



APPLYING WORKING WITH NATURE
TO NAVIGATION INFRASTRUCTURE PROJECTS

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PIANC
The World Association
for Waterborne Transport Infrastructure



WWN FRAMEWORK

WG 176 TERMS OF REFERENCE

- **Provide technical information** regarding the WwN approach for navigation infrastructure projects
- **Give guidance** on how to integrate WwN into navigational infrastructure projects
- **Describe the differences** and 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:

- support sustainable delivery of project benefits by utilizing science and engineering to produce operational efficiencies supporting sustainable delivery of project benefits;
- 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;
- gain triple-win outcomes that broaden and extend the base of benefits provided by projects;
- reduce social friction, project delays and resistance by applying science-based collaborative processes to organize and focus interests, stakeholders, and partners.

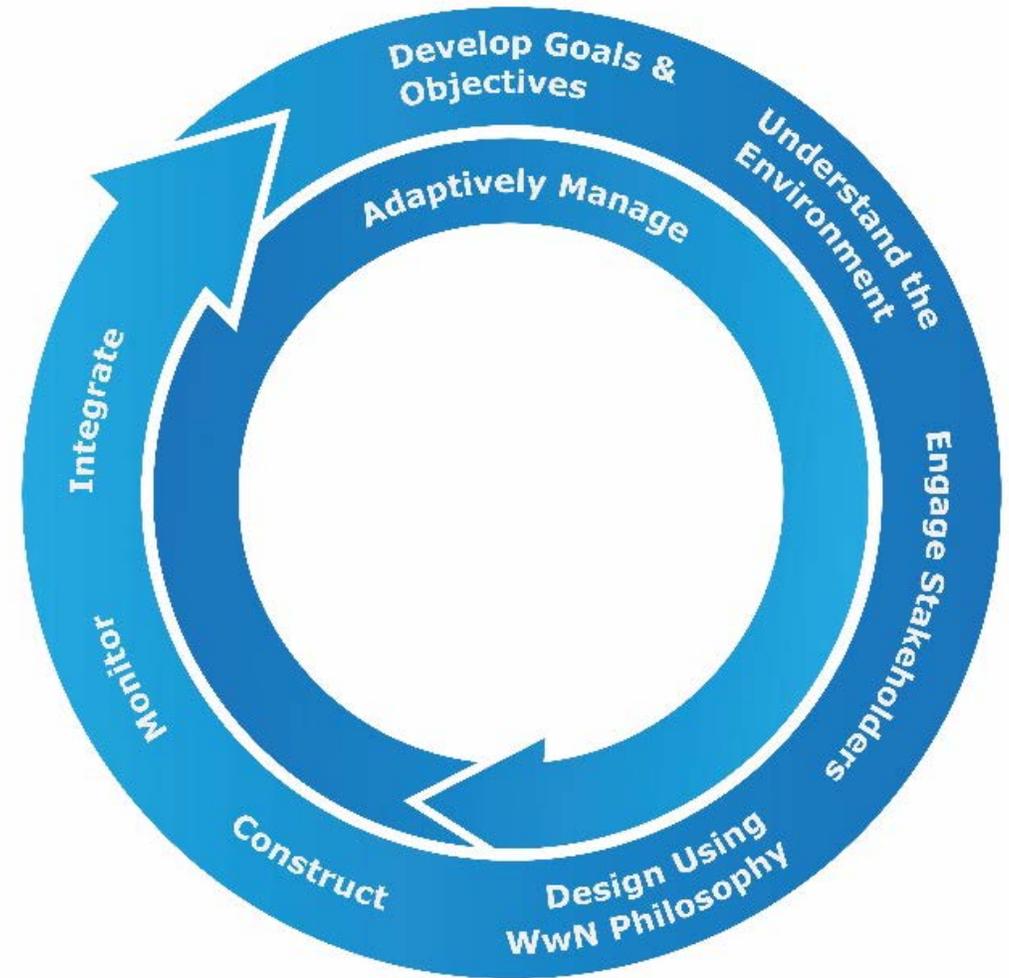
The objective of the proposed WG is to provide technical information regarding the Working with Nature approach for navigation infrastructure projects by drawing from existing approaches and best practices worldwide. The report will give guidance to important relevant PIANC and other reports and how 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.

