



SUMMARY

PIANC Working Group on Carbon Management for Port and Navigation Infrastructure

PIANC is committed to the long-term success of the waterborne transport sector and plays a central role in guiding its agile adaptation to changing global contexts. There is growing interest in managing the “carbon footprint” of industrial activities to respond to climate change. Effective carbon management involves steps to reduce and offset emissions and sequester carbon. The PIANC Terms of Reference for the Working Group on Carbon Management for Port and Navigation Infrastructure proposes an approach for investigating the carbon footprint of navigation infrastructure development, operations and maintenance, and identifies best practices for management of the sector’s carbon footprint.

Through deliberate management of infrastructure and environmental systems, there is a potential to create a carbon neutral or carbon negative navigation sector. Proactive steps to effectively manage carbon will help the navigation sector: 1) comply with emerging regulatory requirements, 2) respond to general stakeholder and public pressure to reduce environmental burdens, 3) take a leadership role in carbon management practices, and 4) drive innovation and investment while influencing future practice and regulation. Starting with the problem of carbon management will provide experience that can later be leveraged to address larger aspects of sustainability for navigation infrastructure.

Identifying opportunities for carbon management requires a greater understanding of the carbon sources and sinks relevant for waterborne transport. As a first step, the working group will focus on the unique carbon contributions of—and opportunities to reduce and offset emission from—waterways navigation infrastructure development, including dredging and the beneficial use of dredged sediments. The group will review navigation-relevant case studies and report on methods to quantify and best manage navigation carbon footprints. These methodologies, lessons-learned, and best practices will be broadly relevant to the international PIANC community.

Terms of Reference

Carbon Management for Port and Navigation Infrastructure

Background

Releases of anthropogenic carbon dioxide and related greenhouse gases into the atmosphere contribute to climate change. Navigation infrastructure development and maintenance activities contribute to worldwide carbon releases through the operation of dredging equipment, vessels, and related machinery and infrastructure. Opportunities exist to improve the carbon budget of navigation projects by reducing or offsetting carbon emissions or by sequestering carbon. For example, while a maintenance dredge fleet releases carbon by combusting fuel, on- or near-site beneficial use of dredged material to enhance or create wetlands avoids transportation-related emissions and can create a habitat for carbon sequestration. By taking these opportunities to align infrastructure development activities with opportunities to offset or sequester carbon, the navigation sector can move towards carbon-neutral or carbon-negative status.

The topic of carbon management is broadly relevant to PIANC members needing to develop, operate, and maintain ports and navigation channels while also urgently needing to best respond to developing climate change regulations and stakeholder concerns. Starting with the problem of carbon management will provide experience that can later be leveraged to address larger aspects of sustainability for navigation infrastructure. Investigating carbon management issues now will best position PIANC to influence future practice and regulation.

The lack of a comprehensive and quantitative view of what contributes to the carbon budgets of port and navigation infrastructure and projects and what actions might improve those carbon budgets presents a barrier to improving carbon management. For example, this might include a lack of knowledge of how much carbon is released by each type of dredge or how much carbon can be sequestered per unit area of constructed wetland. These types of issues will be explored through a review of case studies related to the carbon footprints of port and navigation infrastructure.

Estimating the “carbon footprint”—the total direct and indirect emissions that are attributable to a project or program—is a critical first step toward effective carbon management. Life-cycle assessment (LCA) is an analytic method to inventory and analyze the impacts associated with a product, process, or service over the entire course of the program or product’s “life”. It can be used to identify the carbon footprint of navigation infrastructure and activities and best practices for reducing them and increasing sequestration.

The best practices needed to address the carbon footprints of navigation channel development and maintenance projects will differ based on location and context-specific factors; some strategies may rely more on operational changes while others may seek built or natural infrastructure solutions. Case studies developed by this working group will help inform the navigation community's understanding of the carbon footprints and sequestration potential of port and navigation infrastructure and activities.

