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26 MAGGIO 2021

SMART PORT CONFERENCE

La portualità del futuro/ Port of the future

Professor Christa Sys

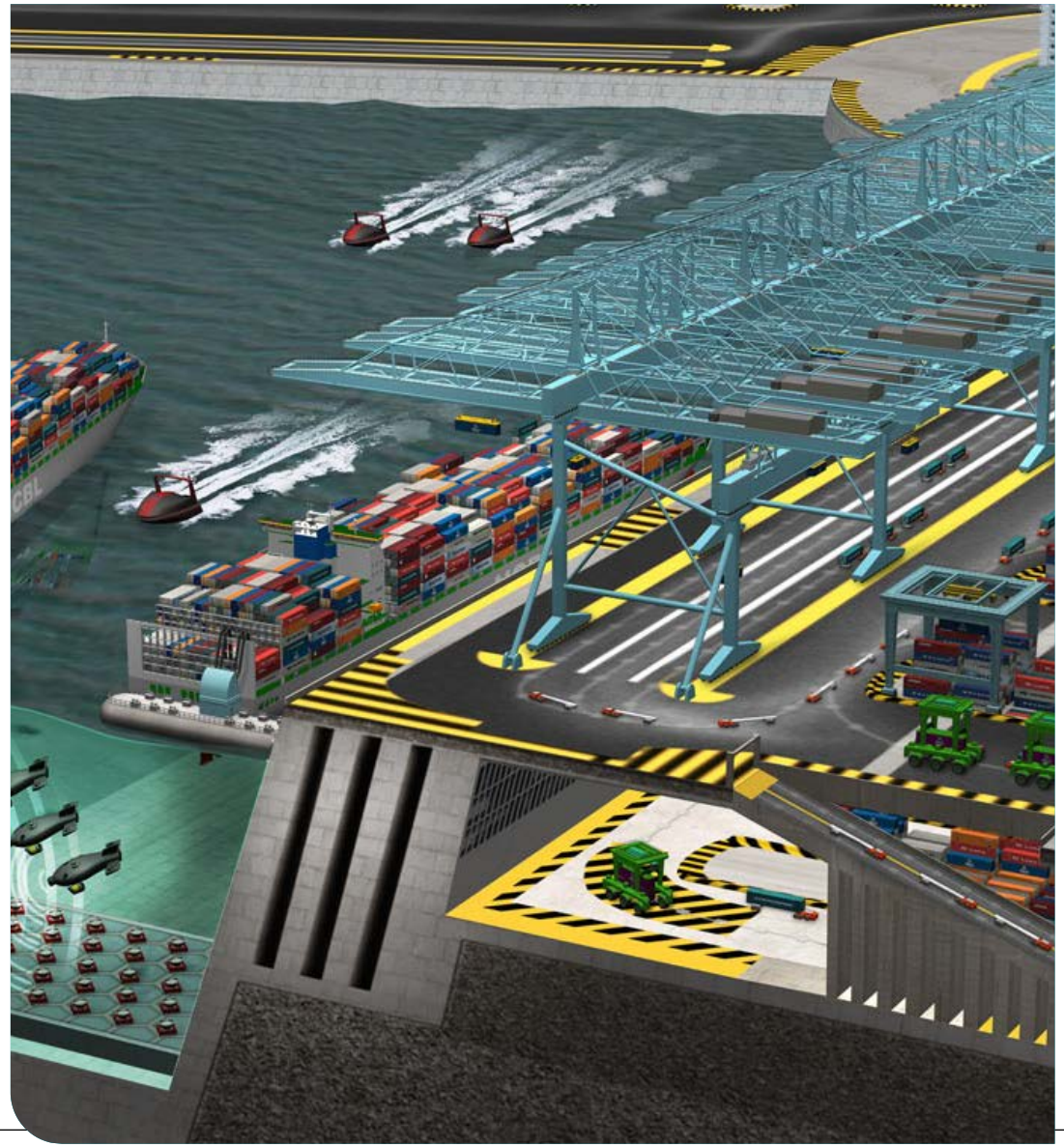
Online session May 26th 2021

Antwerp Management School
Powered by C-MAT

Me, myself and I

Prof. Christa Sys	TK Blue MORA WISTA Belgium	Joint PhD Applied Economics Ugent-UA (Competition in the container liner shipping industry)
Business environment Maritime economics and business Maritime supply chains	Chair holder BNP Paribas Fortis Transport, Logistics and Ports	Working at University of Antwerp since Oct. 2010
Creating a resilient maritime ecosystem	Course coordinator C-MAT	Involved in projects (H2020, ….)
Faculty of Business & Economics > Department Transport & Regional Economics	Promotor chair Dennie Lockefeer (Inland navigation)	Antwerp Rail School, Antwerp Inland Navigation School

More info: https://www.uantwerpen.be/en/staff/christa-sys/

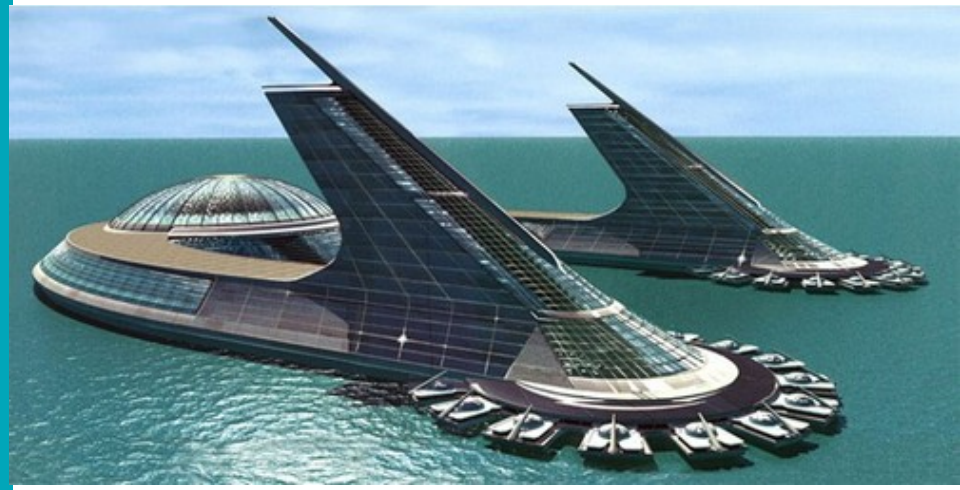


Port of the Future Art - IGW (infographicworld.com)

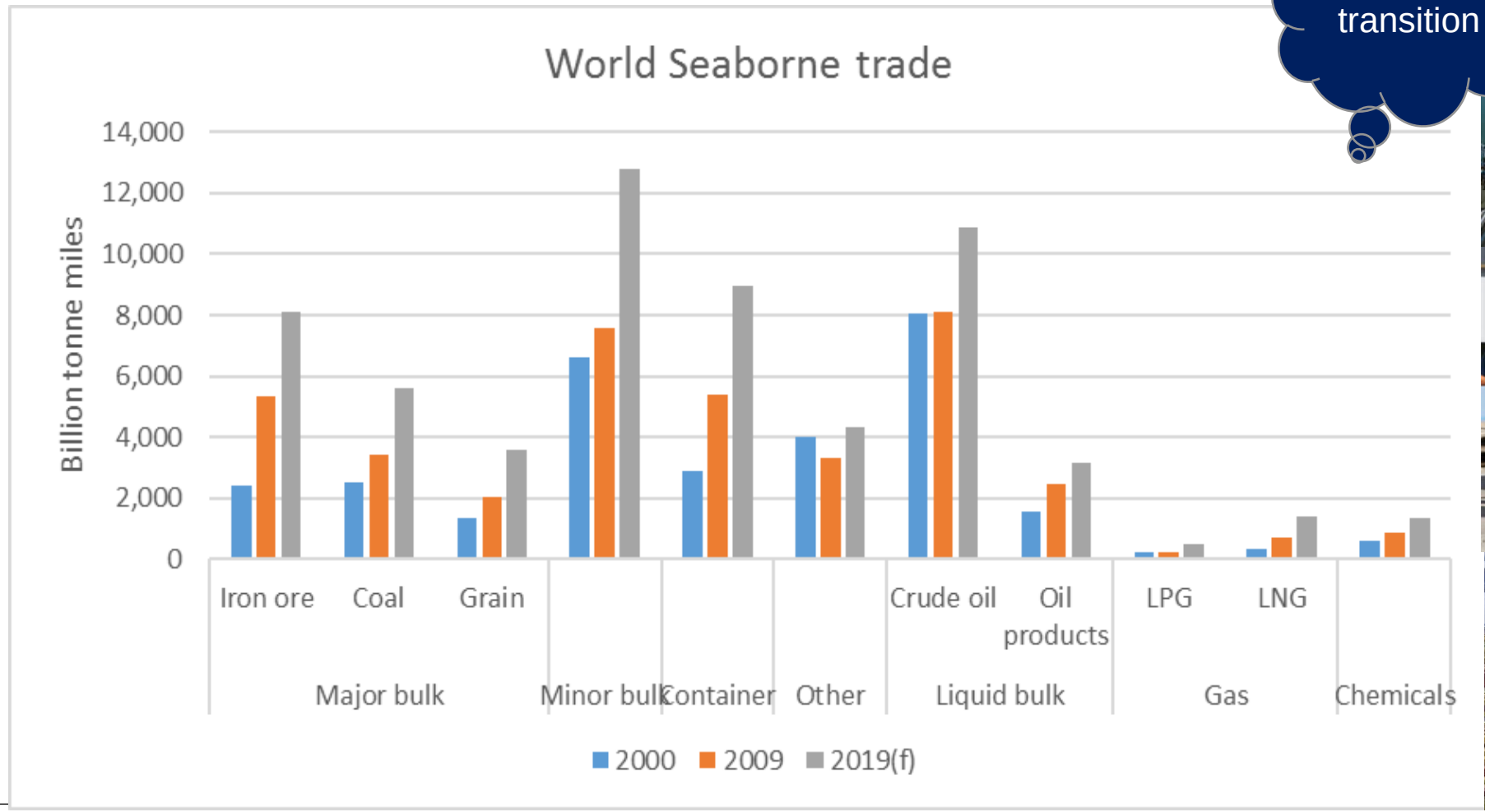
Content

- Definitions
- Mega trends
- Demografic drivers
- Technological drivers
- Sustainable drivers

What is a (smart) port?



