

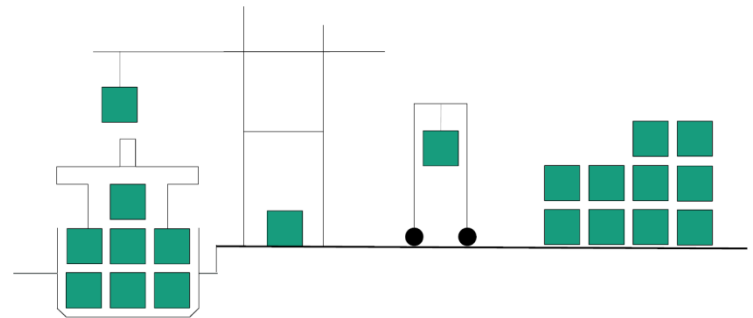
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# Efficiency of Maritime Transport – A System Approach from the Logistics Perspective



Prof. Dr.-Ing. Carlos Jahn  
Ship Efficiency Conference, Hamburg, 26. September 2011

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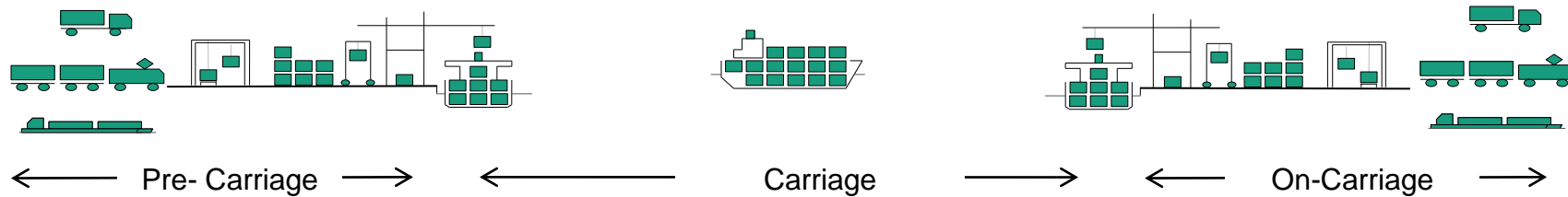
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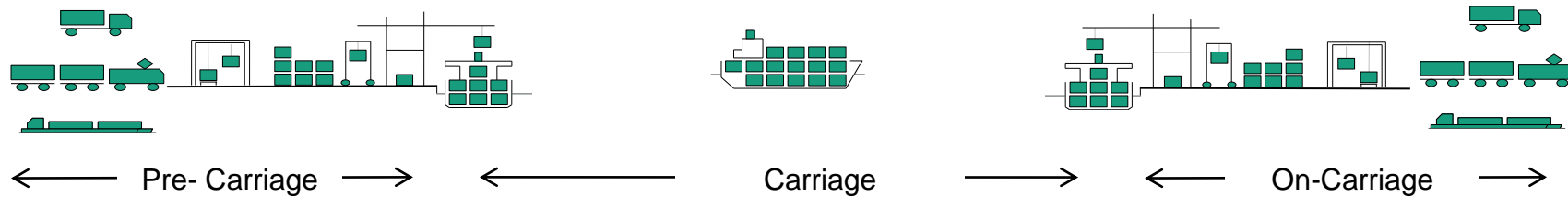
# AGENDA



