De Vlaamse Waterweg nv

Autonomous vessels on inland waterways

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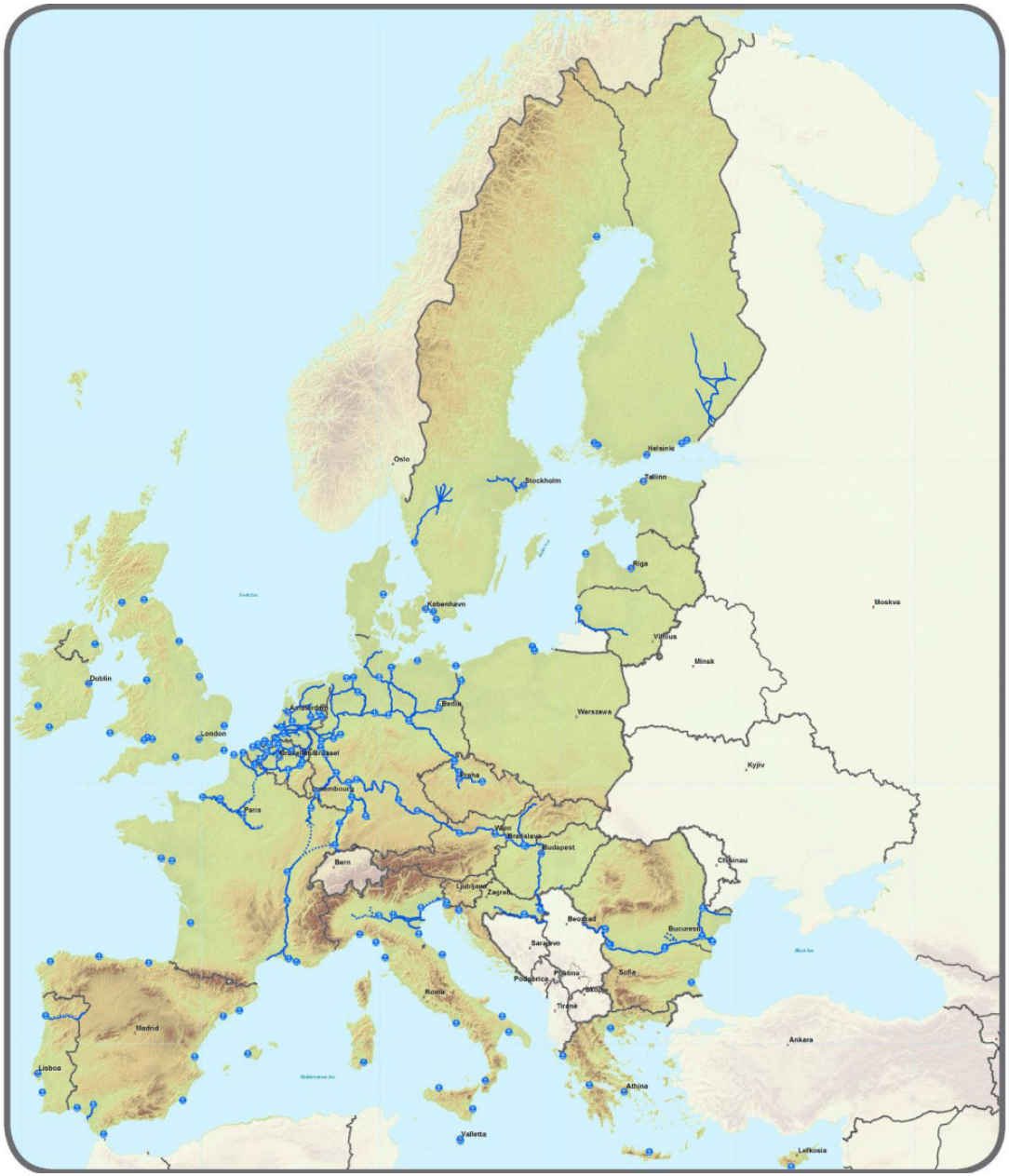
RIS Project Manager Smart Shipping

