

NEW GUIDANCE AND DECISION-SUPPORT TOOLS FOR NATURE-BASED SOLUTIONS

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BACKGROUND AND MOTIVATION

Coastal flood risks are projected to intensify across North America - and globally - over the coming decades due to increasing population densities near the coastline and the effects of climate change (Bush and Lemmen 2019; EPA 2017; INECC 2019). Conventional coastal flood and erosion risk management systems have typically relied upon building hardened structures with artificial material (i.e., concrete, steel, etc.). These techniques have often resulted in unintended socio-economic impacts, may experience catastrophic failure, and regularly lead to the degradation or loss of natural ecosystems. With much of the existing infrastructure in North America exceeding or nearing the end of its service life, there is an opportunity to consider the role of Nature-based Solutions (NBS) in coastal protection. However, uptake and implementation of NBS are limited by numerous technical, social/attitudinal, environmental, and institutional barriers.

In 2021, a 30-month project was initiated by the Commission for Environmental Cooperation (CEC) to support the broader implementation and effective use of NBS to manage flood risks in coastal communities across North America in a changing climate. To achieve this goal, the project aimed to establish a community of practice and provide decision makers with practical information, guidance, tools, and training, covering three topics with identified gaps in knowledge: (1) retrofitting existing infrastructure systems, (2) co-benefits identification and assessment, and (3) monitoring and adaptive management. The project stages included the following:

- Phase 1: Workshop series
- Phase 2: Guideline development
- Phase 3: Online Training and Education

This presentation will outline the collaborative and intersectoral process followed for this project. In particular, the presentation will highlight the new design-support tools, guidance, and reference information developed within these new guidance documents and associated training materials.

PHASE 1 - WORKSHOPS

During Phase 1, an intersectoral workshop series was developed and hosted by DHI on behalf of the CEC. The

goal of this workshop series was to lay the foundation for a North American community of practice on NBS, convene practitioners to scope needs and opportunities, and identify barriers to implementation of NBS.

Seven (7) workshops were held, focusing on NBS co-benefits, retrofitting existing infrastructure using NBS, and monitoring of NBS. The workshop series was held and interpreted in three (3) languages. Group activities included six (6) case studies, four (4) collaborative Miro Board activities, and two (2) question series in Mentimeter. The workshops saw the participation of 19 expert speakers and 76 participants from diverse backgrounds spanning from academic, private industry, government, and non-governmental organizations.

PHASE 2 - GUIDELINES

Phase 2 of the project included developing a comprehensive set of guidance documents, with the aim of supporting decision makers and practitioners across North America in the effective use and uptake of NBS for coastal flood risk management. Development of the guidelines was led by DHI, with support from the TransCoastal Adaptations at Saint Mary's University and CB Wetlands & Environmental Specialists (CBWES). Four guidance documents are under development and expected to be launched in early 2024. The guidance documents cover the topics of: (1) Co-Benefits, (2) Retrofitting Existing Infrastructure, (3) Monitoring Efficacy, and (4) Monitoring Methodology and Indicators.

Significant previous relevant guidance and best practices are synthesized in the documents, and case studies from across North America are provided throughout. In addition, all guidelines aim to identify, and address gaps and barriers identified during the previous intersectoral workshop series, where possible.

More specifically, the **Co-benefit** guideline also aims to:

- Contextualize the socio-economic and environmental differences that exist across North America, which may impact co-benefits.
- Provide a comprehensive summary of potential social, environmental, and economic co-benefits.
- Provide tools to identify, value, and compare co-benefits to support decision making (e.g., Figure 1).



Figure 1 - Social, environmental, and economic co-benefit valuation methodologies, arranged by the time, budget, and expertise required to utilize the techniques.

The **Retrofitting** guideline also aims to:

- Contextualize existing differences that may influence retrofitting initiatives and highlight opportunities for retrofitting within the North American environment.
- Demonstrate the value proposition of retrofitting, and outline incentives.
- Provide a comprehensive summary of options that may be available for NBS retrofitting and, where possible, provide examples of costs and cost-comparisons (see Figure 2).
- Develop strategies for decision-makers to identify and compare retrofitting opportunities and options.
- Summarize key administrative and technical considerations for retrofitting.

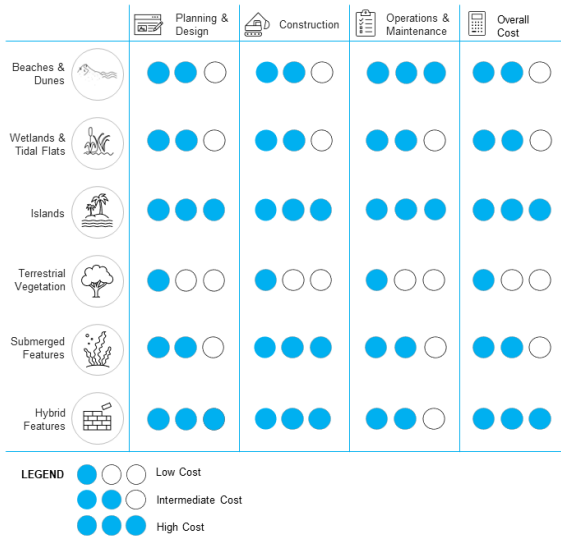


Figure 2 - Relative costs of project development stages for different NBS types.

The two **Monitoring** guidelines aim to:

- Contextualize differences that exist within the North American environment that may influence monitoring planning and implementation.
- Provide a value proposition for investment in monitoring.
- Summarize guiding principles and goals of monitoring.

- Establish core and additional Performance Indicators for monitoring (e.g., Figure 3).
- Summarize specific considerations for various types of NBS and ecosystems.
- Summarize key administrative and technical considerations for monitoring plans, including roles and responsibilities, funding challenges, methods, varying physical environments, and time and spatial scales.

LEGEND	Submerged Features	Wetlands & Tidal Flats	Coastal Forests & Shrubbery	Beaches & Dunes	Islands	Hybrid Features
● Core						
● Additional						
○ Not applicable						
Performance Metric						
Reduced maximum still water flood levels for target areas	○	●	●	●	●	●
Shorter flood duration for target areas	○	●	●	●	●	●
Reduced wave effects	●	●	●	●	●	●
Reduced or diverted flood velocities	○	○	○	○	○	○

Figure 3 - Examples of some core Performance Metrics for various NBS types.

The guidance documents also summarize key gaps and opportunities for decision makers to support the broader uptake and effective implementation of NBS. In total, 67 opportunities are identified.

PHASE 3 - CONTINUING EDUCATION

The third phase of the project will include an online training course related to the guideline series. The training course is intended to be free-of-charge, self-paced, and guide users through a series of video lectures and demonstrations, written content, ad-hoc questions and polling, and an end of module test participants to confirm knowledge. Like the guidance documents, the webinars will be available in English, Spanish, and French.

CONCLUSION/DISCUSSION

These new guidance documents represent a significant contribution to the existing literature on NBS. During this presentation, we will summarize key findings from the workshop series, provide an overview of the new suite of guidance documents and key tools and frameworks included within, and summarize the status of online training. Draft versions of the guidelines are currently being implemented across several projects, including two marsh restoration projects in British Columbia, Canada. The presentation will highlight the application of the draft guidelines to several ongoing projects.

REFERENCES

Due to space limitations, references are not included.