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ENVISIONED PRODUCT

- Step 1:** Establish project goals 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/Implement
- Step 6:** Monitor, adapt, and manage



Basic Steps of WwN Depicting a Dynamic, Adaptive Management Process

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



MEETING ECOSYSTEM SERVICE OBJECTIVES

- Supporting 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 CASE STUDIES



LE HAVRE-PORT 2000

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

LE HAVRE-PORT 2000 AND WORKING WITH NATURE



- The Port 2000 container port studied at the end of the 90's, 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 m³, 21MM €)
 - Building of two bird resting areas including an artificial island (11MM €)

PORT2000: WWN STEPS 1 AND 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

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



PORT2000: WVN STEPS 3 AND 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



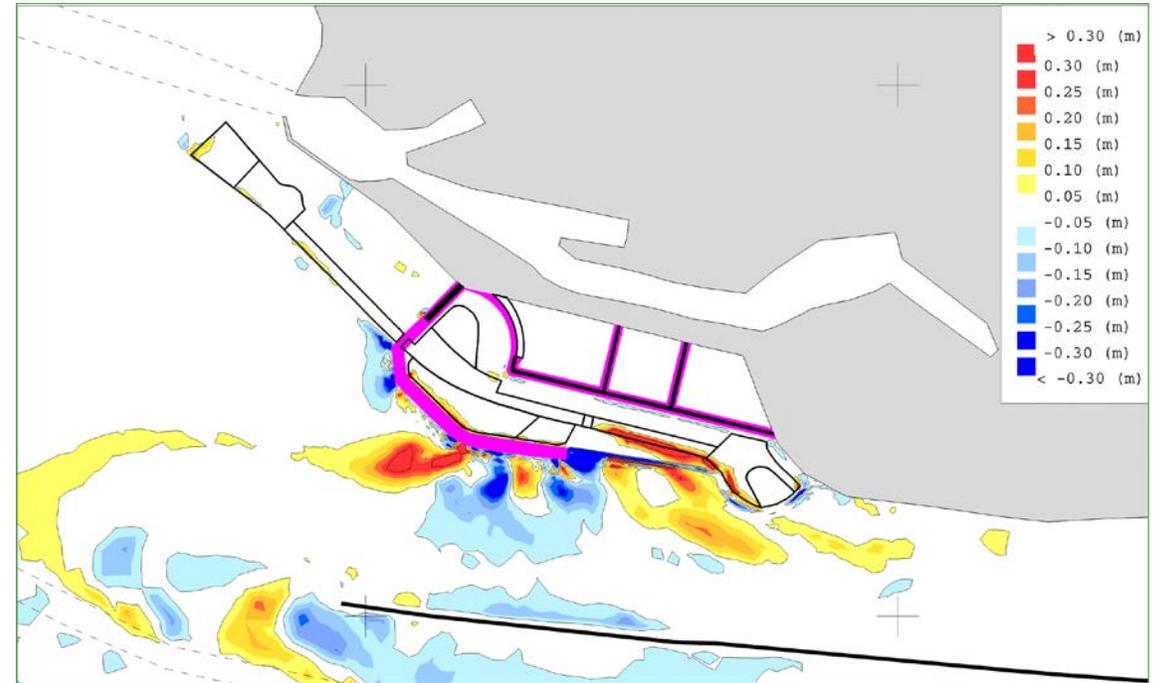
Step 4: Prepare project proposal/design to benefit navigation and nature

- Design relied on 26MM m³ out of 45MM m³ as fill material for the new port facility
- Morphological dredging of some 3.5MM m³ outside the port to remove sediment from the estuarine system, minimizing any sedimentation impacts of project

