APPLYING WORKING WITH NATURE TO NAVIGATION INFRASTRUCTURE PROJECTS

34th PIANC WORLD CONGRESS
PANAMA 2018 May 7 to 11

CANAL DE PANAMÁ

Victor S Magar, PhD, PE (WG 176 Chair)
Sunday, May 6

RAMBOLL

OUR TEAM

Victor Magar, PhD, PE
Ramboll, Chicago IL, USA
vmagar@ramboll.com
+1 312 288 3840

Juan C Savioli
DHI Group, Malaysia

Kirsten Wolfstein
Hamburg Port Authority,
Hamburg, Germany

Paul Scherrer
Deputy General Manager
PIANC First Delegate France

Ellen Johnck
RPA Consulting, San Francisco,
CA, USA

Sim Turf
Flemish Departement of
Mobility and Public Works,
Brussels, Belgium

Johny Van Acker
De Vlaamse Waterweg NV,
Afdeling Bovenschelde, Belgium

Danielle Amber
Ramboll, Ann Arbor, MI, USA

Pradeep Mugunthan
FourPeaks, Chicago, IL, USA

Lauren Dunkin
USACE, Vicksburg, MS, USA

Daan Rijks
Boskalis, The Netherlands

William Coulet
Exo Environmental, Norfolk, UK

Jason Sprott
Sprott Planning and Environment,
Australia

Captain Sabelo Mdlalose
Port of Richards Bay
South Africa

DISCUSSION OUTLINE

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1 Background and Working Group (WG) Goals

2 Working with Nature (WwN) Framework

3 Scope and Content of WwN Guide

4 WwN Case Studies

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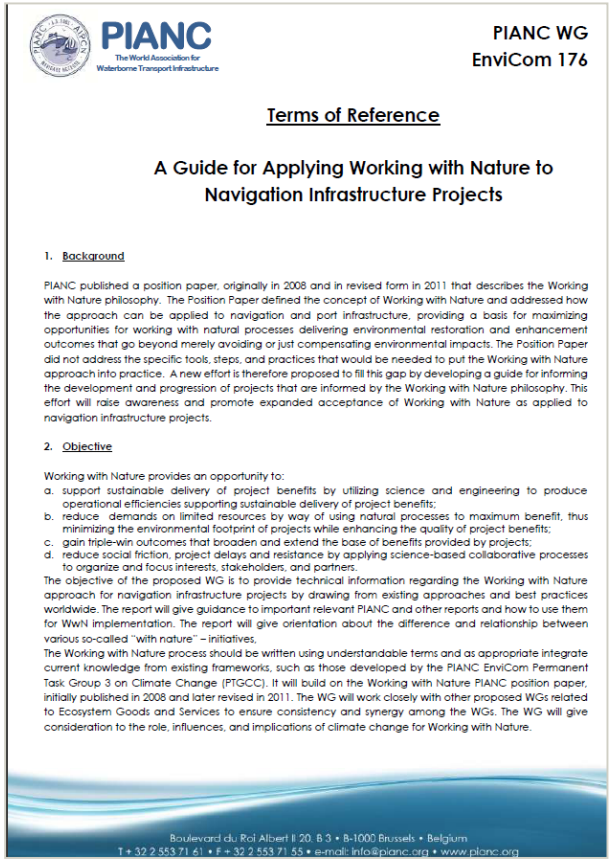
BACKGROUND & WG GOALS

WHY DEVELOP A WwN GUIDE

1. **Comply** with emerging regulations
2. General **stakeholder / public pressure** to reduce environmental burdens
3. Leadership role in **protecting and enhancing** the natural environment
4. Drive **innovation and investment** in nature, while managing navigational infrastructure goals
5. Help **identify opportunities** to reduce and offset negative environmental impacts and create **new opportunities** aligned with navigation infrastructure development

GOALS OF THE WwN GUIDE

- **Provide technical information** regarding the WwN approach for navigation infrastructure projects
- **Give guidance** on how to integrate WwN into navigational infrastructure projects
- **Describe relationships** between various “with nature” initiatives (EwN® and BwN)
- **Provide case studies** that highlight the WwN approach