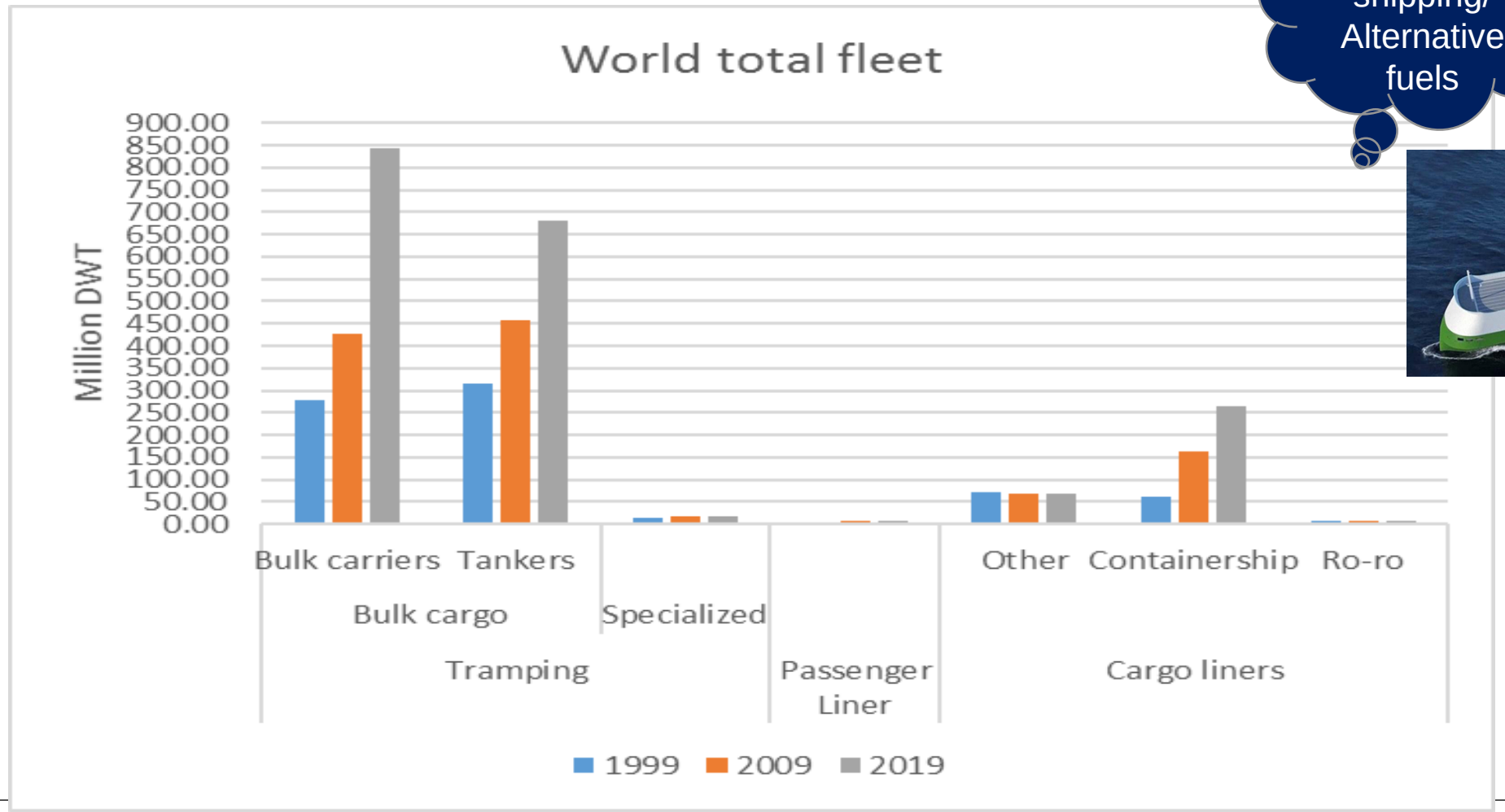
A node in maritime ecosystem



Energy transition

Sys and Vanelslander, 2020

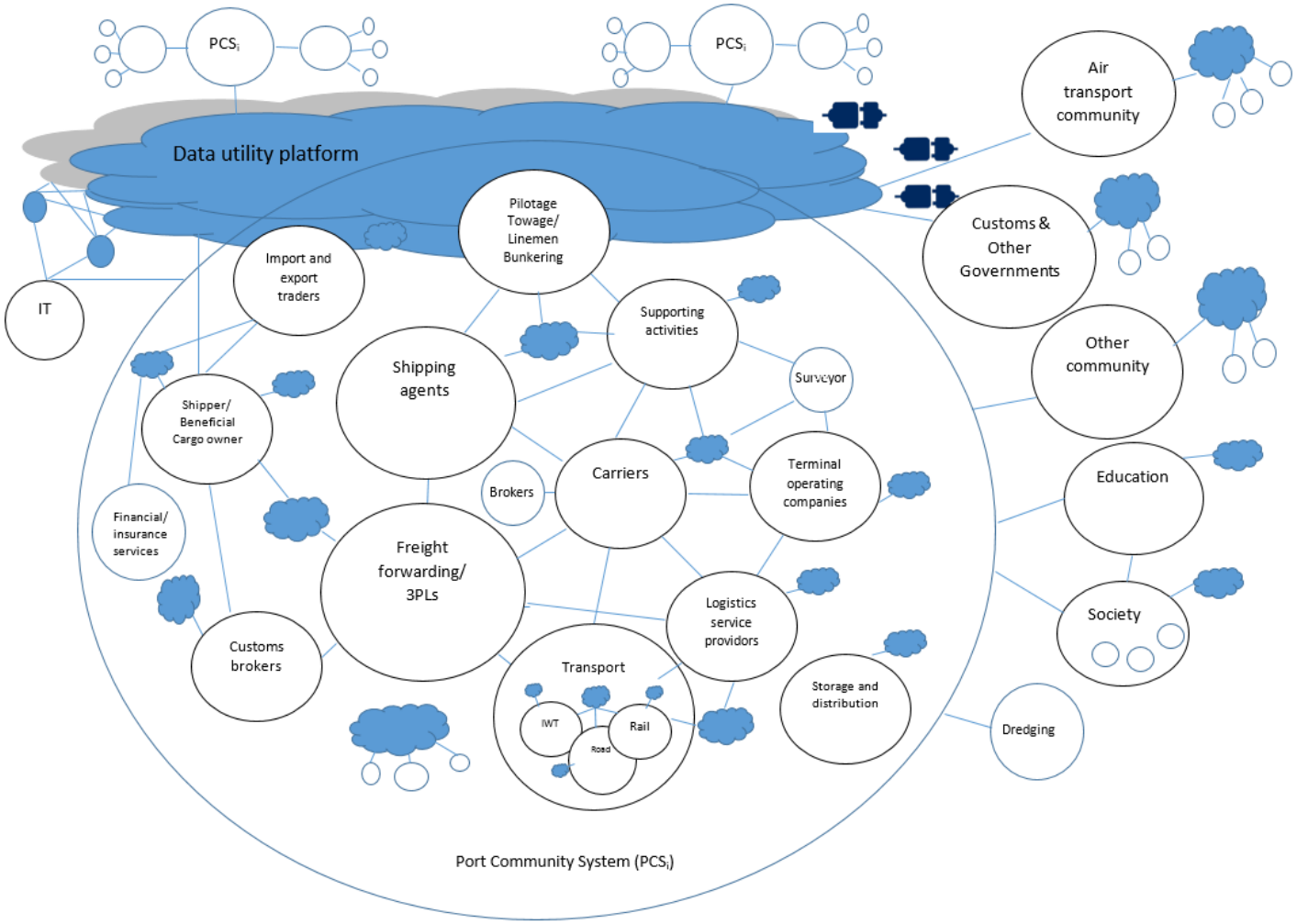
A node in maritime ecosystem



Bigger/ Autonomous shipping/ Alternative fuels

Sys and Vanelslander, 2020

A node in the maritime ecosystem



Sys & Vanelslander, 2020

"to match supply and demand globally, efficient and effective cargo, information and financial flows are interconnected in a variety of multi-layered networks linking all actors (B2B, B2G) (living components) and infrastructure (e.g. port, hardware,…) (non-living components) whilst reducing costs, improving (operational) efficiency, ensuring sustainability, complying with regulation and simultaneously improving customer satisfaction (e.g. reliability) to retain or increase market share"

Starting from a good definition of ‘Smart port’

- A novel concept describing **the future state of the port entering digital transformation**

  “*a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies*” (Vity, 2019)

- A port that optimizes **in-, intra- and outbound flow of goods and information**, leads **sustainable development and guarantees safe, resilient and secure activities** through the **capabilities of its (extended) port community and enabling innovative technologies**. (Boullauazan, Sys & Vanelslander, 202x) including Artificial Intelligence (AI), Big Data, Internet of Things (IoT) and Blockchain to improve its performance

➔ But will practice follow? Community formation? Making data available?

Mega-trends > need a cohesive port community to act in collaborative innovations (co.innovation)

Demography and society (1/2)

Trend	Port innovation impact
The global **population** will increase from its present level of 6.9 to about 9.1 billion people.	**More, more efficient and differently located ports needed.**
The trend toward **urbanisation** will continue, with over 70 per cent of the world's population living in cities in 2050, compared to 50 per cent at present.	**New port locations needed, as well as new ways of efficiently reaching the increasingly concentrated hinterlands.** **Relation and partnership between the Port and the city will change** **Building local supply chains and supporting smart city policies will reduce congestion and emissions. Intermodal activities in ports and cities are increasing.**

Source: own processing of and adding to OECD (2010)

Demography and society (2/2)

Trend	Port innovation impact
The population is **ageing**; by 2050, 22 per cent of the population will be over 60 compared to 11 per cent now. Globally the number of people over 80 will more than triple. Ageing is not just a developed world phenomenon and, for example China too will have an older population.	**New products will need to be handled.**
Incomes will be significantly higher; at only 2 per cent annual growth in income, global GDP will more than double.	**Increasingly efficient port handling needed.**

Source: own processing of and adding to OECD (2010)

Technological drivers

Crucial concept: (strengthen) competitiveness

01

How can innovative ICT concepts contribute to a better (read: cheaper) integration of the maritime ecosystem?

02

What are the "bottlenecks" and how do we clear them?

03

What costs can be saved through maritime ecosystem thinking, both in terms of money and time?

From research...

- DIGITAL CO.INNOVATION, A KEY ISSUE
  - digital **co.innovation** will change the business model of the actors along the maritime supply chain
    - a new form of innovation where the intention of the parties is to **build together new knowledge** and **create new opportunities** for cooperation along maritime supply chains (*Sys & Vanelslander, 2015*)
    - a tool that can improve the **competitive advantage** of port-related stakeholders
    - enables to answer to the **challenges** (a.o. intermodality, integrated chains and smooth management) facing the sector currently faces.
  - Why? only the successful chains will survive in this highly competitive market

Digital innovation in the port sector: Barriers and facilitators

Article *in* Competition and Regulation in Network Industries · October 2017
DOI: 10.1177/1783591717734793

1st Valentin Carlan


2nd Christa Sys
12.42 · University of Antwerp


3rd Thierry Vanelslander
22.52 · University of Antwerp

4th A. Roumboutsos
17.71 · University of the Aegean

Abstract

Digital innovation changes industry as a whole, and gradually also the port sector. The present article examines in detail 32 information and communications technology (ICT) innovation cases collected between autumn 2013 and spring 2015. Leading actors along the maritime supply chain were asked to indicate the importance and to assess the degree of the success achieved in each ICT innovation initiative, to identify the driving forces behind the adoption of innovation and to denote the associated costs and benefits. This input allows identifying the barriers of digital innovation from initiation through to implementation, as well as assessing the impact of facilitators of ICT innovation. To do this, the present research combines four quantitative instruments. The added value of this combined approach is a deeper understanding of the digital innovation process within the port sector. The research firstly indicates that alignment exists between company strategies and success degrees in the port sector, in contrast to non-ICT initiatives. The ICT innovation initiatives are also profit driven. Secondly, the port sector should be more open to disclose cost and benefit information and should conduct more such analyses. Next, there are conditions that improve the degree of success. Overall, terminal alignment with the right ICT infrastructure proves key. However, too many divergent interests among the stakeholders entail that digital innovation challenges the ability to cooperate. An important finding is regulation was not identified as a barrier nor as a facilitator.