PORT2000: WWN STEPS 5 AND 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



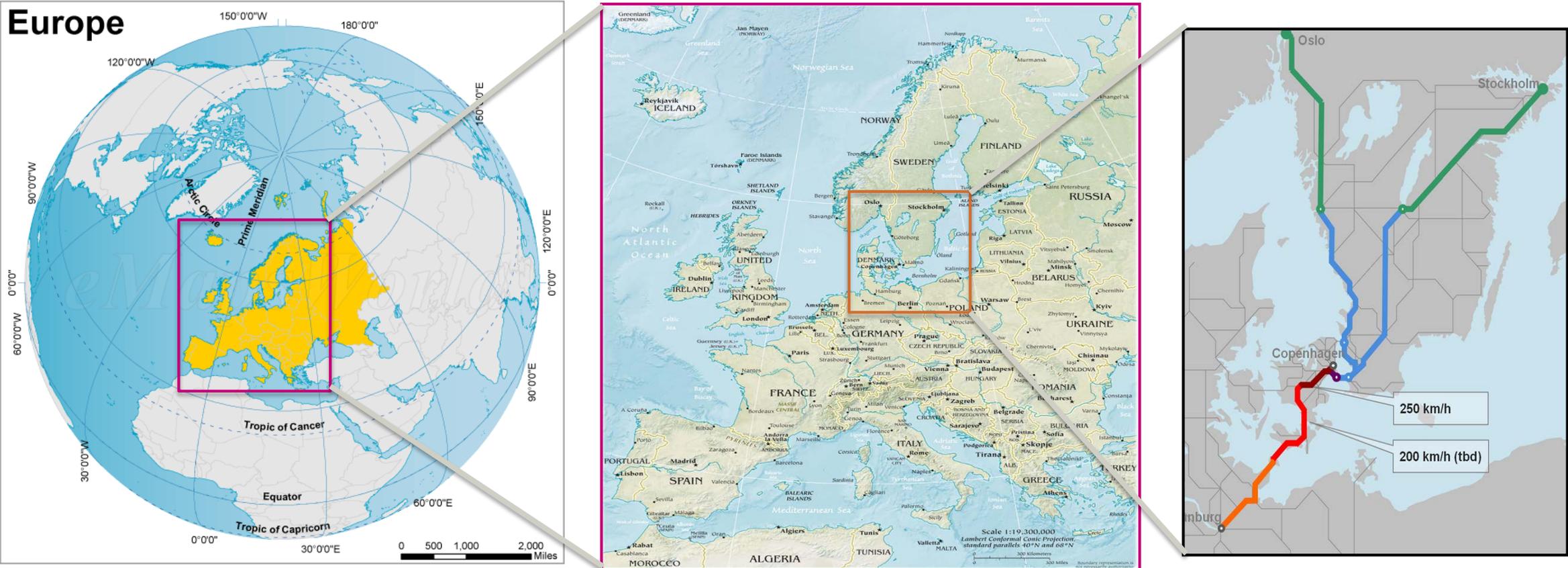
FEHMARNBELT FIXED LINK AND WORKING WITH NATURE PRINCIPLES