PIANC
The World Association for Waterborne Transport Infrastructure

PIANC WG
EnviCom 176

Terms of Reference

A Guide for Applying Working with Nature to Navigation Infrastructure Projects

1. Background

PIANC published a position paper, originally in 2008 and in revised form in 2011 that describes the Working with Nature philosophy. The Position Paper defined the concept of Working with Nature and addressed how the approach can be applied to navigation and port infrastructure, providing a basis for maximizing opportunities for working with natural processes delivering environmental restoration and enhancement outcomes that go beyond merely avoiding or just compensating environmental impacts. The Position Paper did not address the specific tools, steps, and practices that would be needed to put the Working with Nature approach into practice. A new effort is therefore proposed to fill this gap by developing a guide for informing the development and progression of projects that are informed by the Working with Nature philosophy. This effort will raise awareness and promote expanded acceptance of Working with Nature as applied to navigation infrastructure projects.

2. Objective

Working with Nature provides an opportunity to:
a. support sustainable delivery of project benefits by utilizing science and engineering to produce operational efficiencies supporting sustainable delivery of project benefits;
b. reduce demands on limited resources by way of using natural processes to maximum benefit, thus minimizing the environmental footprint of projects while enhancing the quality of project benefits;
c. gain triple-win outcomes that broaden and extend the base of benefits provided by projects;
d. reduce social friction, project delays and resistance by applying science-based collaborative processes to organize and focus interests, stakeholders, and partners.

The objective of the proposed WG is to provide technical information regarding the Working with Nature approach for navigation infrastructure projects by drawing from existing approaches and best practices worldwide. The report will give guidance to important relevant PIANC and other reports and how to use them for WwN implementation. The report will give orientation about the difference and relationship between various so-called “with nature” – initiatives.

The Working with Nature process should be written using understandable terms and as appropriate integrate current knowledge from existing frameworks, such as those developed by the PIANC EnviCom Permanent Task Group 3 on Climate Change (PTGCC). It will build on the Working with Nature PIANC position paper, initially published in 2008 and later revised in 2011. The WG will work closely with other proposed WGs related to Ecosystem Goods and Services to ensure consistency and synergy among the WGs. The WG will give consideration to the role, influences, and implications of climate change for Working with Nature.

Boulevard du Roi Albert II 20, B 3 • B-1000 Brussels • Belgium
T + 32 2 553 71 61 • F + 32 2 553 71 55 • e-mail: info@pianc.org • www.pianc.org