- **Regulation was not identified as a barrier nor as a facilitator**

However, digital Innovation is facilitated by:

- Actor capabilities,
- Market demand,
- The innovation champion profile
- Cooperation (coopetition, co-innovation) BUT divergent interests among the stakeholders challenge digital innovation

Research in Transportation Business & Management

Volume 19, June 2016, Pages 51-64

How port community systems can contribute to port competitiveness: Developing a cost–benefit framework

Valentin Carlan, Christa Sys, Thierry Vanelslander

Show more

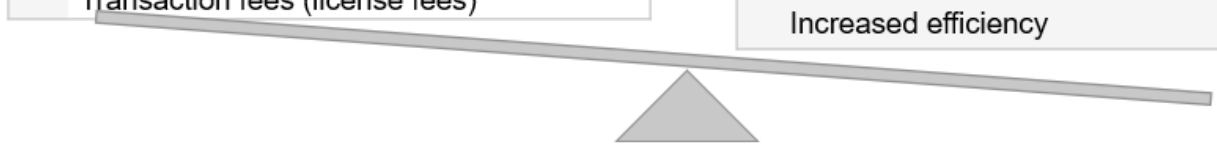
https://doi.org/10.1016/j.rtbm.2016.03.009

Abstract

The trend towards collaborative innovation in the maritime supply chain implies a good understanding of the actors and their roles, and an efficient exchange of information. A Port Community System (PCS) increases port efficiency by connecting the ICT systems of each of its members, thereby facilitating their communication. To verify whether this type of collaboration and its benefits actually materialize, an understanding of the costs and benefits of such PCS is required. This paper recognizes the inconsistency in the existing literature with respect to PCS costs and benefits quantification. Therefore, after an in-depth literature review, interviews with experts of PCS were carried out, a comprehensive framework to quantify the costs and benefits was developed. Next, a case study was drawn-up to develop a discussion regarding the costs and the extra benefits that port stakeholders incur when using a module of a PCS. The case analysis suggests that there is a positive cost–benefit balance for every stakeholder adhering to a PCS. By covering the development and operational costs of certain modules, PCS operators seek to increase the port competitiveness. This way, PCS users manage to gain higher net benefits and have a competitive advantage over other port stakeholders outside the community.

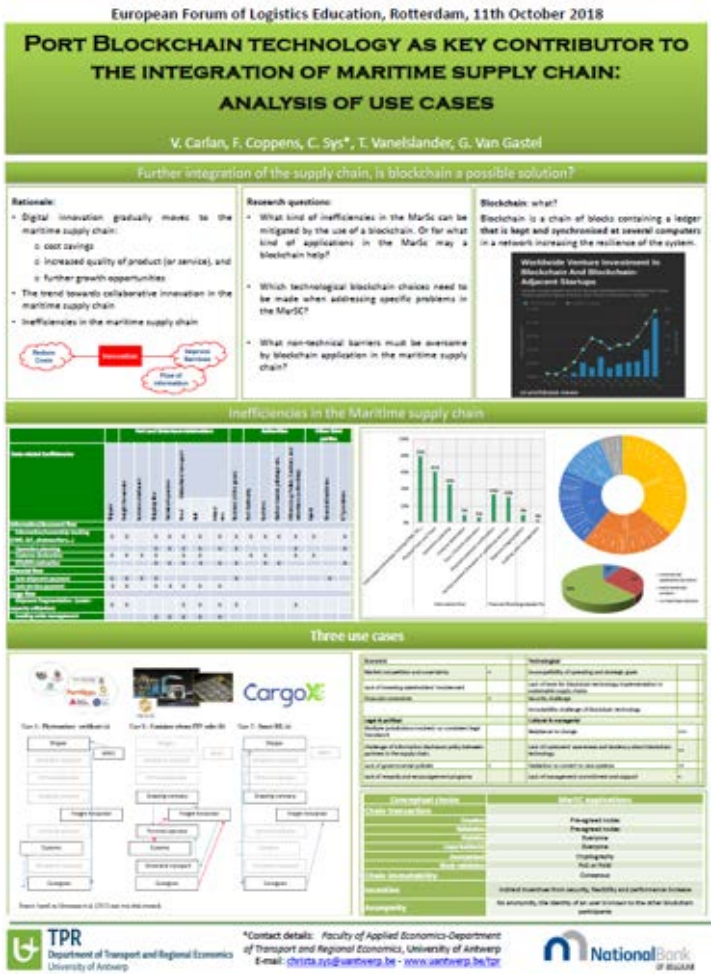
Cost elements*
PCS operator (administrator)
Platform development costs (including hardware/software acquisition/development cost, staff cost, training etc.)
Operating cost (staff cost, maintenance cost, storage and data management costs)
PCS user (MSC stakeholders)
Connection cost
Hardware/software cost
Training cost
Transaction fees (license fees)

Benefits*
Digital economy benefits
Economic benefits
Increased quality of information
Increase performance
Community attendance benefits
Increased competitiveness (stakeholder level)
Increased efficiency



Carlan, V., Sys, C., Vanelslander, T., (2016)

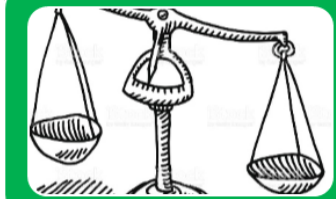
Blockchain



Economical

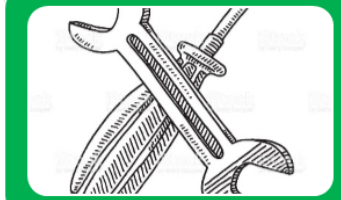
- Market competition and uncertainty
- Lack of investing stakeholders' involvement
- Financial constraints

Legal & political



- Multiple jurisdictions involved: no consistent legal framework
- Challenge of information disclosure policy between partners in the supply chain
- Lack of governmental policies
- Lack of rewards and encouragement programs

Technological

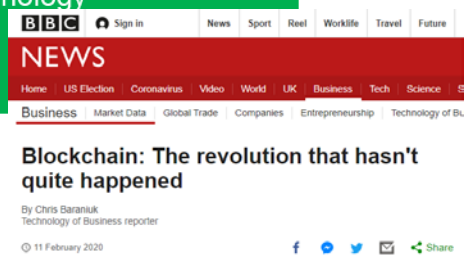


- Incompatibility of operating and strategic goals
- Lack of tools for blockchain technology implementation in sustainable supply chains
- Security challenge
- Immutability challenge of blockchain technology

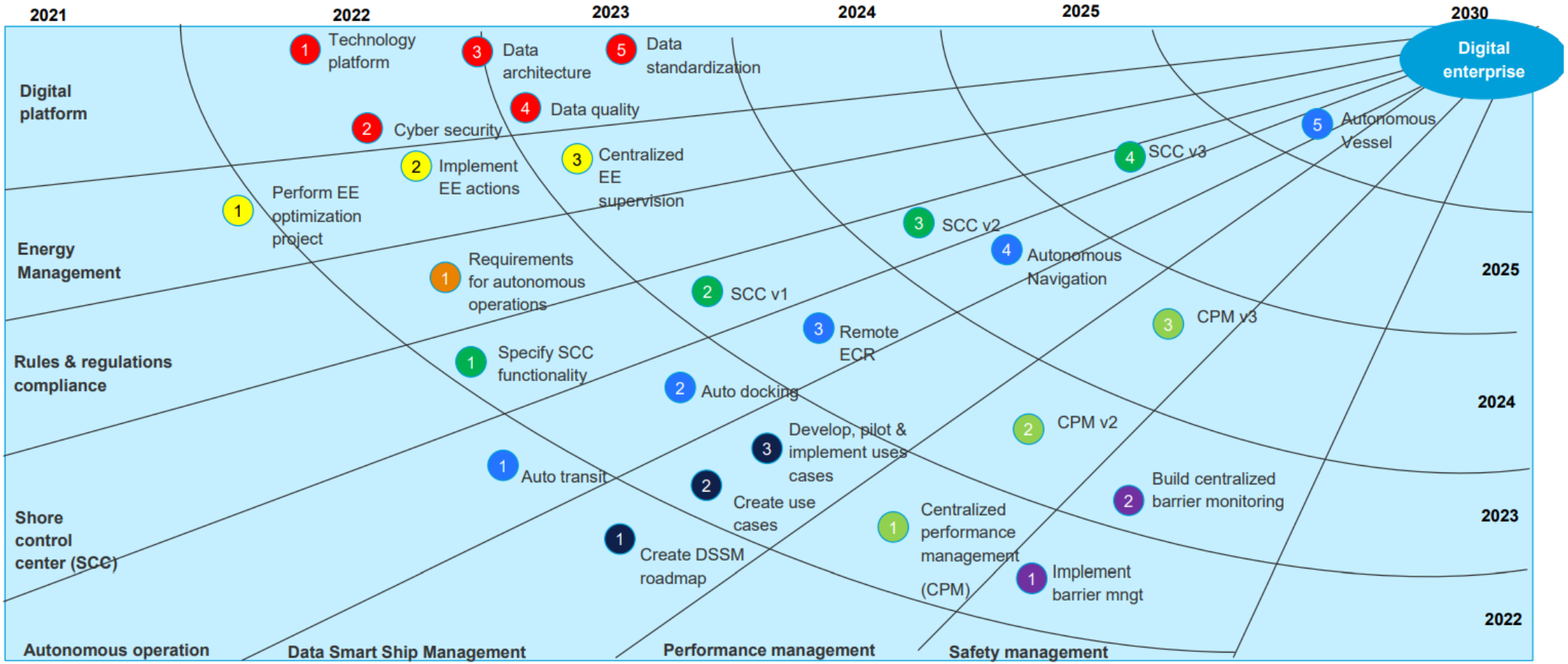
Cultural & managerial

- Resistance to change
- Lack of customers' awareness and tendency about blockchain technology
- Hesitation to convert to new systems
- Lack of management commitment and support