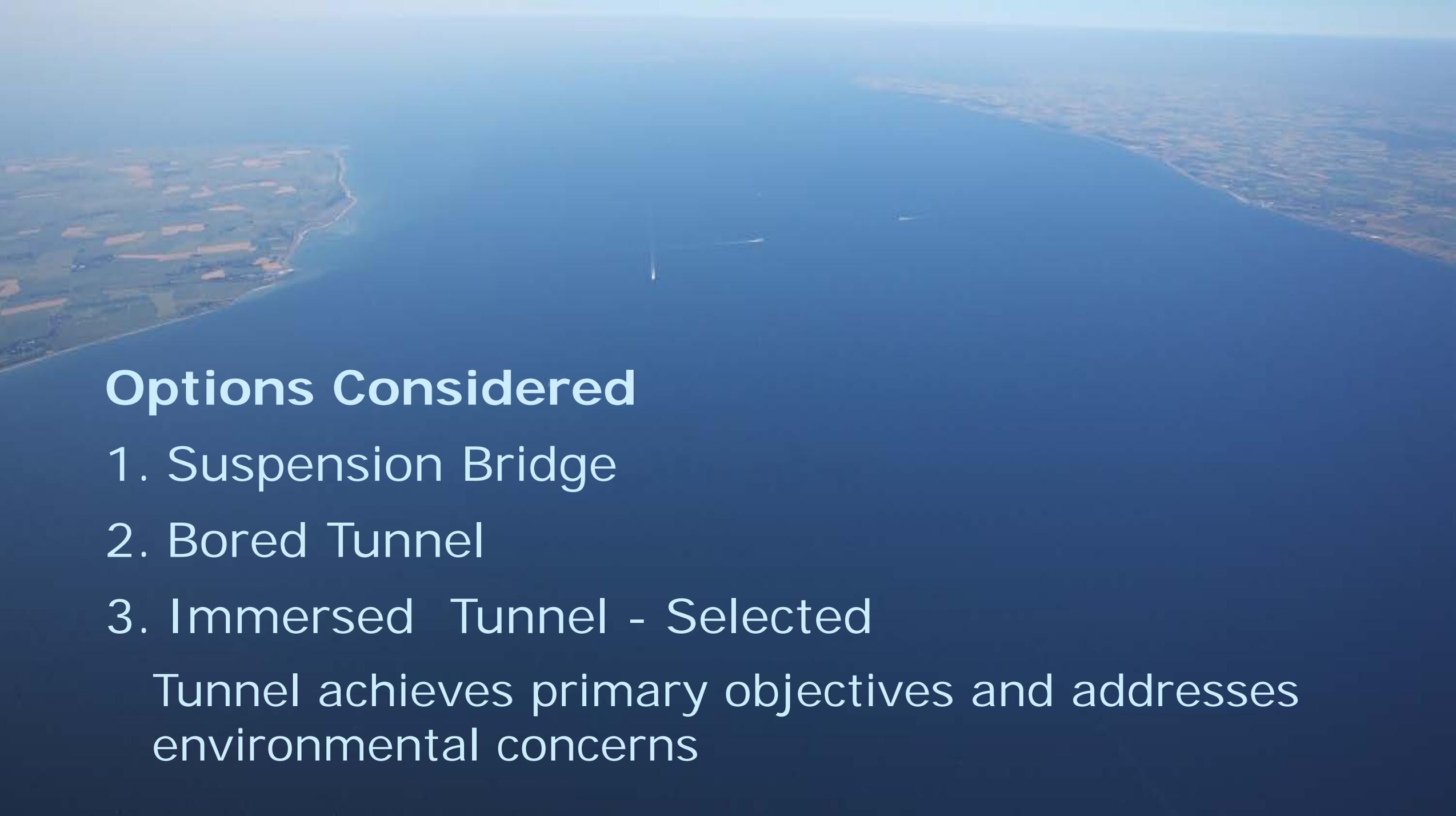
Juan Savioli, DHI Group, Malaysia
Victor Magar, Ramboll, Chicago USA

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Courtesy of Femern A/S and their consultants