WwN FRAMEWORK

WwN FRAMEWORK

Step 1: Establish project needs and objectives

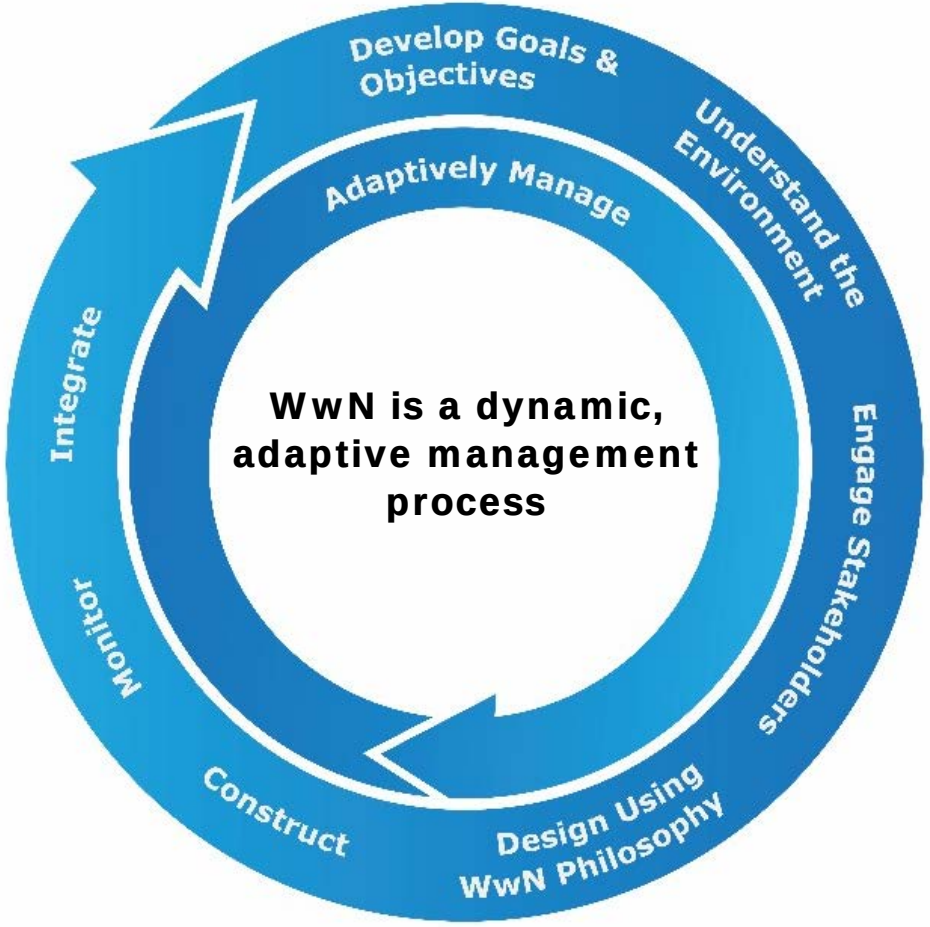
Step 2: Understand the environment

Step 3: Make meaningful use of stakeholders engagement (identify natural- and socio-environmental win-win opportunities)

Step 4: Prepare project proposal/design to benefit navigation and nature

Step 5: Build and implement

Step 6: Monitor, evaluate, and adapt



Working with Nature

PIANC A.D. 1885 AIPCN NAVIGARE NECESSE

Step 6 - Monitor, Evaluate & Adapt:

- Evaluate and learn from data collection to implement changes as appropriate

Can be combined in integral (ECI) approach

Step 1 - Establish project needs and objectives:

- Organize multi-functional or integrated team
- Establish set of project objectives
- Perform data review

Step 2 - Understand the Environment:

- Collect additional data to fill gaps, considering ecological, physical and social aspects
- Perform detailed assessment and modelling
- Define reference state for monitoring

Step 4 - Prepare initial project proposal / design:

- Conduct feasibility analysis
- Identify win-win situations
- Prepare detailed design
- Align design with existing environment

Step 5 - Build and implement:

- Select form of contract
- Prepare Bid documents and select contractor
- Build project, implement construction management and quality assurance programme
- Implement project

Step 3 - Make meaningful use of stakeholder engagement to identify win-win opportunities

PIANC WG176 Guide for Applying Working with Nature to Navigation Infrastructure Projects

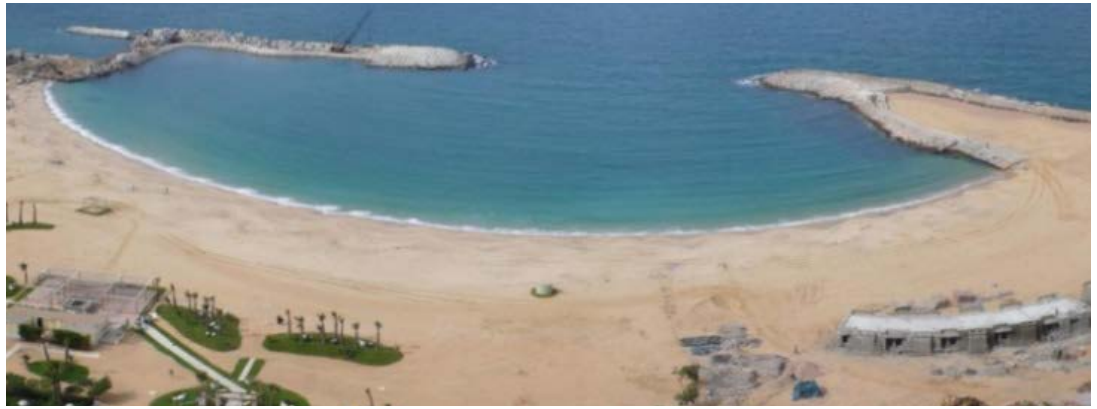
Start of Project

Completion of Project

SCOPE & CONTENT OF WwN GUIDE

SHIFT IN FOCUS

- Stop having a technical design first, and then an EIA to mitigate or limit damages
- Shift philosophy from control to management, from working **against** to working **with** nature
- Represents an ambition to address **environmental protection** in parallel with development challenges
- Identify **win-win solutions** that respect nature and are acceptable to project proponents stakeholders
- Facilitate adaptation of projects to **climate change** (reduce vulnerability and improve resilience)