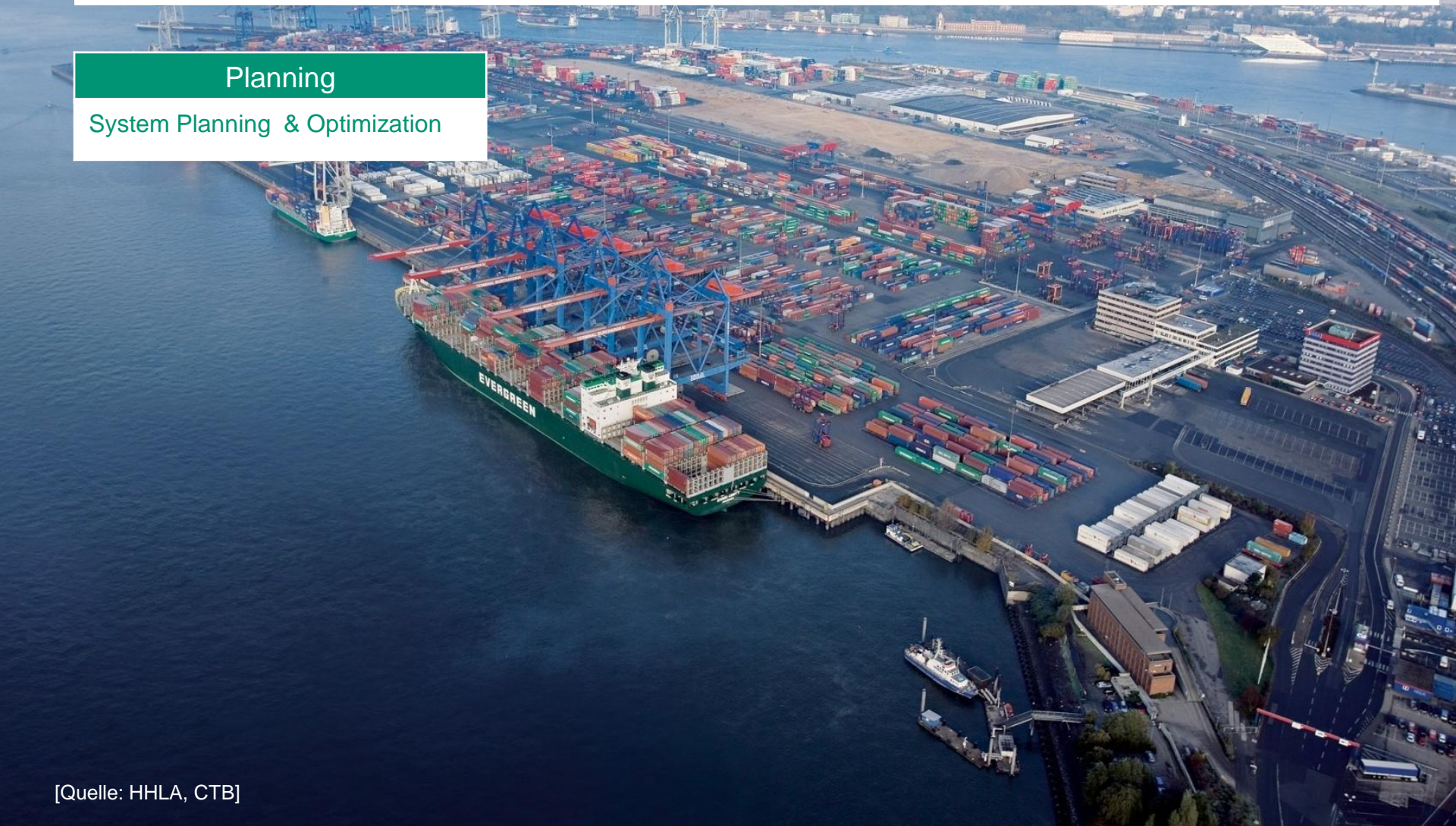
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1. Introduction
  2. The Ship-Port-System as a Logistics Issue
  3. System Efficiency: Measures, Effects
  4. Conclusion and Outlook

