



How NbS solutions can be compared to traditional infrastructure performance?

Workshop 3B: Monitoring efficacy of Nature Based Solutions

26 May 2022

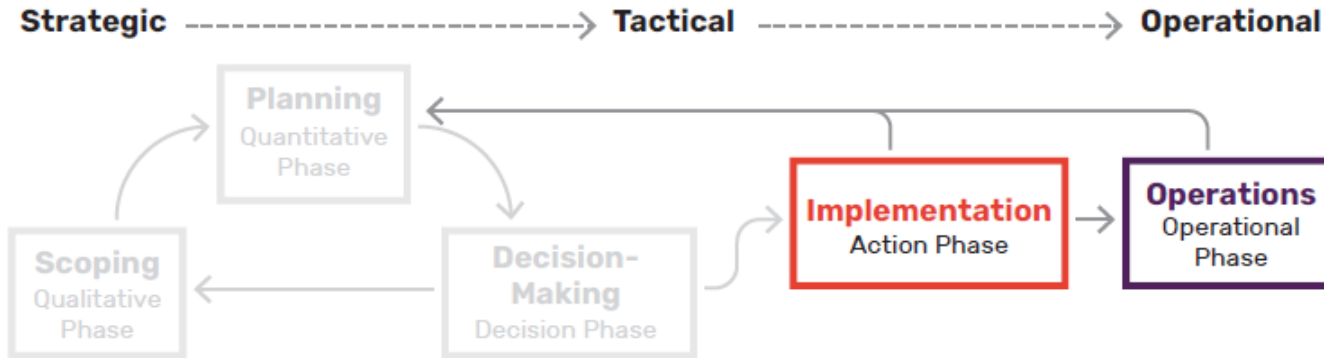
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- All interventions require monitoring
- Benefits of NbS change overtime because of natural processes
- Monitoring plan should reflect project goals, stakeholder interests

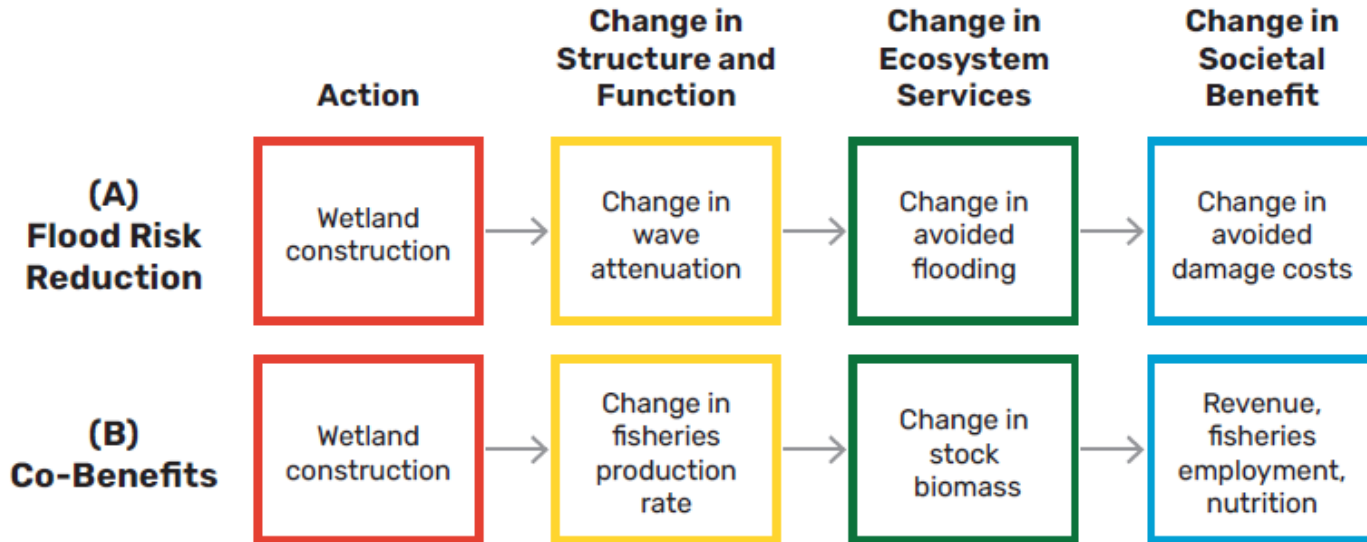
Figure 6.13. *Implementation Phase and Operations Phase*



Bridges, T. S., J. K. King, J. D. Simm, M. W. Beck, G. Collins, Q. Lodder, and R. K. Mohan, eds. 2021. *International Guidelines on Natural and Nature-Based Features for Flood Risk Management*. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

What metrics to monitor?

- Conceptual model to assess NbS benefits & application to risk reduction and benefits
- Useful model to **identify metrics to monitor**
- Identify metrics early in planning process to incorporate in adaptive management plan



Bridges, T. S., J. K. King, J. D. Simm, M. W. Beck, G. Collins, Q. Lodder, and R. K. Mohan, eds. 2021. *International Guidelines on Natural and Nature-Based Features for Flood Risk Management*. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

Metrics for flood/erosion risk reduction



Metrics for flood/erosion risk reduction

- Shoreline change, stabilized beaches
- Stable, growing vegetation
- Reduced wave overtopping, flood frequency
- Long-term \$ savings in cleanup, maintenance, reconstruction



Metrics for co-benefits (challenging)

Ecosystem

- Filter stormwater runoff
- Habitat creation
- Bank stabilization

Societal

- Aesthetics, tourism
- Recreation, access to shore
- Waterfront land/property



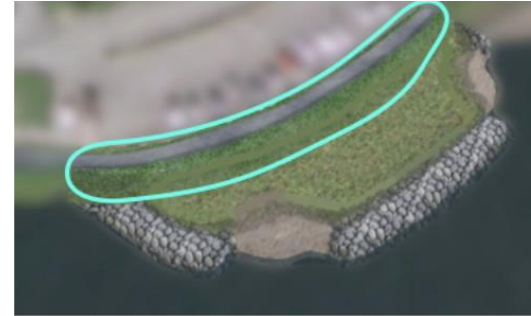
Rock Sills

A hard engineering structure that runs parallel to the shoreline. Rock sills help reduce wave energy and storm surge impact.