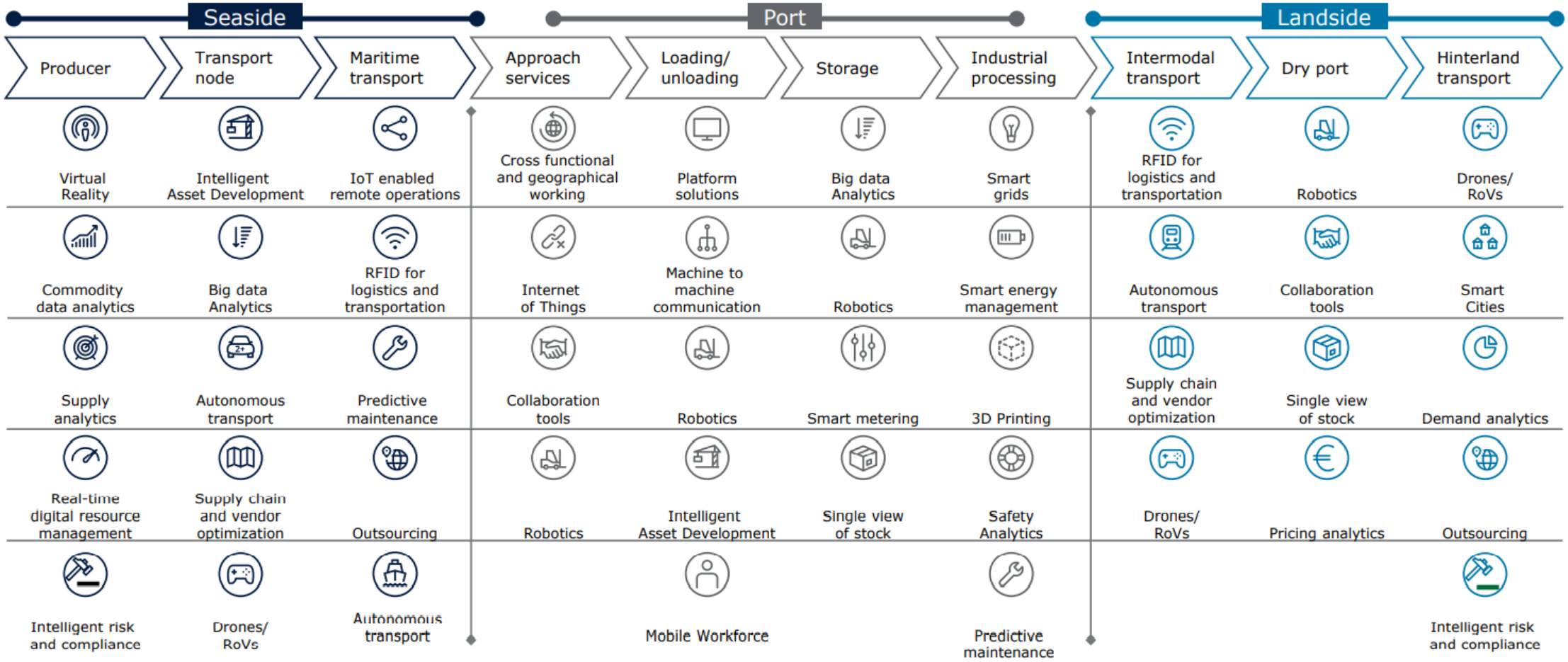
➔ Full blockchain benefits are enabled only in combination with other technologies



...to practice
Digital transformation roadmap (DNV)



Increase in innovative and sustainable solutions ➔improve efficiency, reduce costs



Note: Non exhaustive Source: Monitor Deloitte – Deloitte Port Advisory

Deloitte Global Port Advisory, April 2020

Connectivity/ communication

The 14,000 TEU ONE Cygnus during sea trials. Photo: Ocean Network Express

ONE to Charter World's Largest Containerships at 24,000+ TEU

Mike Schuler
Total Views: 11790
December 28, 2020

Share this article

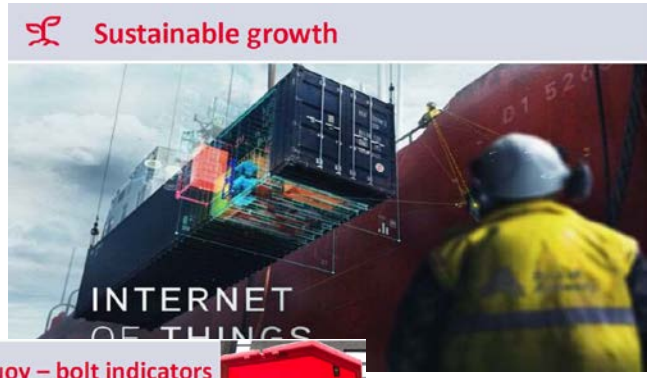
Japan-based shipping line Ocean Network Express has announced plans for the long-term charter of the world's largest containerships.

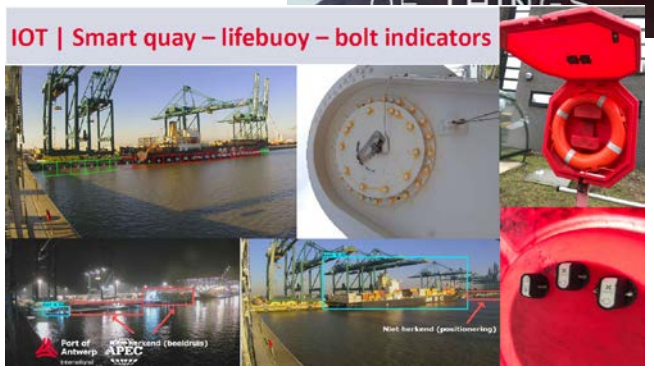
The company has signed a Letter of Intent with shipowner Shoei Kisen Kaisha to charter six Ultra Large Container Ships newbuilds with capacity of more than 24,000 TEU, each for a period of 15 years.

The newbuildings are planned to be built by the consortium of Imabari Shipbuilding Co., Ltd. and Japan Marine United Corporation and the company expect to take delivery in 2023 and 2024.

"This new class of ships will join our core fleet and forms part of our ongoing strategy to introduce large, modern, and fuel-efficient vessels to further strengthen our fleet competitiveness," ONE said in a statement.

With capacity exceeding 24,000 twenty-foot units, the new ships will likely be the largest in the world, just slightly larger than the current titleholders: HMM of South Korea's twelve 23,964 TEU newbuilds which kicked off with delivery of HMM Algeciras in April.





Data governance

Legal issues

Cyber security

Internet band width

Semi-Autonomous Sailings Start Aboard Shortsea Vessel in Belgium

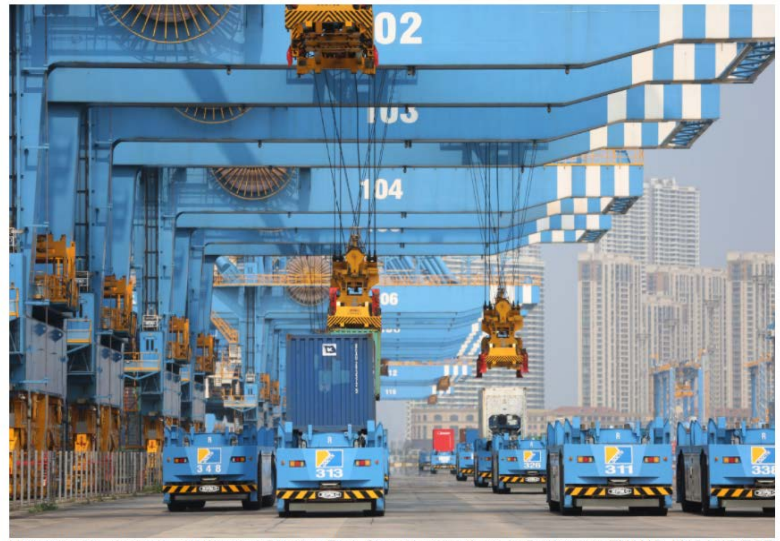
Deseo began semi-autonomous voygs between Antwerp and Zeebrugge (photo courtesy of Seafar)

BY THE MARITIME EXECUTIVE 02-16-2021 02:26:19

The development of autonomous shipping took another step forward with the first sailing of a semi-autonomous shortsea cargo vessel between the Belgian ports of Zeebrugge and Antwerp. The program, which seeks to expand on previous efforts on inland waterways, is viewed as the first step towards autonomous sailing.

Qingdao Port smart system a world first

By CHENG YU in Beijing and XIE CHUANJIAO in Qingdao, Shandong | China Daily | Updated: 2020-11-17 10:21



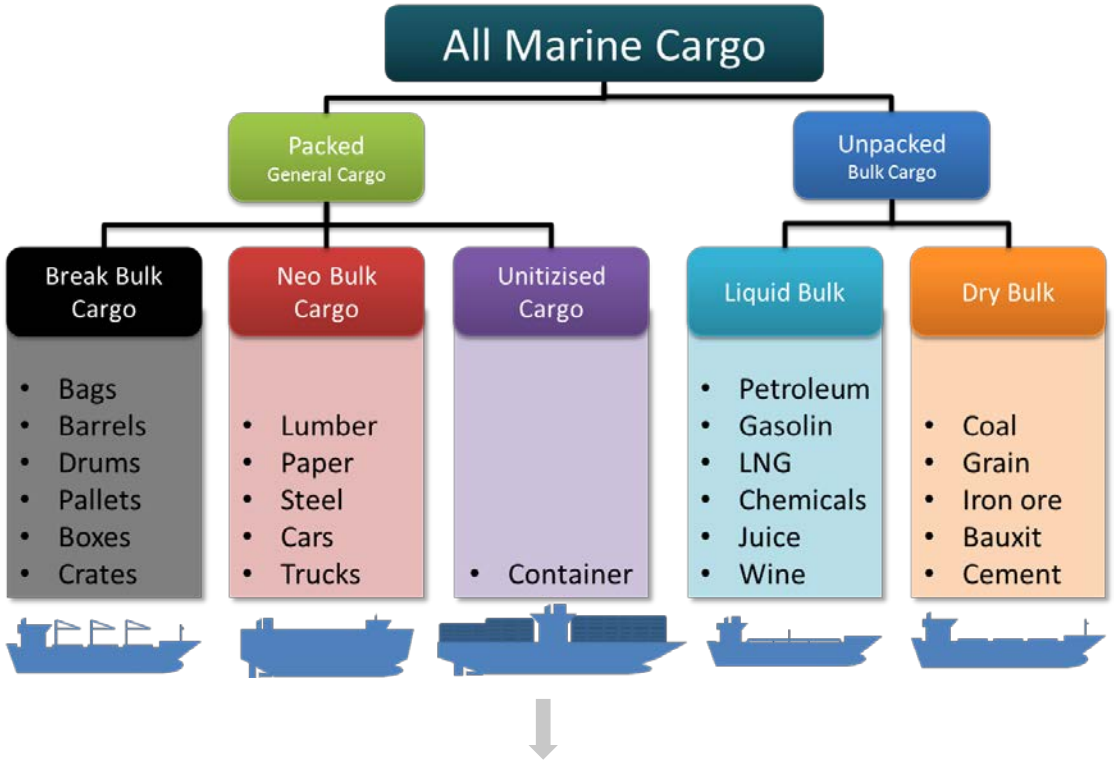
Unmanned trucks load containers at Qingdao Port, Shandong province, in September. ZHANG JINGANG/FOR CHINA DAILY

