PIANC

The World Association for Waterborne Transport Infrastructure

GUIDELINES FOR AIR POLLUTANTS AND CARBON EMISSIONS PERFORMANCE INDICATORS FOR INLAND WATERWAYS

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INLAND WATERWAYS AND PORTS COMMISSION

GUIDELINES FOR AIR POLLUTANTS AND CARBON EMISSIONS PERFORMANCE INDICATORS FOR INLAND WATERWAYS

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This report of the PIANC Inland Navigation Commission (InCom) WG 229 is the result of fine teamwork of an international team of dedicated Inland Waterborne Transport experts on the highly topical subject of 'Guidelines for Air Pollutants and Carbon Emissions Performance Indicators for Inland Waterways'.

The team started in April 2020, at the start of the worldwide COVID-19 pandemic. As for the rest of the world, we had to find our way with online meetings and long-distance exchange of ideas and information.

So, with the final submission of our report, I want to thank my team members for their continued commitment and inspirational efforts to reach our objectives. Our partnership resulted in conceptual ideas, highly relevant methodologies, extensive calculation efforts and challenging and sharp reviews. Special thanks to Ms Man Jiang, PhD student at TU Delft, for the calculation support during the comparative case studies.

A special word of thanks also goes to the members of the PIANC Inland Navigation Commission (InCom) for their valuable reviews and reflections during the final phase of the report.

I hope it all adds to our common zero emission objective to secure a strategic and sustainable worldwide Inland Water Transport sector.

Gouda, the Netherlands
January 2024.

Klaas Visser
Chairman PIANC WG 229.

ABSTRACT

The objective of this WG 229 of PIANC InCom was to develop guidelines that can assist waterways managers/operators/governments/ship designers/shipbuilders, in classifying ports and vessels, based on their environmental and operational performance, and to develop a sustainable design for both vessels and infrastructure.

In Chapter 2, a literature review shows the high relevance of this subject from a global and European policy context. Reference is made to publications of governments, knowledge institutes and non-governmental organisations. A preliminary state-of-play is presented of the costs (including emissions) of (inland water) transport.

In Chapter 3, structures for emissions performance indexes are defined, in which these 'costs' of inland ship energy conversions (greenhouse gases, hazardous emissions) are weighed against the benefits (produced engine power in kilowatt hours, transported cargo in tonnes-kilometres). In this chapter, nine different index definition methodologies are explained. These methodologies differ in principal assumptions for the input parameters, related to physical considerations of ships and corridors, as well as whether top-down or bottom-up analyses for ships and corridors are considered. The scope of the methods is a tank-to-wake approach, the well-to-tank energy path is outside the scope of this research.

Chapter 4 gives a short description of the required datasets and the availability of datasets in practice or in literature. With index algorithms and datasets available, a comparative case study can be performed. The objective of the case study is the Amsterdam-Rotterdam-Antwerp-Rhine corridor, a very representative and well documented inland water navigation corridor. This objective corridor is described in Chapter 5.

In Chapter 6, the four most applicable index methodologies are applied to the ARA-Rhine corridor. These are the TU Delft OpenTNSim-Energy approach, the EICB labelling approach, the EEDI-related index definition of the University of Duisburg and the computation of the CCNR IEN Committee. The results are compared and discussed. Although the quantified emissions in the case study vary among approaches, each approach contributes to the evaluation of sustainability performance of inland navigation in the quantitative manner. Also, it is relevant to observe the various quantification potentials realised by each approach: from waterway stretch level to trip level and to corridor level, from main engine performance to all the energy convertors performance on board, from vessel fuel use estimation to vessel emissions and energy use estimation.

Nevertheless, as stated in the Conclusions and Recommendations of Chapter 7, in all cases the objective should be that all working approaches have been validated and converge against unambiguous results. This means also that we need a sound data base for the evaluation of the different approaches and a transparent description how the evaluations were performed, for every relevant ship type and for every relevant navigational corridor. This conclusion of PIANC WG 229 may be a very relevant starting point for further research on this highly topical subject.

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