FEHMARNBELT LINK: CONNECTION BETWEEN SCANDINAVIA AND CENTRAL EUROPE





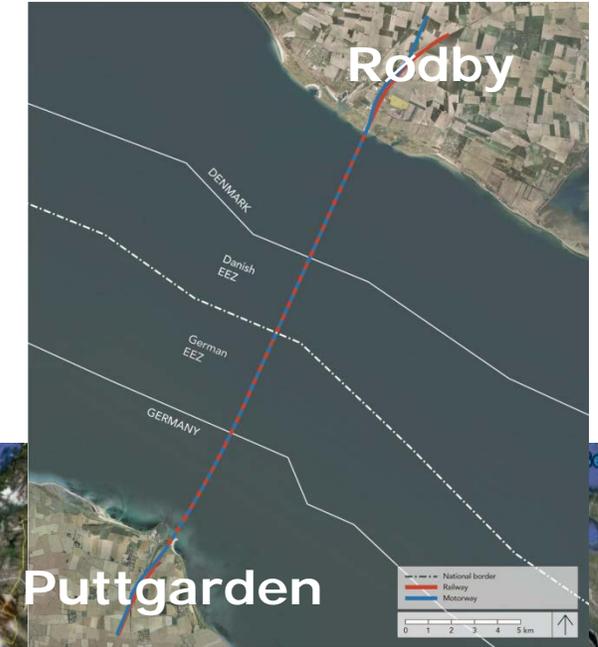
Options Considered

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

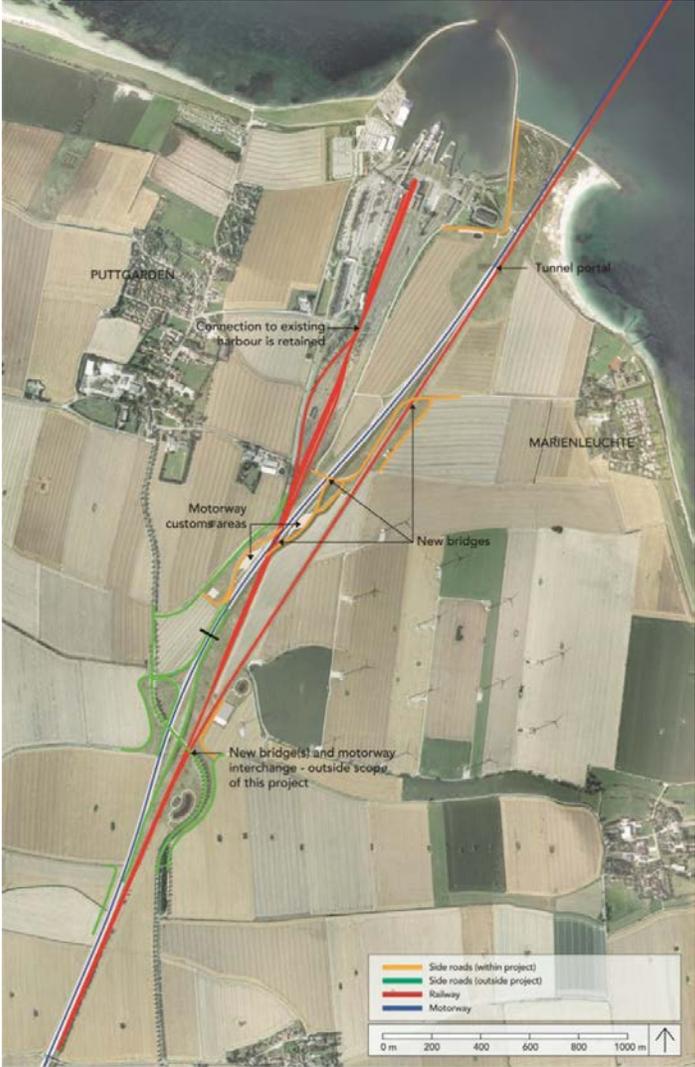
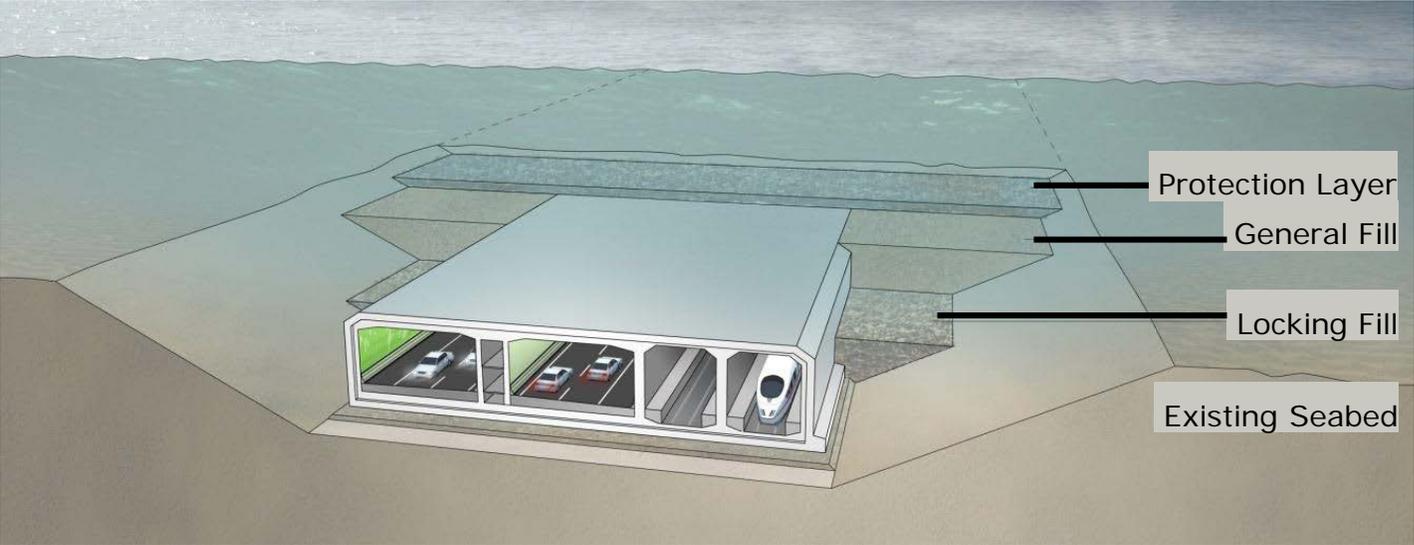
Tunnel achieves primary objectives and addresses environmental concerns