Intelligent tech heralds 'zero transfer' container movement across port, land and rail

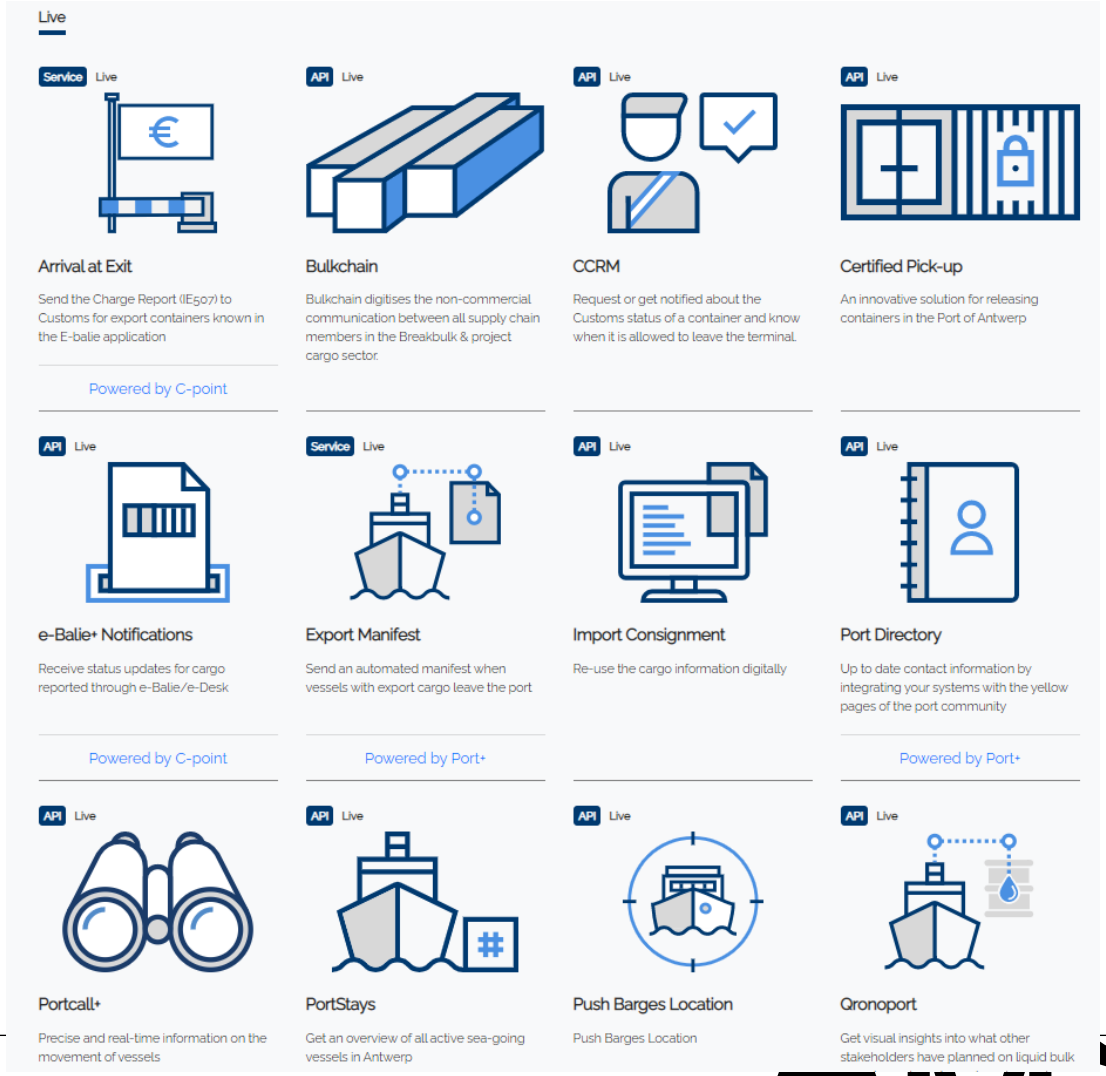
5G Port network to drive innovation > challenges

- Frequency bands
- Deployment and coverage
- Cost
- Device support
- !! Security (and privacy)

@Cargo-level

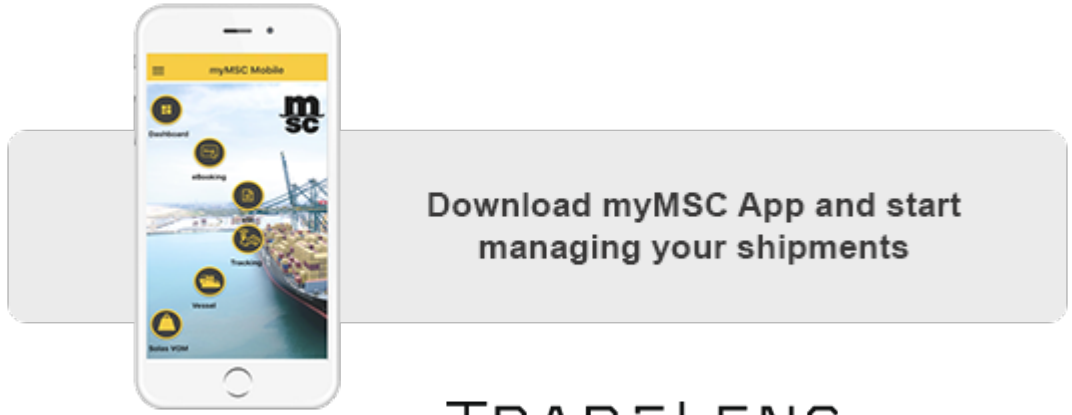


- Tracking & tracing (geolocation, temp./humidity, door opening, shock detection…)(e.g. traxens device)
- Container reload/re-use
- Secure container release (blockchain technology)
- …



@Document-level

Dynamic pricing
Online bookings
Paperless bill of lading



TRADELENS

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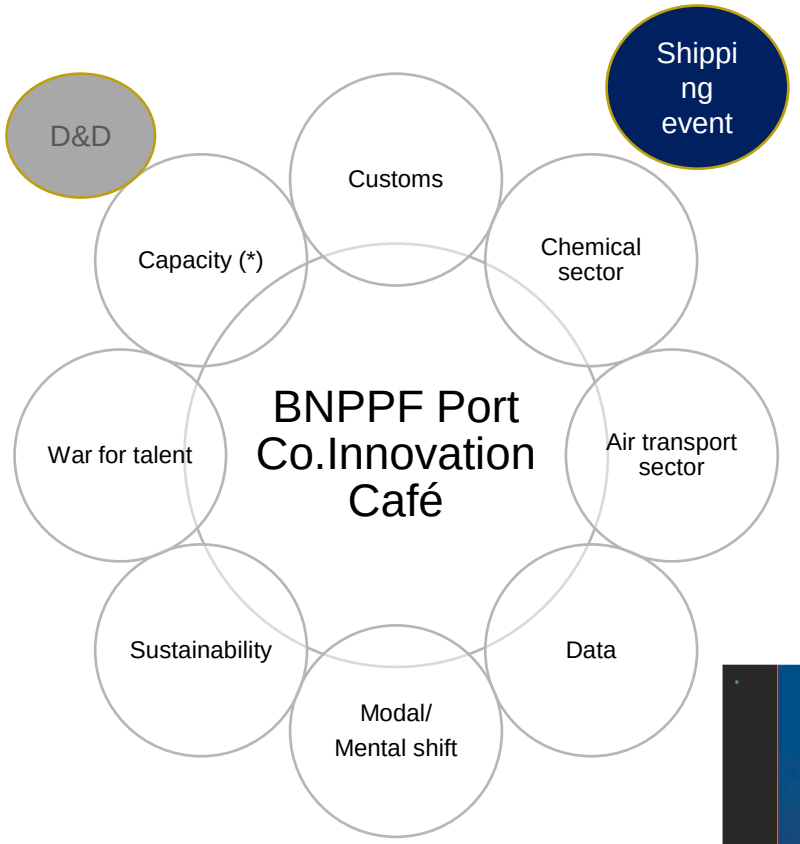
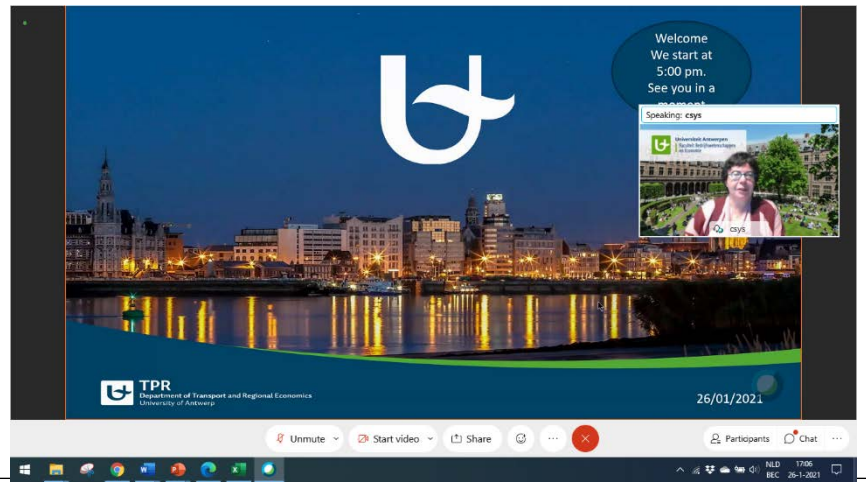
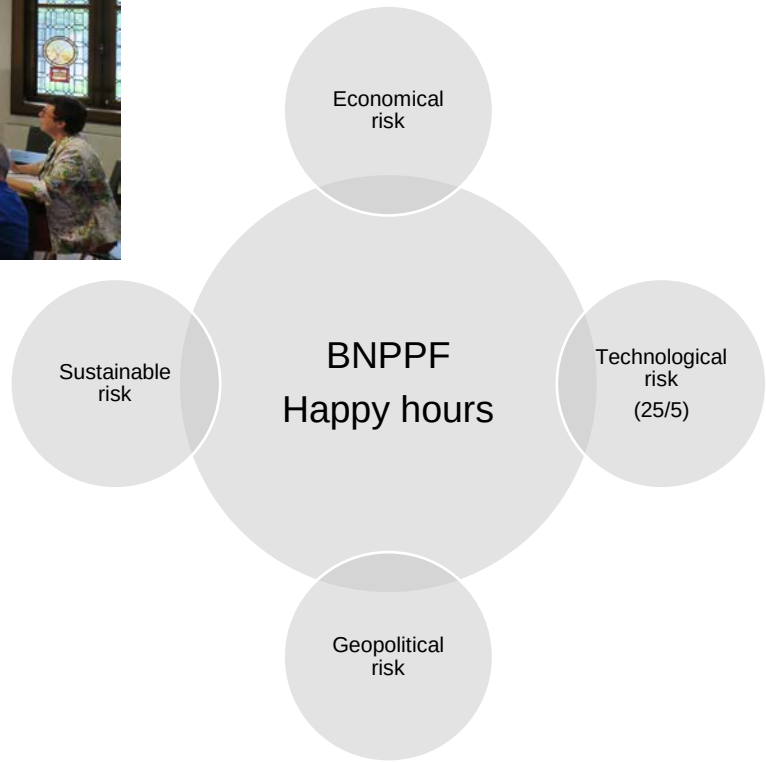
cogoport