MAN-MADE DEVELOPMENT IN EGYPT

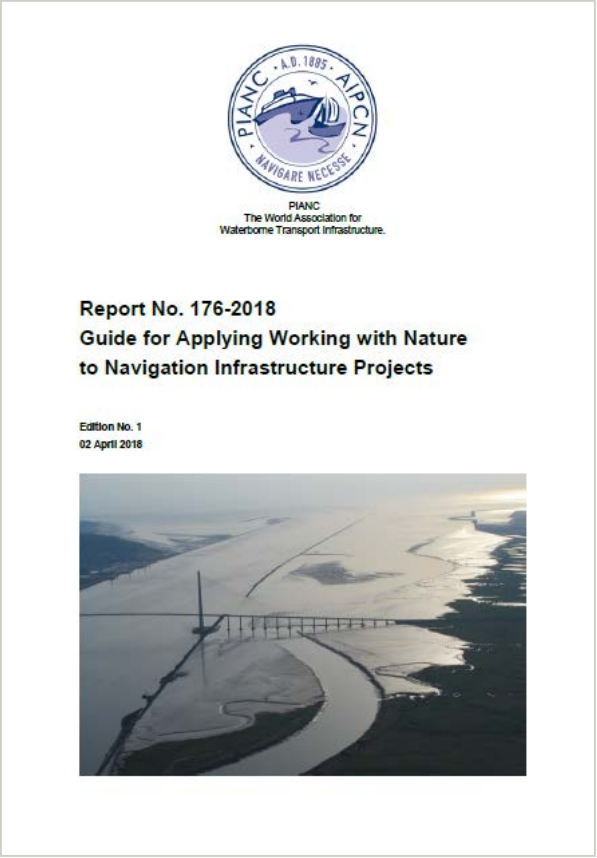
NATURAL BEACH IN PORTUGAL

ALIGN WITH ECOSYSTEM SERVICE OBJECTIVES

- Support achievement of biodiversity targets (e.g., Birds and Habitats Directives; EU 2020 Biodiversity Strategy)
- Restore/create fish habitat
- Create/enhance intertidal areas
- Facilitate energy attenuation (e.g., offshore islands)
- Contribute to carbon storage (e.g., in salt marshes, seagrass beds)
- Improving recreational resources

WwN GUIDE – CHAPTER OUTLINE

- Chapter 1: Introduction – Introduces the WwN and intended audience
- Chapter 2: Background – Provides background on WwN, introduces the WwN vision and beneficiaries
- Chapter 3: Context – Describes the context of when and where to implement WwN for navigation
- Chapter 4: WwN Framework – Describes the framework, outlining the six-step WwN process
- Section 5: *Working with Nature Case Studies* – 12 case studies, providing WwN examples



PIANC
The World Association for
Waterborne Transport Infrastructure.

Report No. 176-2018
Guide for Applying Working with Nature to Navigation Infrastructure Projects

Edition No. 1
02 April 2018

WwN CASE STUDIES

1. Creation of wetlands and new habitat
2. Strategic sediment in-water placement
3. Stabilization and upland placement to create land
4. In-river sediment placement to promote the formation of natural island habitats
5. Leveraging of a new infrastructure development (e.g., tunnel construction across a waterway) to develop new shoreline habitat and recreation areas

LE HAVRE-PORT 2000

Paul Sherrer, Deputy General Manager Port of Le Havre Authority
PIANC First Delegate for France Section
Le Havre, France