ABOUT THE LINK

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

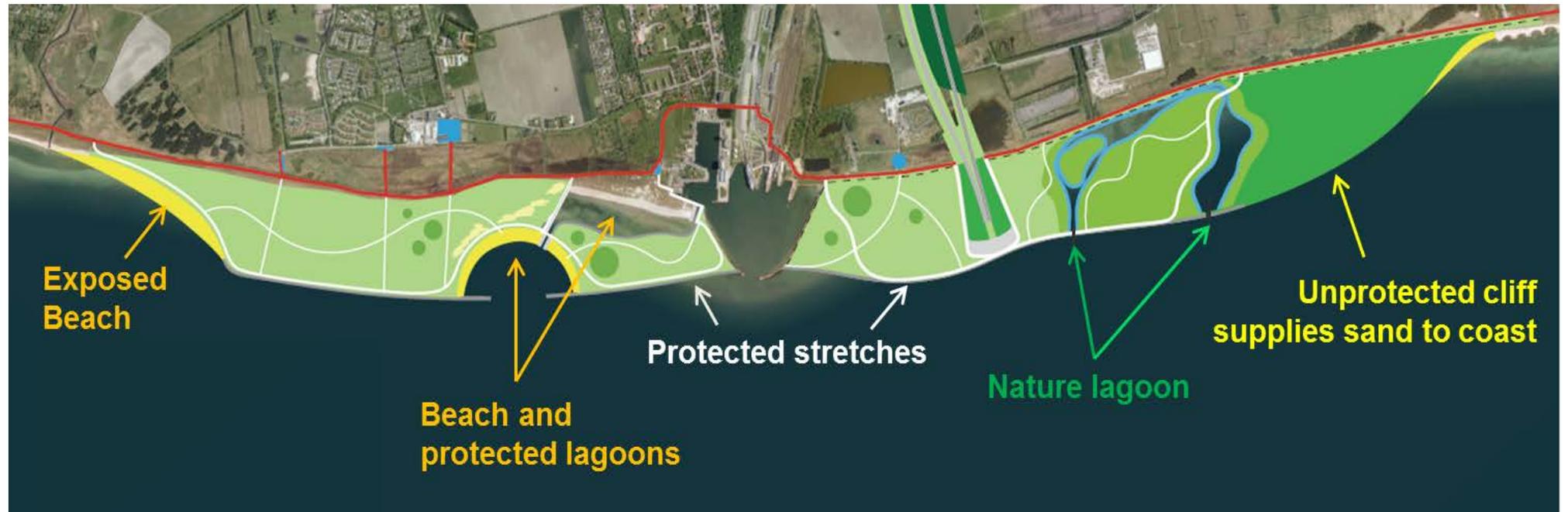


SELECTED OPTION – IMMERSED TUNNEL



WWN BENEFITS

- No shipping obstructions created by a suspension bridge
- Cost effective and energy efficient
- Opportunity to create new landscapes, primarily on the Danish side (Reuse 16MM m³ surplus material from tunnel excavation)
- Re-establish some of the environmental values lost during the construction of a major dikes and reclamation works in the early 1900's