Research| BNPPF Port Co.Innovation Café

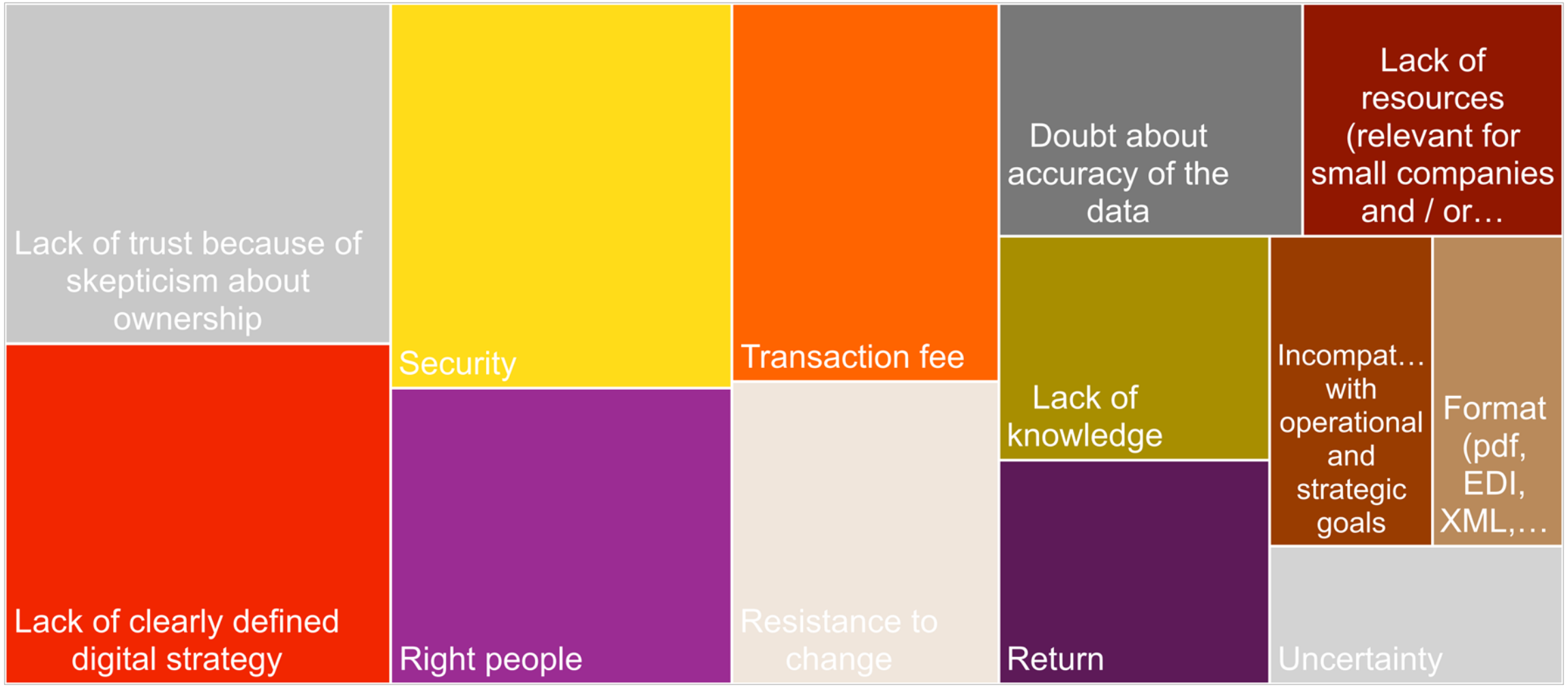




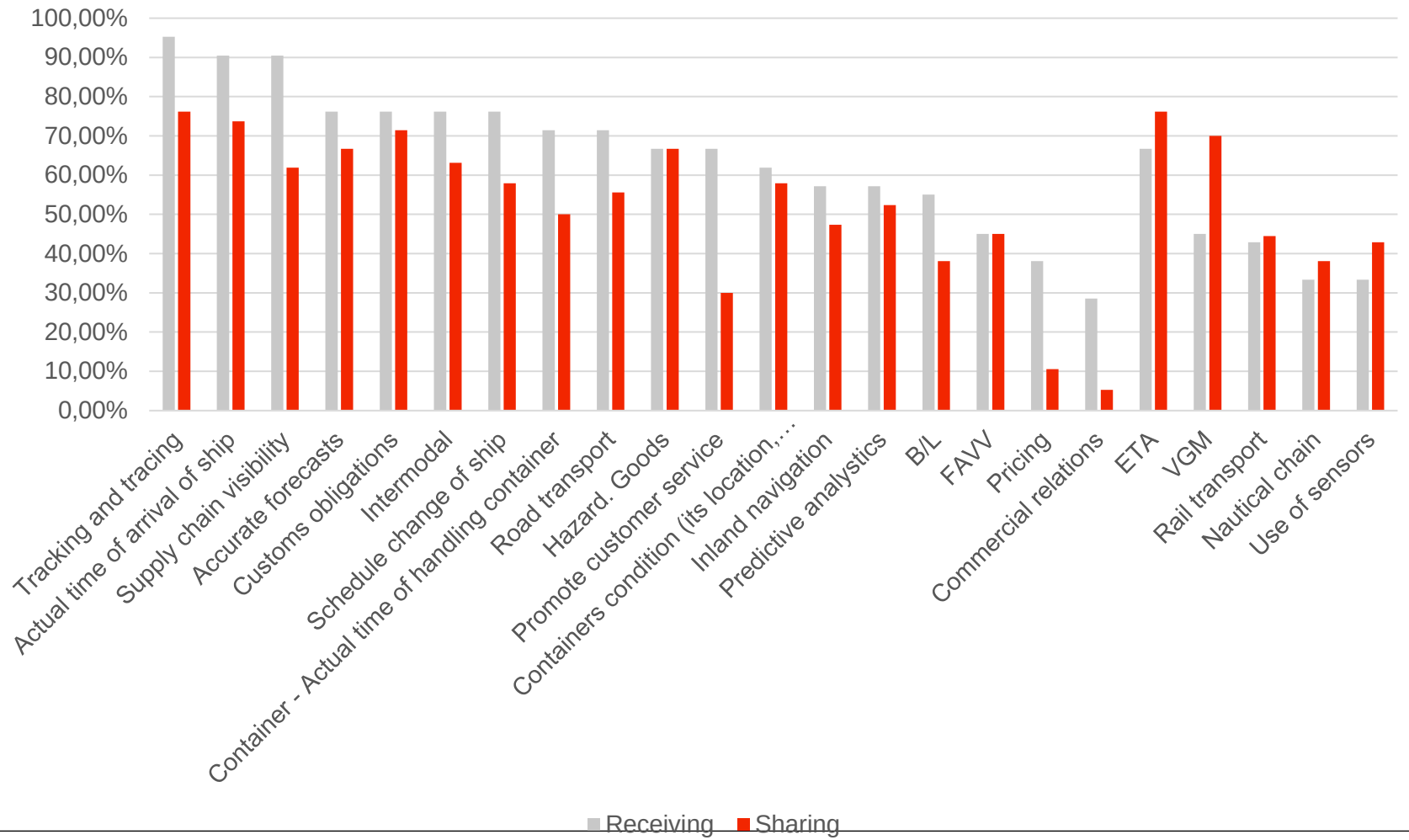


(*) online

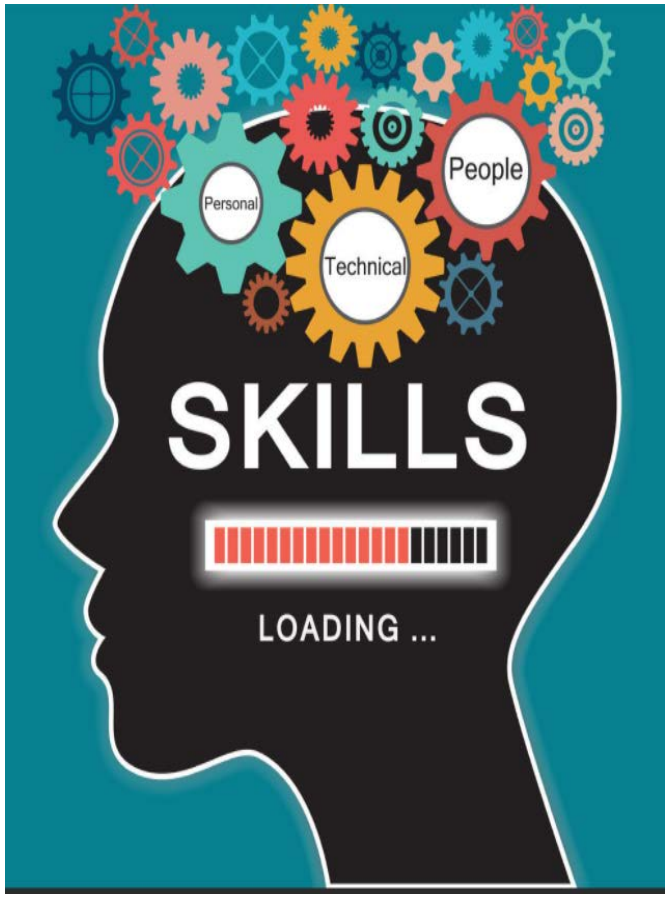
Data: bottlenecks



Relevant data vs willingness to share



Data: solutions?