LE HAVRE-PORT 2000

- The Port 2000 container port studied at the end of the 90s, built 2001–2006
  - 3,500 m heavy duty container quays for vessels of 16+ meters draught
  - 900MM € public + 600MM € private funds
- Commensurate move toward environmental restoration of the Seine Estuary (50 M €)
  - A purely environmental channel to develop an intertidal wetland (1.5 Million m^3, 21MM €)
  - Building of two bird resting areas, including an artificial island (11MM €)
  - Hydromorphological modelling (Physical and Mathematical) of the Estuary

PORT 2000: WwN STEPS 1 & 2

Step 1: Establish project needs and objectives

- Recognize the port as a major entrance to Europe
- All size containerships, Asia and Americas
- Rehabilitation of Seine Estuary wetlands

Step 2: Understand the environment

- 1990s, global environmental studies of the whole Seine Estuary
- Fishes and fish nurseries
- Bird habitat
- Amphibians
- Plants

PORT 2000: WwN STEPS 3 & 4

Step 3: Make meaningful use of stakeholders engagement

- Conduct many informal discussions with the public starting as early as 1996
- Public hearings, 4 months ca. 1997-1998
- Continuous consultation of stakeholders
- Special attention to fishermen, as Estuary users

Step 4: Prepare project proposal / design to benefit navigation and nature

- Design relied on 26MM m^3 out of 45MM m^3 as fill material for the new port facility
- Morphological dredging of some 3.5MM m^3 outside the port to remove sediment from the estuarine system, minimizing any sedimentation impacts of project

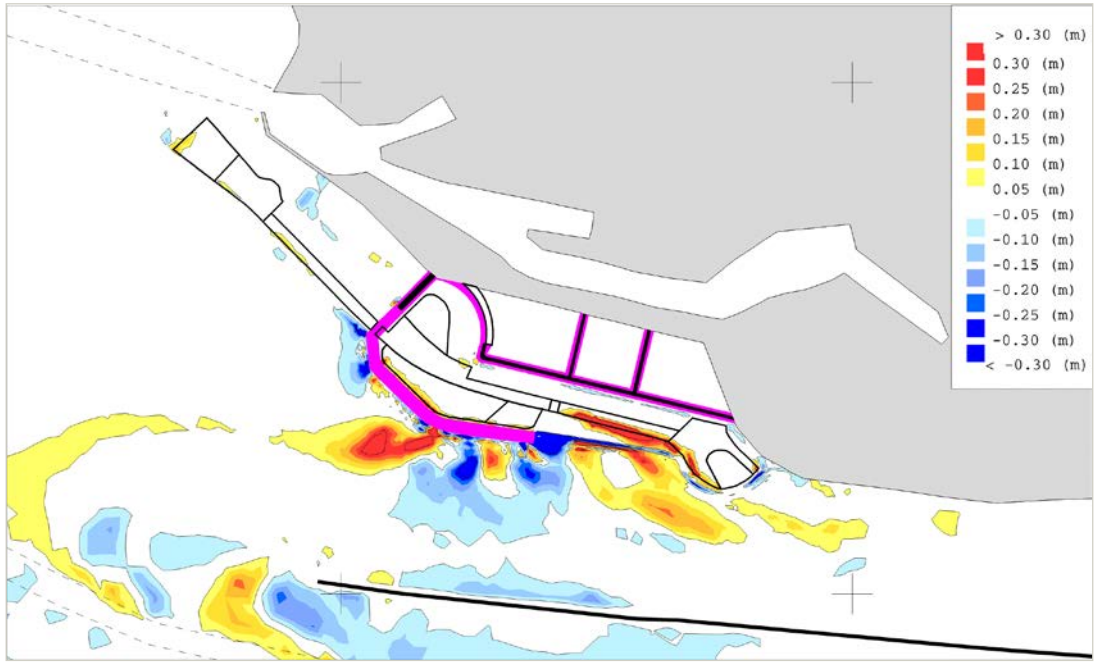
PORT 2000: WwN STEPS 5 & 6

Stage 5: Build and implement

- Mathematical modeling for the phasing the breakwater construction
- Physical and mathematical modeling of the stability of the gravel sub-base of breakwaters to work with the natural currents

Stage 6: Monitor, evaluate and adapt

- 10-year monitoring program of a wide area from outer sea to inland estuary
- Continuous sharing of experience coming from all the monitoring efforts