COASTAL LAGOONS



BEACH AND BEACH LAGOONS



WWN FINDINGS

- The proposed landscaping is a win-win situation
- 16 million m³ will be used to create new landscape elements
- These will add new nature, environmental, and recreational services
- Understanding and mimicking nature play a key role in project vision
- Underwater tunnel minimizes long-term over-water disturbance of the aquatic resource



PORT OF OAKLAND, SAN FRANCISCO BAY, BENEFICIAL USE

Ellen Johnck,
Ellen Joslin Johnck, RPA Consulting Oakland
California USA

PORT OF OAKLAND MIDDLE HARBOR 1993 TO TODAY



MIDDLE HARBOR BASIN PROJECTS WWN STEPS I, II, III

I. Project Goals/Objectives

- Vision 2000 Port terminal modernization and channel deepening to -50 ft
- 12-14 MCY clean sediment for beneficial use
- Redirect maritime operations from Middle Harbor to Inner Harbor

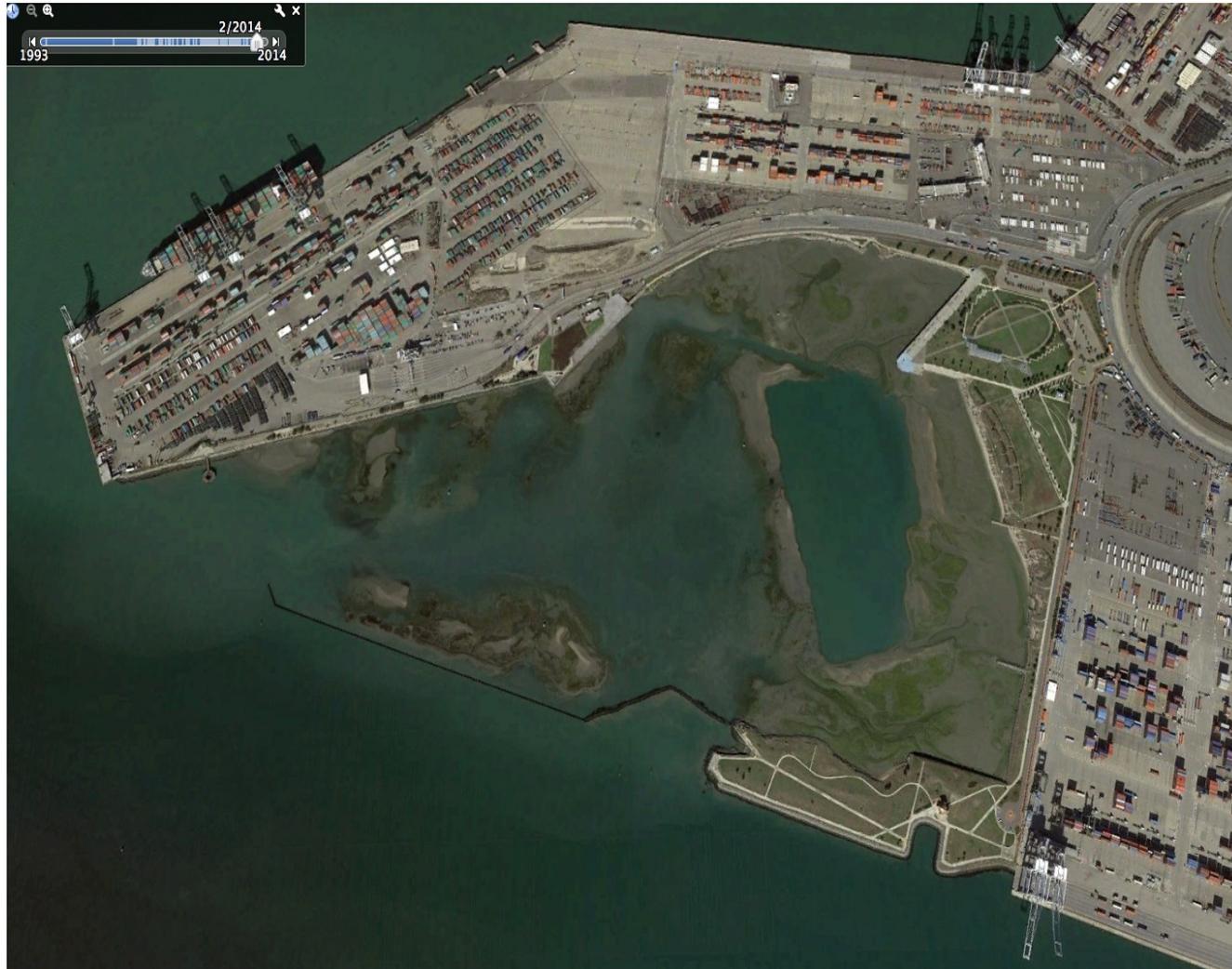
II. Understand Environment

- Habitat Technical Advisory Committee (TAC) to evaluate ecological benefits
- Community to advise on recreational use
- Port participation in regional Long Term Management Strategy
- LTMS Plan adopted 40% upland reuse, 20% ocean/in-Bay placement rule

III. Stakeholder Engagement

- Community advisory groups and meetings
- Local citizens, TAC, NGOs, and agencies

CONCEPT



- Middle Harbor Shoreline Park (MHSP)
- Middle Harbor Enhancement Area (MHEA)



MIDDLE HARBOR BASIN PROJECT DESIGN AND 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



WWN 2010-2017 MONITORING

- 2017 TAC meeting
- Concluded that goals for interim subtidal habitat plus 5-acre demonstration marsh & bird roosting islands were achieved
- Eelgrass planting begins 2018
- 10-year habitat performance evaluation planned (2018-2028) according to the TAC's Monitoring, Management, and Maintenance plan (3M Plan)



PROJECT FUNDING

- Cost to Construct: approx. \$66.8M
- Expenditures to Date: approx. \$57.4M
- Cost to Complete: approx. \$ 9.4M
- FY 2015 Work Allowance: \$ 6.0M
- FY 2016 President's Budget: \$ 1.2M
- Future funding: \$ 2.2M*

*contingent on Federal appropriations