Schelle – 23/10/2019



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De Vlaamse Waterweg nv

1076

800

131

De Vlaamse Waterweg nv

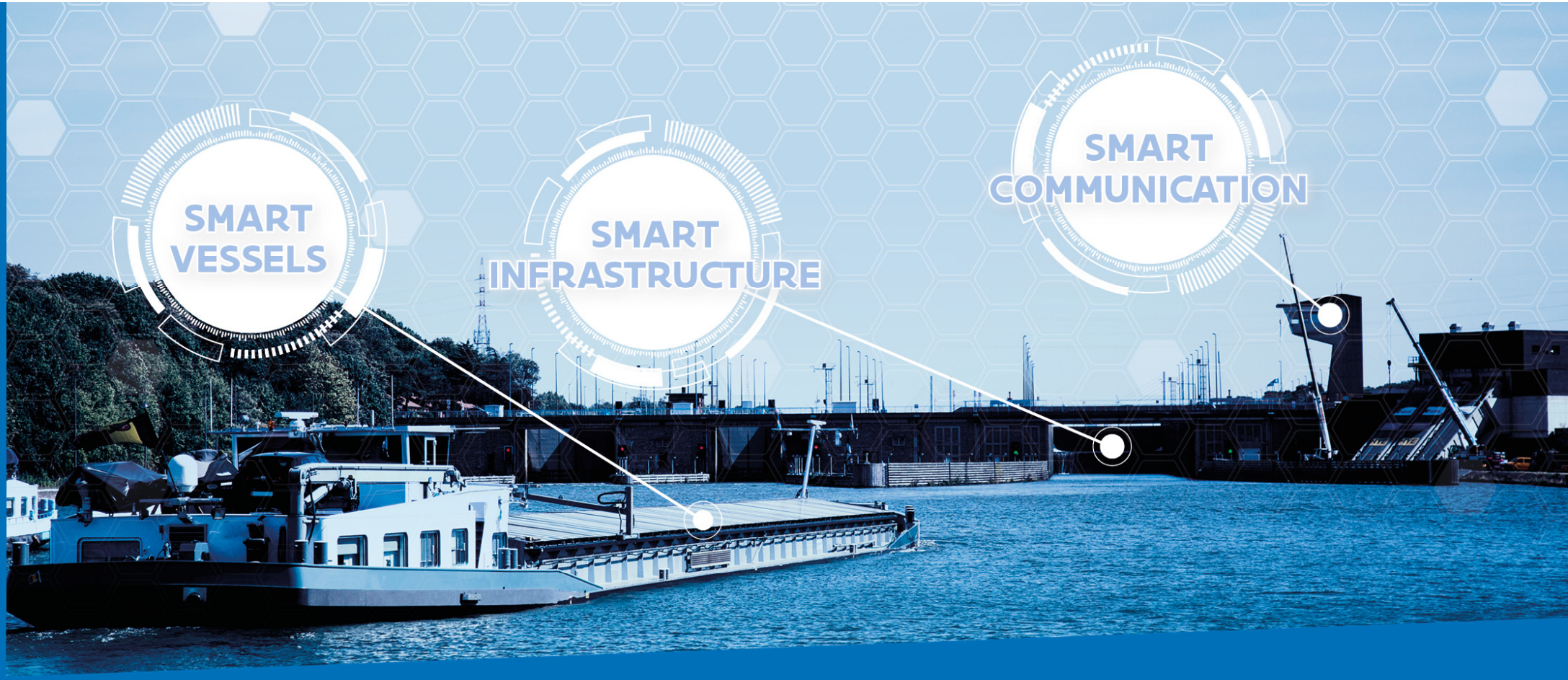

de dijcker
VIOL SPED
VIOL- SPED
COOL
SCANIA
AGC


E411 Namen
E40 Luik
Zaventem
E19 Antwerpen
RW
hansgrohe

Federal planning bureau

~ 27% increase in freight transport by 2040

~ 38% increase in inland shipping



Smart Shipping

Legislation en regulations

Our Approach

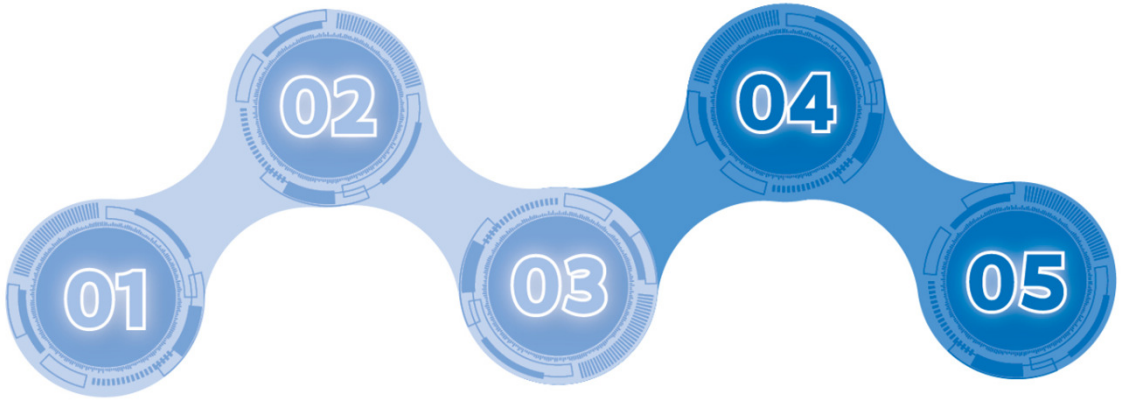
2016-2018

1. Identified Benefits

The benefits identified for the people, the organizations and the planet illustrate that the step towards autonomous vessels is something that the authorities should work on.