Objectives

The objective of the working group is to review and report on the technical literature related to the carbon footprint of navigation infrastructure and supporting activities, provide guidance on applying LCA and related assessment tools and techniques, and investigate opportunities for reducing atmospheric carbon dioxide through operational practices, Working with Nature, land use management, blue carbon projects, and related environmental management. The resulting report will inform the navigation community about practices that have potential to improve carbon management for the development, operation, and maintenance of navigation channels and associated equipment and infrastructure.

Earlier reports to be reviewed

The Working Group will agree on the range of PIANC and third party reports to be reviewed. As far as is practicable, this review will cover not only published but also unpublished (grey) literature, research, etc.

Scope

The Working Group will investigate the carbon footprint of activities related to development, maintenance and operation of navigation channels and port infrastructure including the management of dredged material. LCA and other assessment methods will support this investigation and provide insights into opportunities for improved carbon management. The group will highlight exemplary case studies, identify good practices in the management of navigation infrastructure, identify opportunities to engage in carbon-sequestering activities, and summarize means to reduce the carbon footprint of the industry.

Intended Product

The intended product will be a report proposing a framework to guide policy makers and navigation infrastructure operators toward effective methods for net carbon management. Given the global distribution of PIANC membership, opportunities for carbon reduction and carbon sequestration will vary based on local ecosystems, infrastructure, and politics. Taking this into account, the report will:

- I. Overview the sources of carbon releases for the port and navigation industries, drawing data from literature reviews and related carbon assessment methods.
- II. Develop a general framework for guiding carbon management, including:
 - A. Estimating carbon emissions
 - i. The role of life-cycle assessment (LCA) in developing local carbon footprints
 - ii. Economic input-output methods for carbon emission screening

- iii. Case studies of the carbon footprint of waterways and navigation infrastructure
 - B. Opportunities for reducing carbon emissions
 - i. Analysis of Working with Nature (WwN) methods to reduce the need for waterways dredging and infrastructure maintenance
 - ii. Good practices for minimizing carbon releases
 - iii. Implications of different strategies for dredged material management on net carbon emissions
 - C. Opportunities for carbon sequestration
 - i. Good practices for conservation of carbon-sequestering coastal ecosystems (blue carbon)
 - ii. Creation of inland and marine habitat (e.g., wetlands or islands) from dredged sediment to promote growth of carbon sequestering vegetation.
- III. Review of ancillary issues associated with improved carbon management
 - A. Unintended costs and consequences, including:
 - i. Potential relationship between carbon emissions and particulate matter, carcinogens, or other releases associated with damaging effects on the environment or human health.
 - ii. Long-term effects on the environment, national security, or other infrastructure systems from changes to minimize carbon footprints of port and navigation infrastructure (e.g., effects from increased reliance on grid electricity, etc.)
 - iii. Estimates of financial costs of implementing new carbon management technology or operational changes
 - iv. Estimates of potential financial gains from credits for carbon sequestration
 - B. Legal requirements or political expectations for carbon reduction
 - i. Summary of countries with carbon reduction requirements or carbon emission restrictions either mandated by law or with voluntary compliance
 - ii. Summary of countries with carbon cap and trade or carbon credit market opportunities

Working Group Membership

To provide technical guidance relevant to the PIANC sector and members worldwide, the Working Group should include members representing:

- Ports and harbors
- Dredging and navigation operations
- Environmental and ecosystem consultants
- Governments and policy makers
- Professional organizations
- Academic or research organizations

The working group will partner with IAPH, IADC and EuDA and other interested organizations to develop the data, case studies and the management framework.

Relevance to Countries in Transition

To the extent that fuel-intensive activities can be reduced through greater operational efficiency, both carbon emissions and operating costs can also be reduced. These cost savings can promote more rapid growth of industry in developing countries and potentially help offset costs of some environmental or carbon sequestration projects. Industrialized countries can also implement blue carbon or other sequestration projects in countries in transition, helping offset global carbon emissions from port and navigation infrastructure while benefiting the local communities where these projects are implemented.

Climate Change

The Working Group specifically targets climate change issues related to the development and maintenance of navigation channels.

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