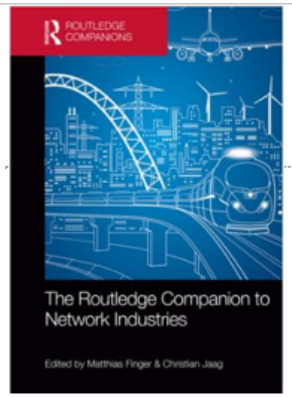


3 Environmental drivers

the industry appears to be taking environmental issues and sustainability as seriously

STRATEGIC SIMULATION AND RESULTS

Nine configurations



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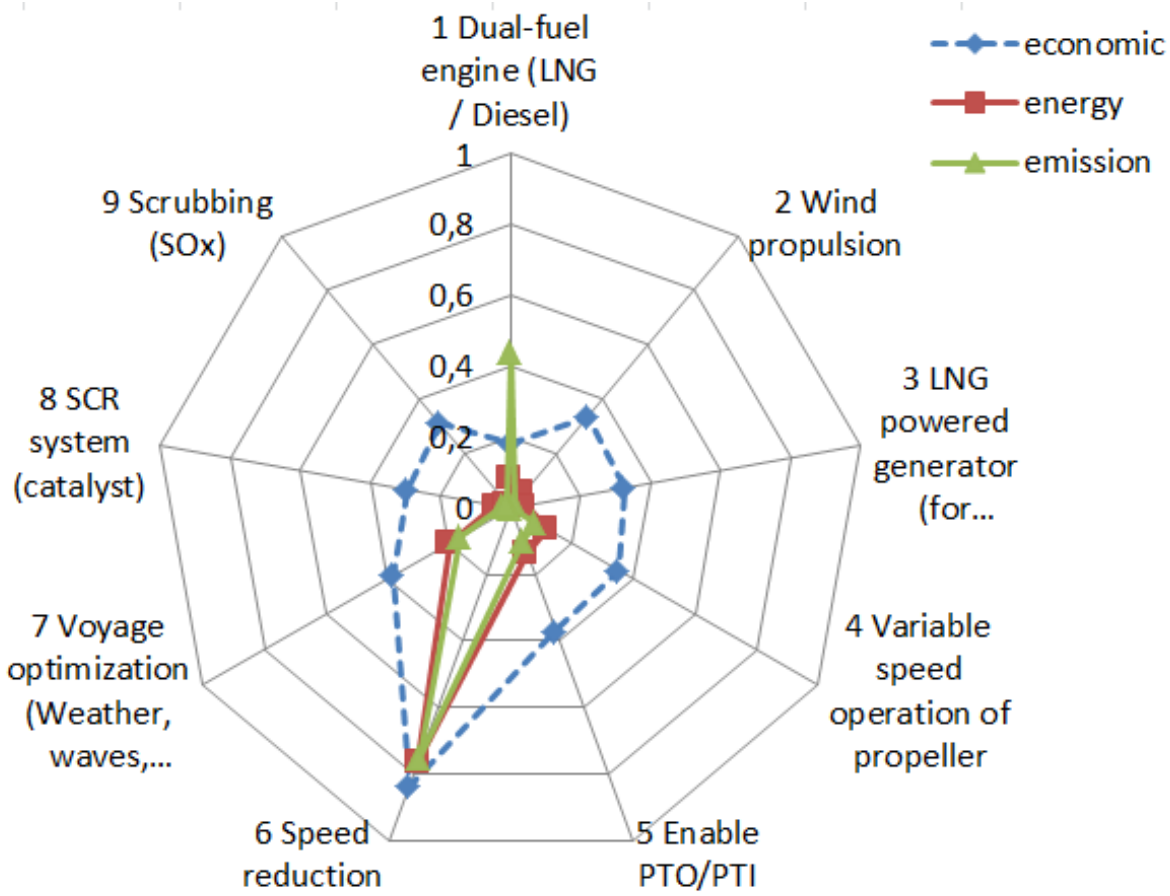
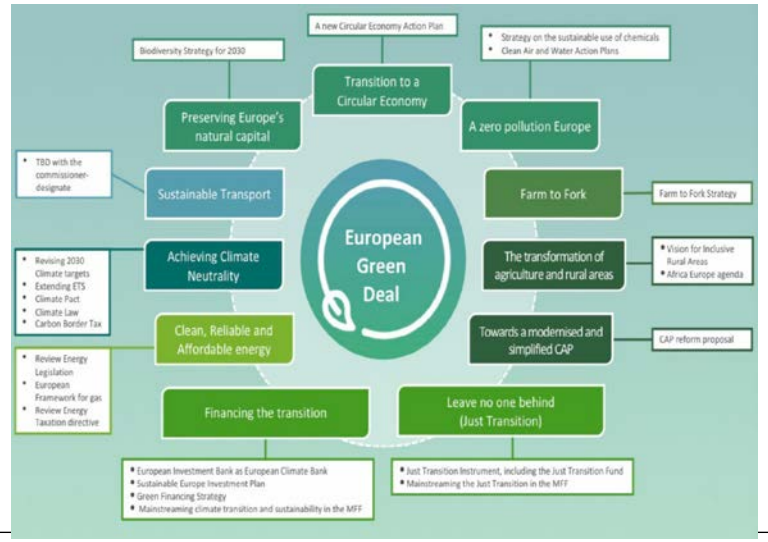
Maritime transport company strategies

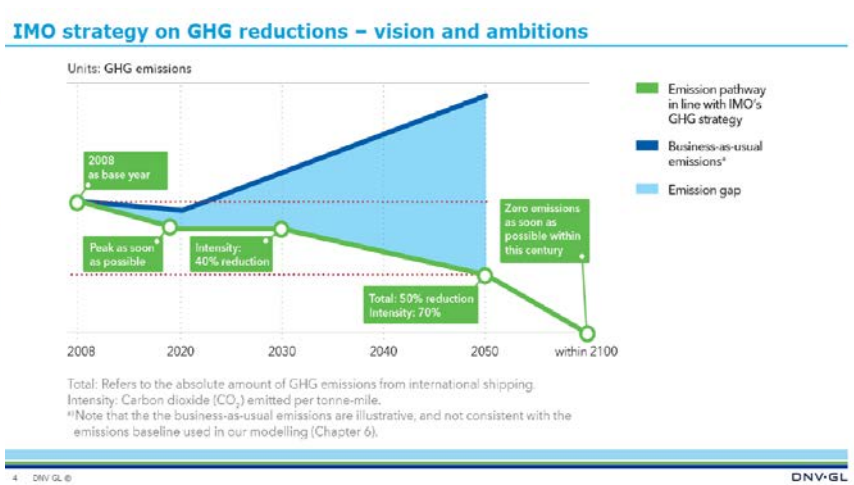
How to be sustainable in the future

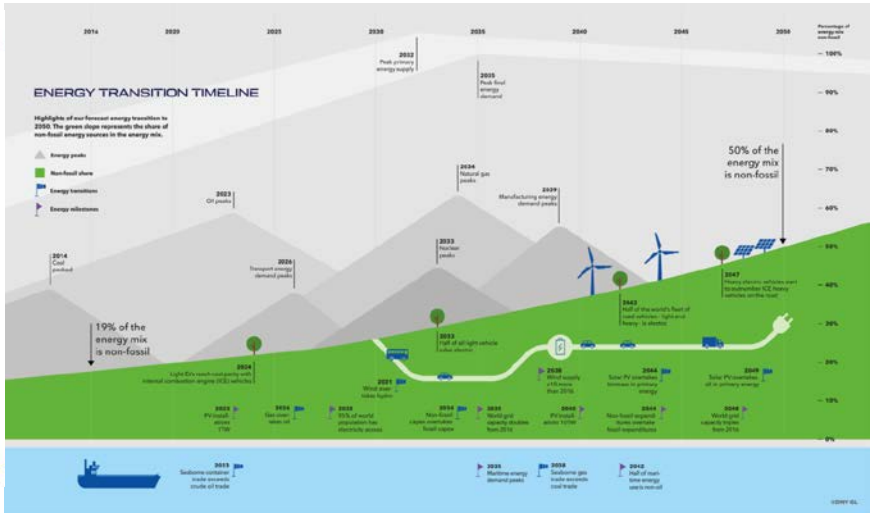
Raimonds Aronietis, Christa Sys and Thierry Vanelslander



Environmental drivers



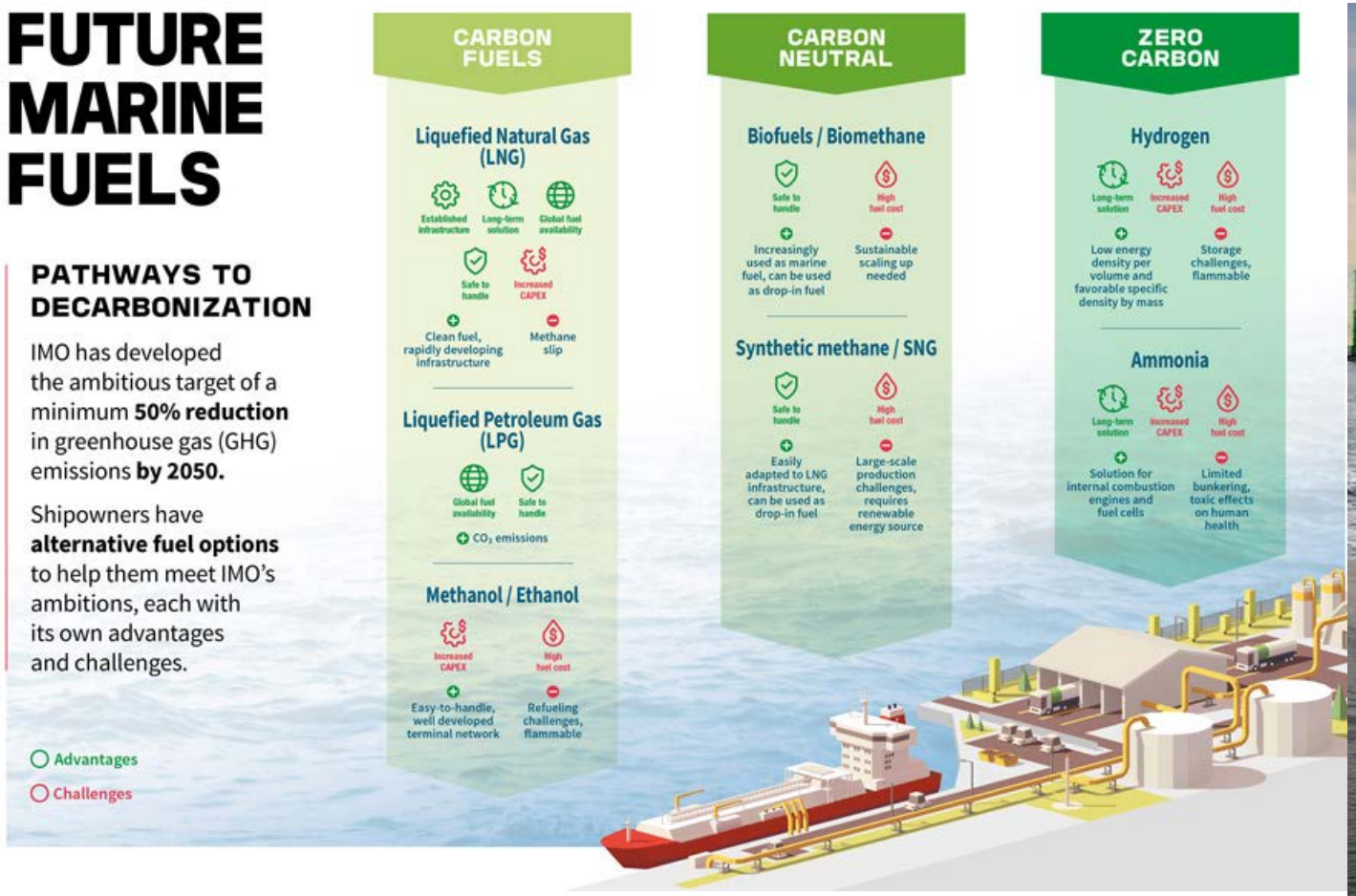




- Alternative fuels (methanol, hydrogen, ammonia, …)
- Energy availability
- Climate change (e.g. low sulphur shipping)
- Carbon capture