2. Law and regulation - Gaps

It has been identified that the current law and regulations are not adjusted to make autonomous vessel operations possible



3. Test areas

Test areas in which autonomous vessels can operate have been approved. It is however still up to the authorities to decide whether it is allowed to test or not.

4. Adjustment law and regulation

After the test cases the best practices and missing gaps in the law and regulation will be filled

5. Autonomous vessels in legal framework

The autonomous vessels will be able to operate on the Flemish inland waterways within a well defined regulatory framework

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Test area

Open to external parties

DVW

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Our Approach

2018-2020

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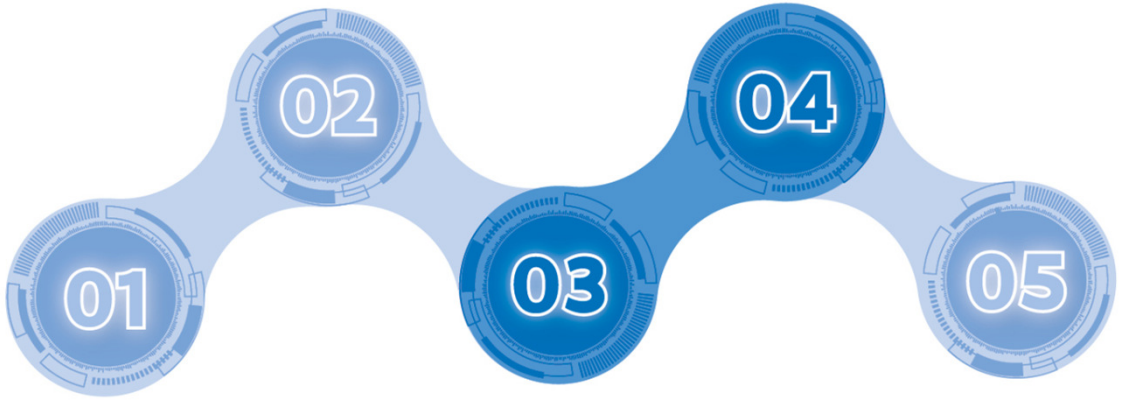

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Law and regulation

Identified GAPS

Crew member regulation

- It is under no circumstance allowed for any type of vessel to sail without any crewmember

Traffic regulation

- The general traffic regulation including the General Police regulation for vessels on Inland Waterways contain several rules from which cannot be deviated

Dangerous goods

- The transportation of dangerous goods on water has to comply with several strict rules

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Law and regulation

New regulation

Crew member regulation

- It is under no circumstance allowed for any type of vessel to sail without any crewmember

Traffic regulation

- The general traffic regulation including the General Police regulation for vessels on Inland Waterways contain several rules from which cannot be deviated

Dangerous goods

- The transportation of dangerous goods on water has to comply with several strict rules

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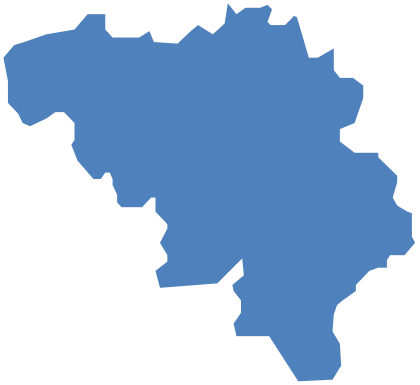
Test area Belgium



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Cooperation CCNR

Levels of Autonomy

Scoping exercise traffic regulation

	Level	Designation	Vessel command (steering, propulsion, wheelhouse, …)	Monitoring of and responding to navigational environment	Fallback performance of dynamic navigation tasks	Remote control
BOATMASTER PERFORMS PART OR ALL OF THE DYNAMIC NAVIGATION TASKS	0	**NO AUTOMATION** the full-time performance by the human boatmaster of all aspects of the dynamic navigation tasks, even when supported by warning or intervention systems *E.g. navigation with support of radar installation*				No
	1	**STEERING ASSISTANCE** the context-specific performance by a steering automation system using certain information about the navigational environment and with the expectation that the human boatmaster performs all remaining aspects of the dynamic navigation tasks *E.g. rate-of-turn regulator* *E.g. trackpilot (track-keeping system for inland vessels along pre-defined guiding lines)*				
	2	**PARTIAL AUTOMATION** the context-specific performance by a navigation automation system of both steering and propulsion using certain information about the navigational environment and with the expectation that the human boatmaster performs all remaining aspects of the dynamic navigation tasks				Subject to context specific execution, remote control is possible (vessel command, monitoring of and responding to navigational environment and fallback performance). It may have an influence on crew requirements (number or qualification).
SYSTEM PERFORMS THE ENTIRE DYNAMIC NAVIGATION TASKS (WHEN ENGAGED)	3	**CONDITIONAL AUTOMATION** the sustained context-specific performance by a navigation automation system of all dynamic navigation tasks, including collision avoidance, with the expectation that the human boatmaster will be receptive to requests to intervene and to system failures and will respond appropriately				
	4	**HIGH AUTOMATION** the sustained context-specific performance by a navigation automation system of all dynamic navigation tasks and fallback performance, without expecting a human boatmaster responding to a request to intervene[1] *E.g. vessel operating on a canal section between two successive locks (environment well known), but the automation system is not able to manage alone the passage through the lock (requiring human intervention)*				
	5	**AUTONOMOUS = FULL AUTOMATION** the sustained and unconditional performance by a navigation automation system of all dynamic navigation tasks and fallback performance, without expecting a human boatmaster responding to a request to intervene				

