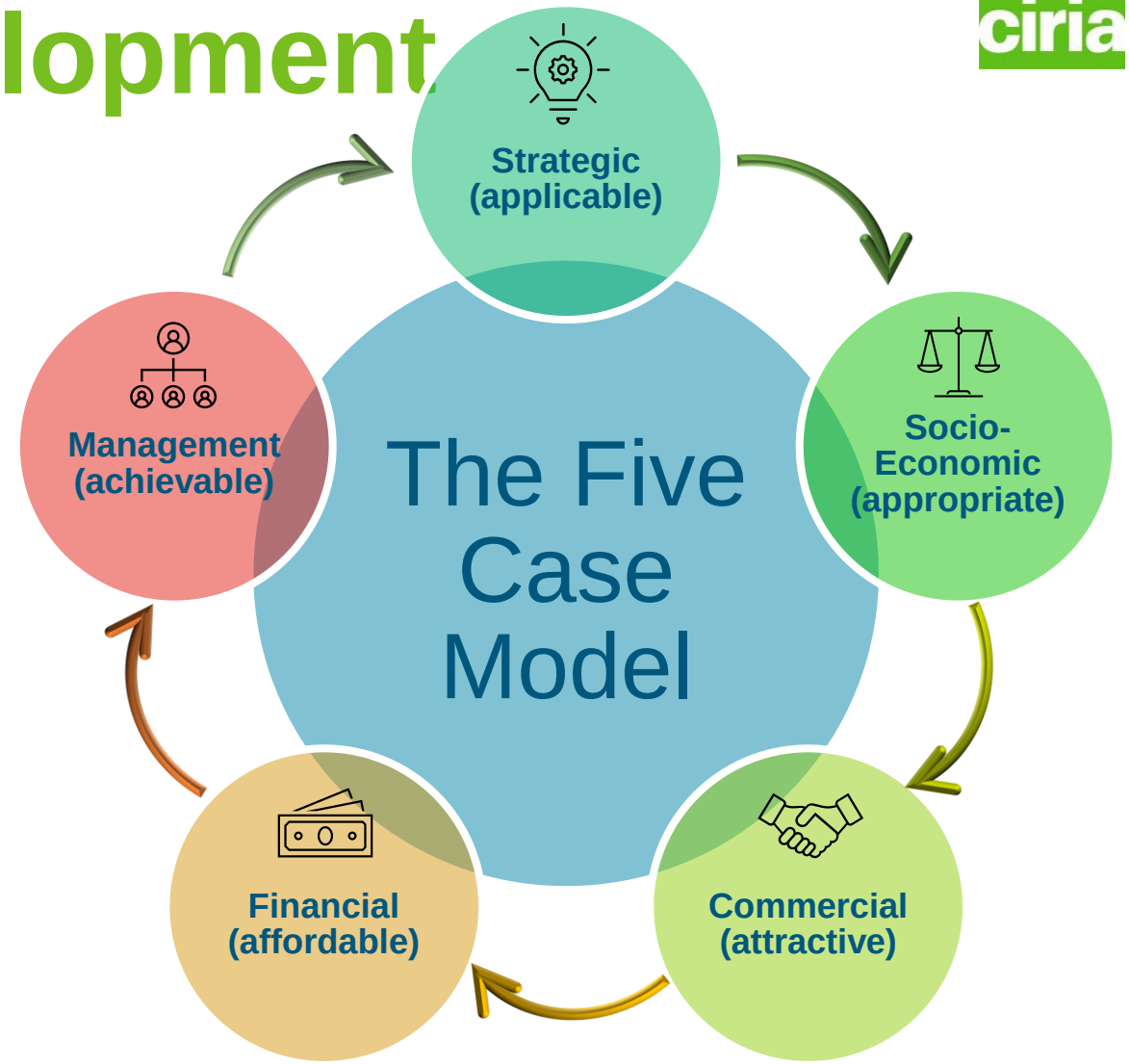
Swim through habitats

Macro habitats

Environmentally sensitive materials

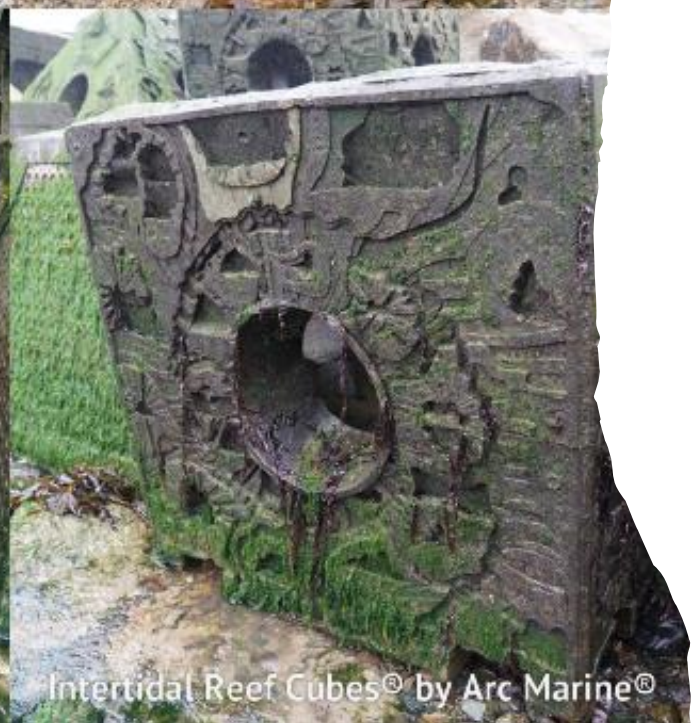
Business case development

- Aligned with UK Treasury recommended approach
- Helps provide a strategy to aid development of robust business cases for eco-engineering techniques.
- Explores strategic, socio-economic, commercial, financial and management principles from an eco-engineering standpoint
- Details challenges, benefits and connections between each principle



Case study – Textured blocks in Newlyn breakwater

- Deployment of ‘eco-blocks’ on rock armour breakwater
- Textured low-carbon concrete
- Four different block designs by four different suppliers
- R&D supported by the Environment Agency
- Studying potential for wider use in future FCERM schemes.



Small-scale pilot in 2020

- 12 eco-blocks deployed to identify best textures for full-scale pilot

Full-scale pilot in 2022

- 88 larger eco-blocks deployed by various suppliers

Each block contains a wide range of intertidal habitat niches, pools, recesses and more.

- Mimic local habitats
- Encourage rapid colonisation of marine life

Costs

- Funded as part of an EU Intereg project along with aid from UK Government's FCERM grant funding

Monitoring

- Reviewed bi-yearly by the EA to track colonisation rate and species distribution

Expected results

- Higher biodiversity than traditional rock armour
- Lower biodiversity than natural rocky intertidal reef

Results

1

Wide range of typically native species now more present

2

No signs of failure/poor structural performance related to sea defence.

3

Notable ecological benefits compared to traditional rock armour design methods

4

Blocks deployed in 2020 now exhibiting higher species richness than the natural reef

CIRIA guidance – progress so far

Authors currently working on the final draft before peer-review

Endorsement from the UN Ocean Decade programme

Targeting a Q2/Q3 launch

Offshore Infrastructure Asset Management

P3286