ENVIRONMENTAL SERVICES AT HORSESHOE BEND, LOUISIANA, USA

Burton Suedel[1], Jacob F. Berkowitz[1], Christy Foran[1], Jeff Corbino[2]

[1] US Army Corps of Engineers, EDC, Vicksburg, MS
[2] US Army Corps of Engineers, New Orleans, LA

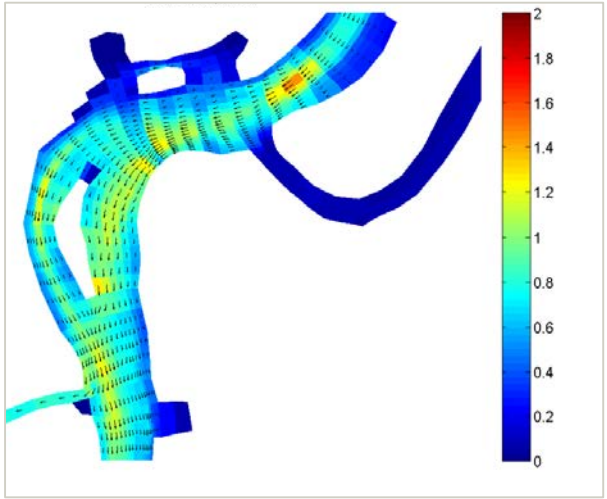
BACKGROUND

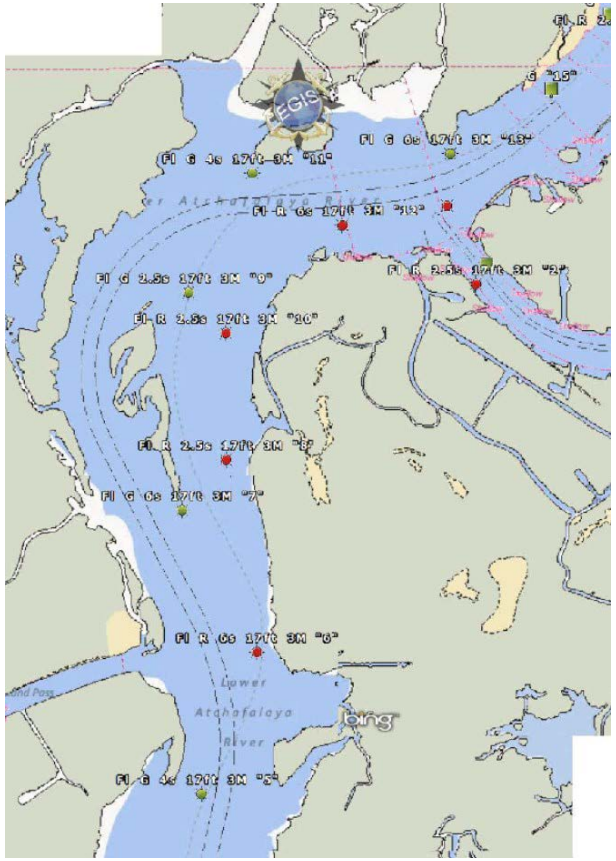
Problem: Limited options for dredged material placement

Solution: Develop an innovative EWN approach to streamline flow using a constructed created wetland island