[1] This level introduces two different functionalities: the ability of "normal" operation without expecting human intervention and the exhaustive fallback performance. Two sub-levels could be envisaged.

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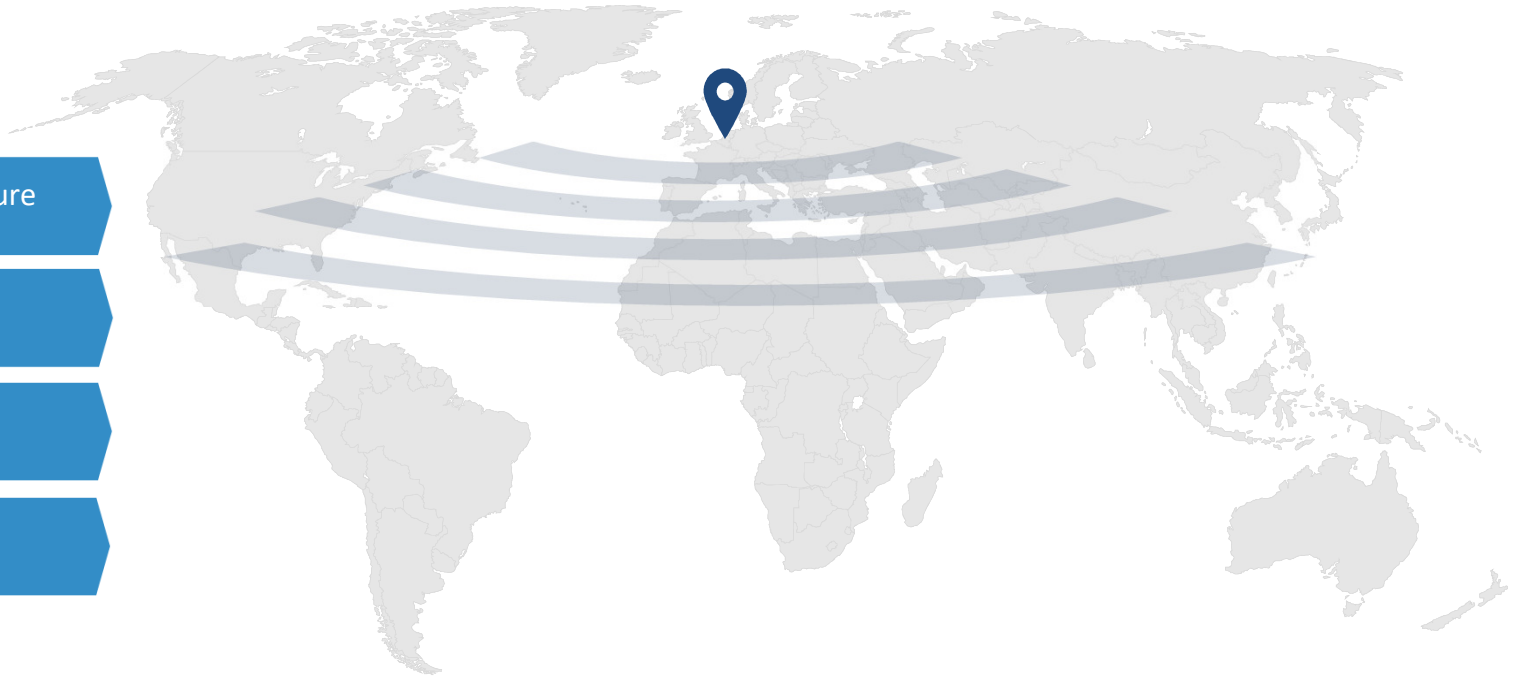
PIANC

- Impact of smart ships on infrastructure
- Gaps in current research
- Use cases and impact analysis
- Recommendations for the future



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your reliable partner for a smart, versatile and prosperous inland waterway network

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