Tidal Wetland

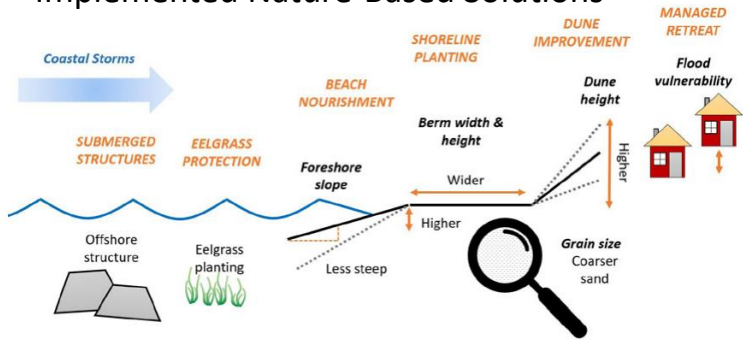
Fills the area between the rock sill and the shoreline with planted native species. Tidal wetlands naturally filter stormwater runoff and reduce storm surge and wave energy. They additionally create valuable coastal habitat for fish and bird species.



Vegetated Bank

Graded areas planted with native shrubs and herbaceous perennials. Vegetated banks help to stabilize the soil.

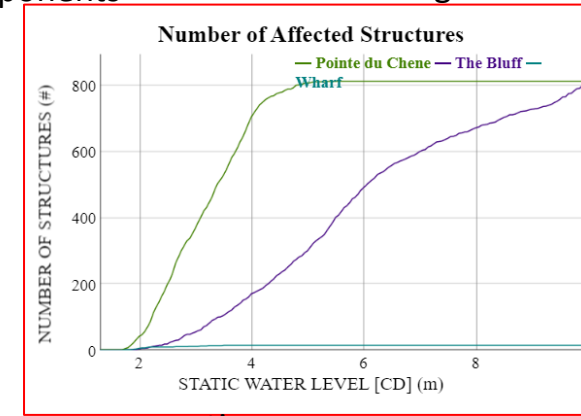
Implemented Nature-Based Solutions



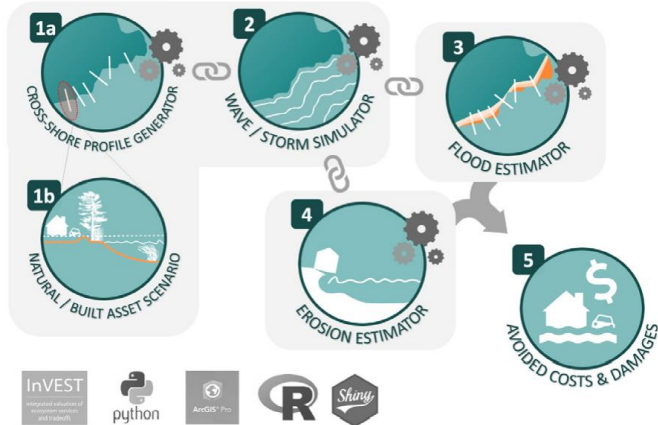
Interactive visualization of toolbox components



Flood damage



Toolbox work-flow



Interactive Visualization of wave propagation

Input Elevation Profile

Choose CSV File

Browse... ppp.csv Upload complete

Profile Smoothing (%)

10

Offshore Wave Parameters

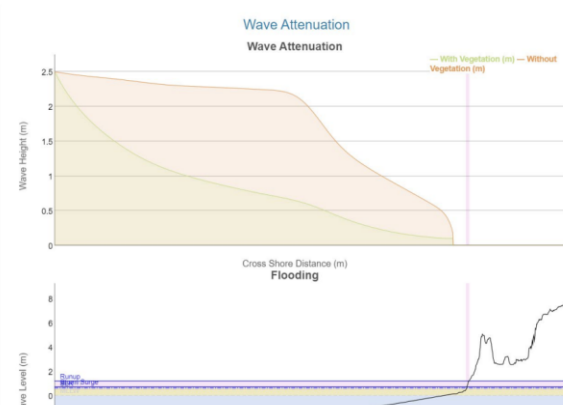
Wave Height - Ho (m) 2.5 Wave Period - To (s) 7

Wind Speed (m/s) 15 Fetch (km) 50 Suggested Wind-Wave Height: 2.05m; Period: 5.77s.

Tides and Water Levels

Mean Sea Level (m) 0.5 Mean High-High Water (m) 0.6

Surge Elevation (m) 0.1 Sea-Level Rise (m) 0.01



Summary for discussion

Comparing NbS to traditional infrastructure requires metrics



Flood/erosion risk reduction

- Shoreline change
- Vegetation cover
- Overtopping
- Flood frequency (eg MNAI tool)
- \$ savings in maintenance

Relatively easier to assess



Ecosystem

- Vegetation cover
- Filter stormwater runoff
- Habitat creation
- Bank stabilization

Challenging – requires definition at planning stage

Societal

- Aesthetics, tourism
- Recreation, access to shore
- Waterfront land/property