APPLYING WORKING WITH NATURE TO NAVIGATION INFRASTRUCTURE PROJECTS

VICTOR S MAGAR (WG 176 CHAIR)
SMART RIVERS CONFERENCE, PITTSBURGH PA, USA

SEPTEMBER 19, 2017
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
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
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
  o 3,500 m heavy duty container quays for vessels of 16+ meters draught
  o 900MM € public + 600MM € private funds

• Commensurate move toward environmental restoration of the Seine Estuary (50 M €)
  o A purely environmental channel to develop an intertidal wetland (1.5 Million m3, 21MM €)
  o 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
  o Fishes and fish nurseries
  o Bird habitat
  o Amphibians
  o Plants
PORT2000: WWN 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 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
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

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

- Protection Layer
- General Fill
- Locking Fill
- Existing Seabed
**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
BEACH AND BEACH LAGOONS

Natural Stable Beach

Lagoon Beaches
**WWN FINDINGS**

- The proposed landscaping is a win-win situation
- 16 million m$^3$ 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
“KREET SAND/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

Commenced work 2012
Completion ca. 2020
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

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
(Working Group Mentor)
Deputy General Manager
Port of Le Havre Authority
PIANC First Delegate for France Section
Port of Le Havre, France

Ellen Johnck
Ellen Joslin Johnck, RPA Consulting, SF, CA USA

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

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

Danielle Amber
Ramboll, Ann Arbor, MI USA

Pradeep Mugunthan
Ramboll, Chicago, IL USA

Lauren Dunkin
USACE, Vicksburg, MS, USA

Daan Rijks
Boskalis, The Netherlands

William Coulet
Exo Environmental Ltd, Norfolk, UK

Jason Sprott
Sprott Planning and Environment, Australia

Captain Sabelo Mdlalose
Port of Richards Bay
South Africa