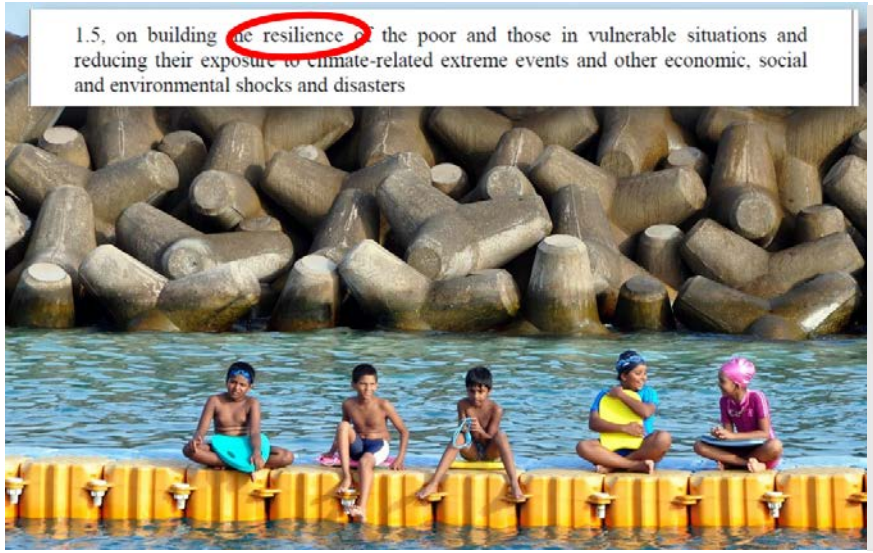
> Need for LT vision of the port (reduce uncertainty)

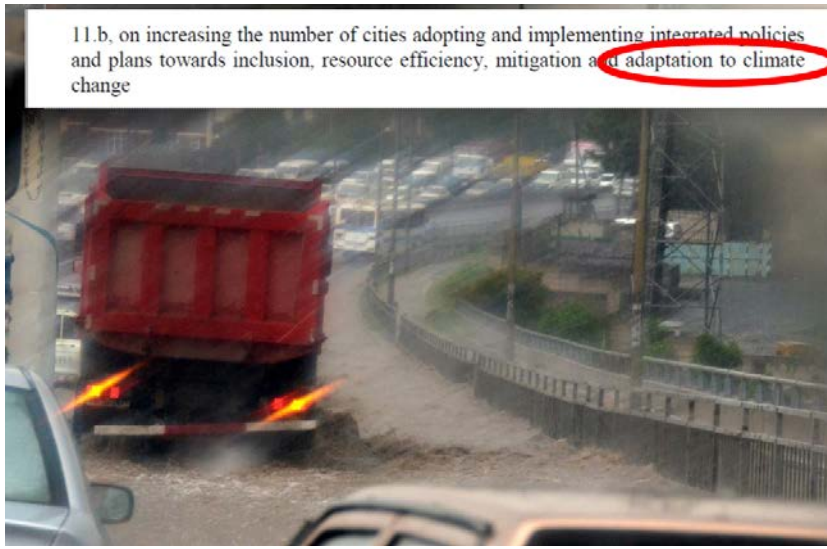
Transition to a multi-fuel port

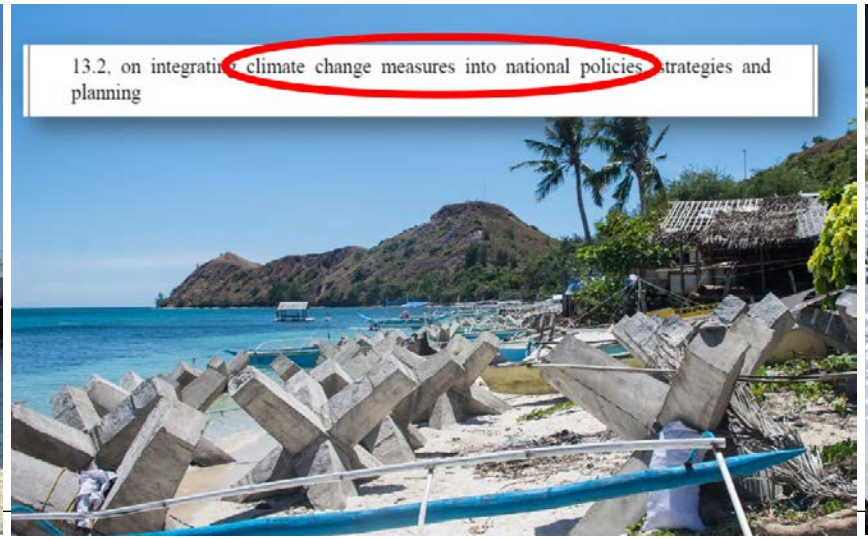


https://marine-offshore.bureauveritas.com/insight/future-marine-fuels-pathways-decarbonization

Sustainable port infrastructure







Dr. Jan Hoffmann, Unctad

Sustainable port infrastructure

1

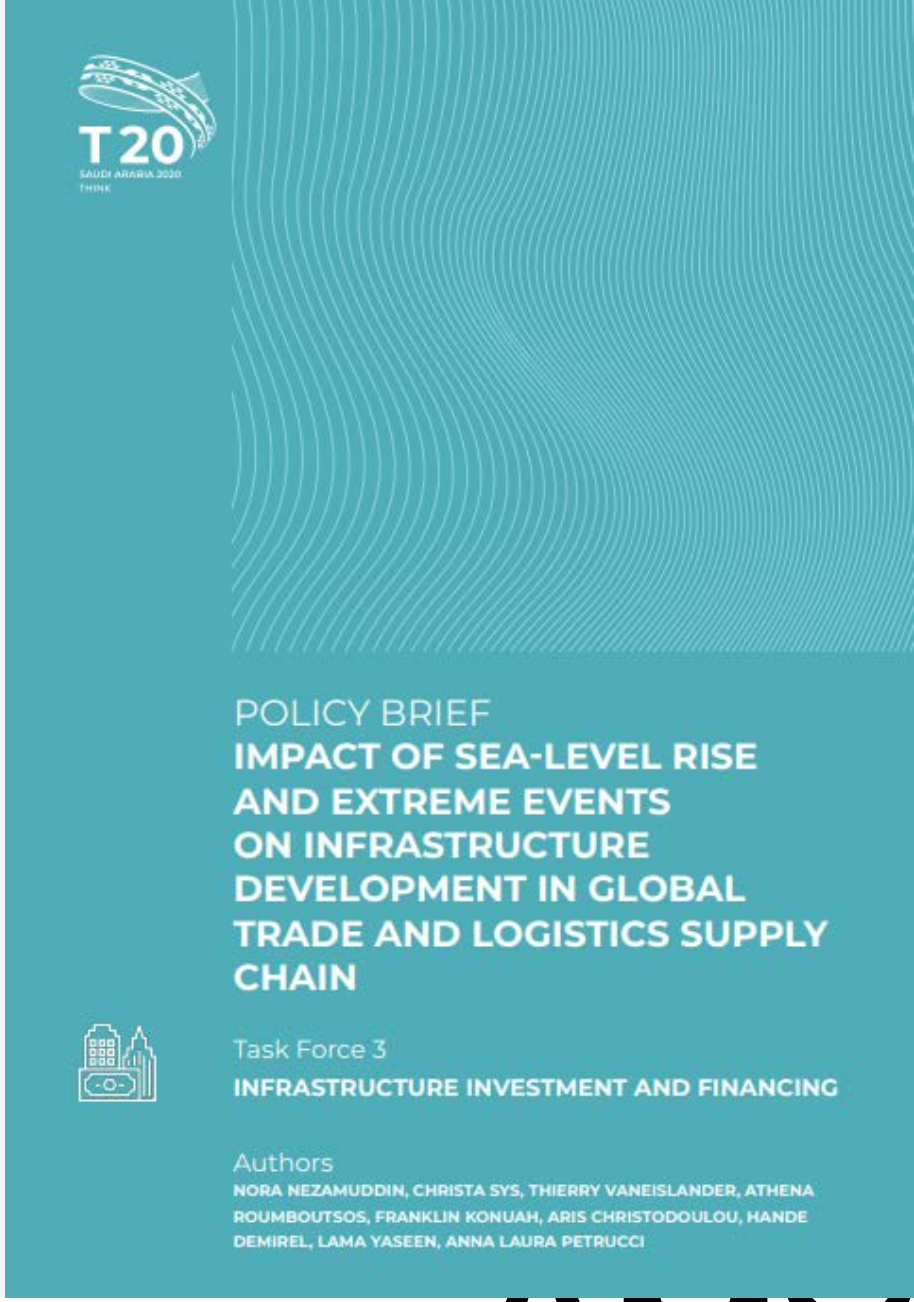
design adaptive enforcement mechanisms that set a minimal standard to reduce pollutants and develop sustainable infrastructure for seaborne activities

2

enabling a global framework to assess climate change and extreme event risks in maritime activities

3

to ensure that future infrastructure investments contribute to mitigating climate change and extreme events (such as pandemics)



Succesful smart port

LT vision

- Invest in renewable infrastructure
- Improve the environmental performance
- Accomodate green ecosystems (maritime/port related circular economy)

AN EXPONENTIALLY EVOLVING MARKET

Takeaways

1. Maritime ecosystem thinking

2. Each port operates under varying environment-related contingencies

3. Tech adoption is not enough, new mindset, rules and disciplines

4. Skills

5. Port innovation themes

(ENVIRONMENTAL) REGULATION	PRESSURE ON LAND USE	CHANGING ENERGY DEMAND	VALUE ADDED IN THE MARITIME ECOSYSTEM
ACCESSIBILITY	OPERATIONAL EFFICIENCY	LEGAL	SAFETY & SECURITY

Thank you for your attention!

Professor Christa Sys

C-MAT

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Promotor Chair Dennie Lockefeer

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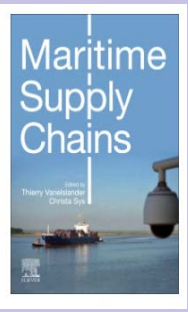

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