Approach: Document ecological services (ES) benefits

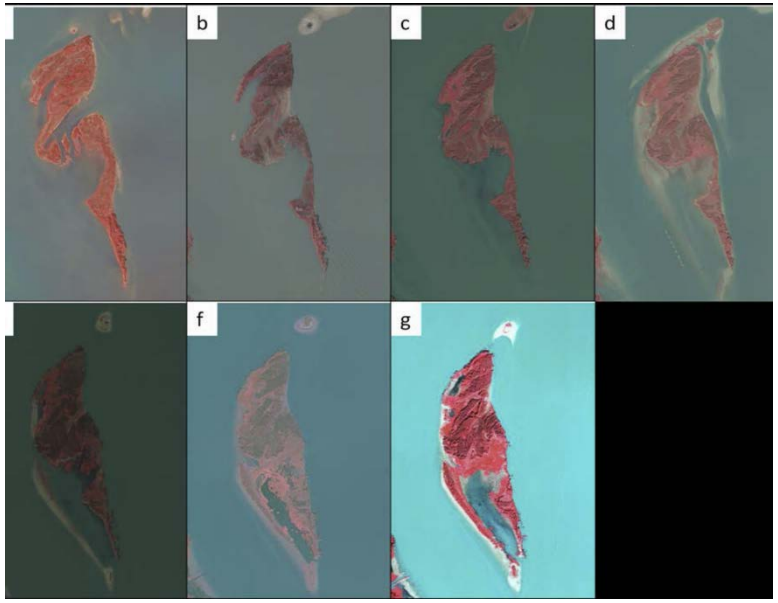
Hydrodynamics: Flow velocities and sediment transport and navigation requirements

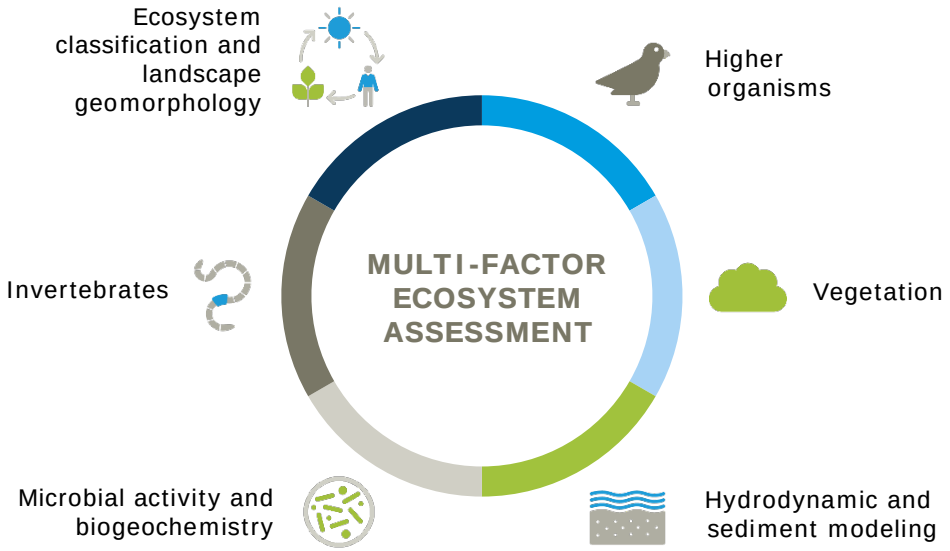




FINDINGS

- Multi-factor approach improved assessment
- WwN produce beneficial outcomes
- ES valuation highlights environmental improvements and cost/energy savings





FEHMARNBELT FIXED LINK & WORKING WITH NATURE PRINCIPLES

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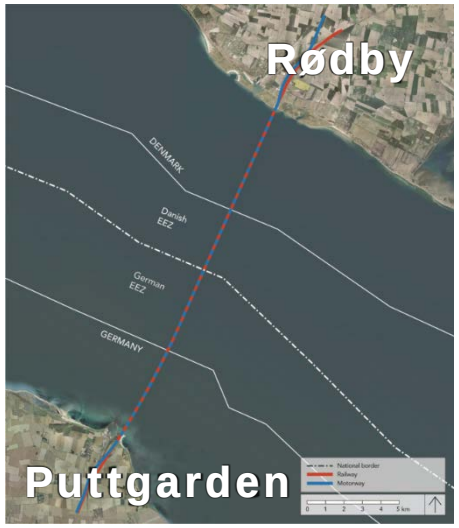
Juan Savioli, DHI Group, Malaysia
Anders Bjørnshave, Femern A/S
Victor Magar, Ramboll, Chicago, USA