& Port cost share





REALIGNMENT MEASURE “KREETSAND/SPADENLANDER BUSCH”

Kirsten Wolfstein, PhD,
Hamburg Port Authority, Hamburg, Germany
Elbe estuary, Germany

KSB DEVELOPMENT TARGETS

Measure should serve multiple purposes

- Reduce tidal energy, weaken tidal pumping
- Reduce upstream sediment transport
- Create natural habitat, including for endemic plant *Elbe Water Dropwort*
- Recreation
- Public education

Monitoring

- Bathymetry & topography
- Development of habitat types
- Elbe Water Dropwort
- Fish species



©: Brockmann consult, Common WaddenSea secretariat



STAKEHOLDER ENGAGEMENT

- Substantial stakeholder engagement from during project planning
- Included citizens, NGO's, and relevant authorities
- Created an information pavilion on the dike & included information displays to explain tidal dynamics, estuarine functioning and construction activities
- Before design, in-depth analysis, field work, and desk studies were performed to understand the environment and natural processes
- Planning process started 2008



CONCLUSIONS AND LESSONS LEARNED

- Integrated approach was able to meet multiple objectives
- Worked with natural hydrodynamics to manage sediment
- Created new habitat including fish and Elbe Water Dropwort
- HPA maintains an integrated estuary management plan (EU Birds & Habitats Directive)
- Broad public acceptance: NGOs, administrators, residents
- Estimated costs of > 60 MM € (exceed planned budget)
- Requires long-term maintenance
- HPA is seeking new locations to dissipate tidal energy



MOVING FORWARD

WWN provides a framework for planners, engineers, and the public to think about using natural processes when engineering infrastructure

Increasing demands on natural resources require that we make concerted efforts to conserve existing habitat and create new habitat to protect the natural environment

By learning from different approaches and WWN case studies, it is possible to prepare for the future while focusing on today's urban needs



THANK YOU

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