Developing consolidated guidance on the sustainable design, maintenance, removal and decommissioning of offshore infrastructure assets

Scope being refined but set to include:

- Energy generation assets and connecting infrastructure
  - Wind turbines (fixed and floating)
  - Wave energy stations
  - Rigs (oil and gas)
- Substations
- Cabling
- Pipelines

Offshore Infrastructure Asset Management

P3286

- An overview of the current offshore infrastructure industry.
- A summary of challenges related to energy disruption, increased energy demand and the need to meet these needs sustainably.
- A detailed literature review of existing guidance and new research into offshore infrastructure asset design, life-cycle, maintenance, replacement, removal, circular economy.
- Exploring greener options
- Case studies showcasing past schemes, techniques used, challenges, lessons learned.
- Recommendations on future industry developments to contribute to UK targets.

Geospatial Community of Practice

P3252

- CIRIA Geospatial
- Follows recent guidance on *GIS for Infrastructure* (C803) and *InSAR and earth observation for civil engineers* (C805)
- A practitioners' network focused on collaboration, knowledge transfer and improving the awareness of ongoing Geospatial developments the wider construction industry
- Targeted at asset owners, infrastructure operators and advisers, decision makers, asset data managers, those with digital transformation strategies
- 2-3 events per year
  - Webinars, live seminars and debates
  - Launch webinar being planned for June/July

Geospatial Community of Practice

P3252

- Less mature and lower adoption of geospatial approaches compared to other sectors (e.g. mining, oil and gas)
- Space to educate the construction sector on capabilities
  - Provide opportunity for low-level guidance and advice
  - Celebrate successes
  - Highlight failures and learning points
- General scope will include digitisation of assets, mapping, earth observation, remote sensing, airborne imaging and sensing

CIRIA Geospatial Members

Thank you for listening

Any questions or comments?

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