Courtesy of Femern A/S and their consultants

FEHMARNBELT LINK: CONNECTION BETWEEN SCANDINAVIA & CENTRAL EUROPE

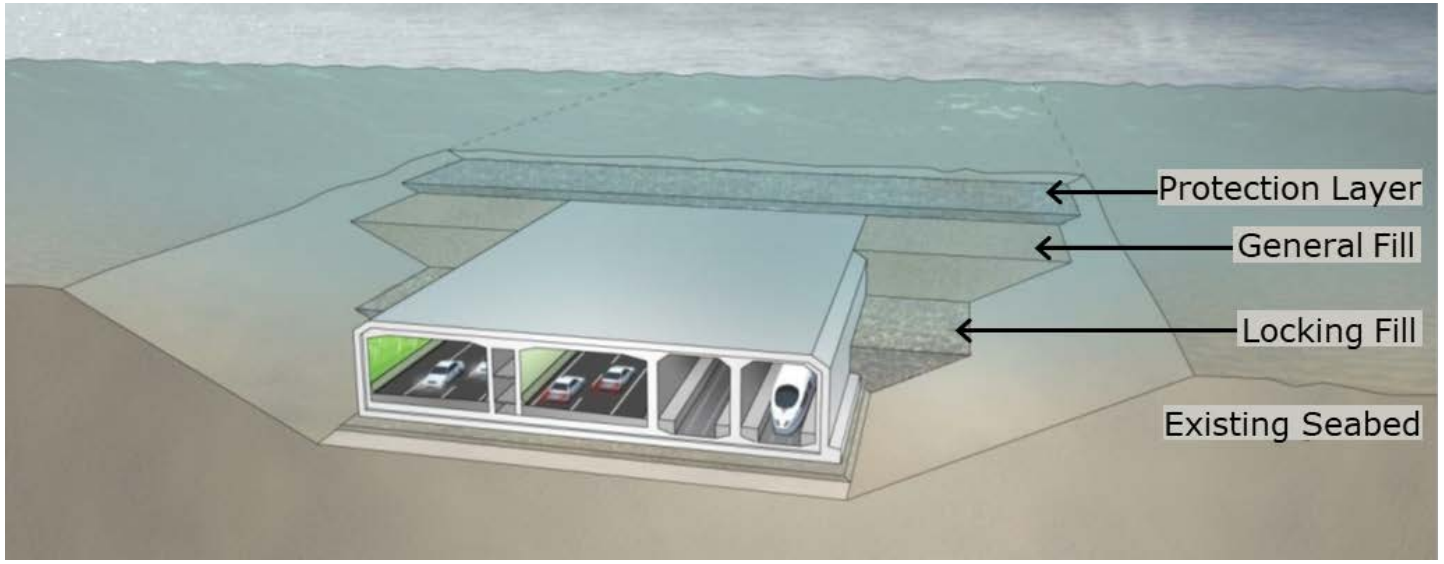
- Largest fixed link in Europe
- 18 km long
- Max water depth 30 m
- Danish-German agreement September 2008
- Extensive stakeholder engagement



Options Evaluated

1. Suspension Bridge
2. Bored Tunnel
3. Immersed Tunnel – Selected

SELECTED OPTION – IMMERSED TUNNEL



Win-Win Solutions

- No shipping obstructions created by a bridge
- Cost effective, energy efficient
- Opportunity to create new landscapes (Reuse 19MM m^3 surplus material from tunnel)
- Add new nature, and recreational services
- Approaches understand and mimic nature

PORT OF OAKLAND, SAN FRANCISCO BAY, BENEFICIAL USE

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Ellen Joslin Johnck, RPA Consulting Oakland, California USA

Courtesy of Femern A/S and their consultants

PORT OF OAKLAND MIDDLE HARBOR 1993 TO TODAY

MIDDLE HARBOR BASIN PROJECT DESIGN & TARGET HABITATS

- MHEA (180 acre/72 ha)
  - Shallow-water habitat
  - Eelgrass
  - Salt marsh bird roosts
  - Fish habitat
  - Coves
- MHSP (38 acre/15 ha)
  - Public access
  - Bike/walk paths
  - Education
  - Bay views and viewing platforms
  - Picnicking and BBQ

MHEA = Middle Harbor Enhancement Area
MHSP = Middle Harbor Shoreline Park

THANK YOU

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Victor S Magar, PhD, PE (WG 176 Chair)
D +1 312 288 3840
M +1 312 731 2419
vmagar@ramboll.com