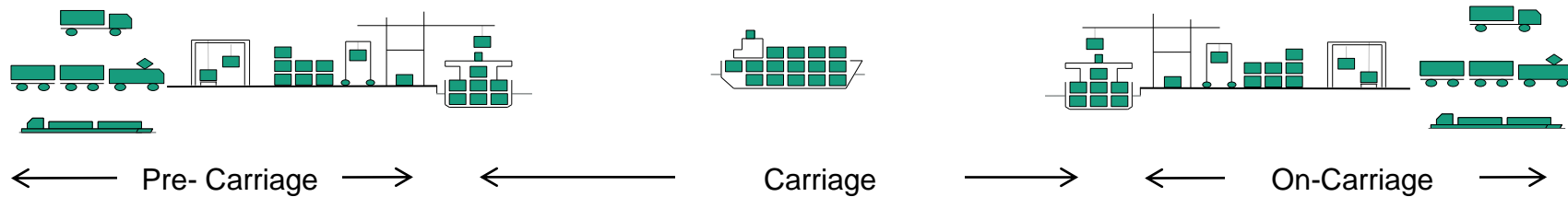






Planning  
System Planning & Optimization



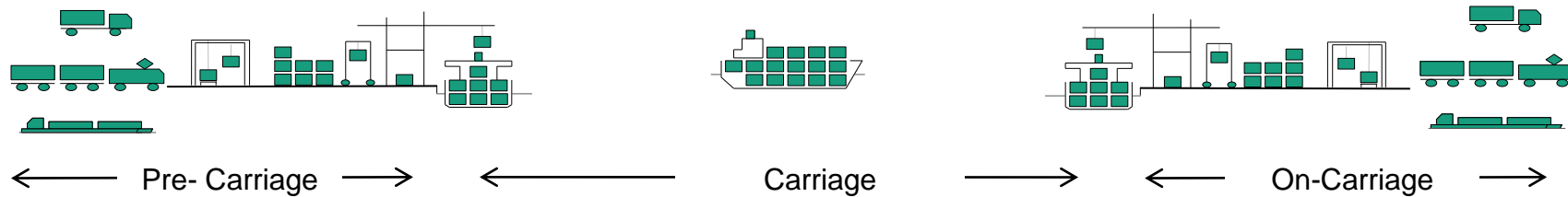


## Planning

System Planning & Optimization

## Processes

Process Design & Controlling



## Planning

System Planning & Optimization

## Processes

Process Design & Controlling

## Prognoses

Maritime Forecasts & Studies

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# AGENDA



- 
1. Introduction
  2. The Ship-Port-System as a Logistic Issue
  3. System Efficiency: Measures, Effects
  4. Conclusion and Outlook



# Logistics



## 1. Logistics Definition

“Logistics is the process of planning, implementing, and controlling the efficient, effective flow and storage of goods, services, and related information from point of origin to point of consumption for the purpose of conforming to customer requirements.”<sup>1</sup>

Source: Council of Logistics Management, [www.clm1.org/mission.html](http://www.clm1.org/mission.html), 1998

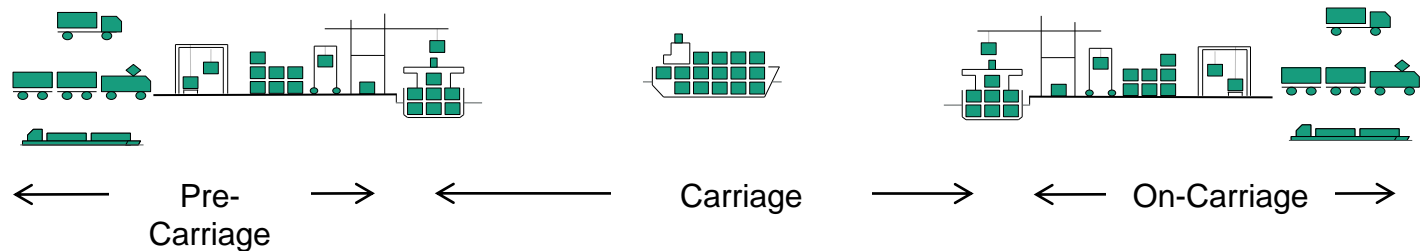
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## 2. Maritime Supply Chain



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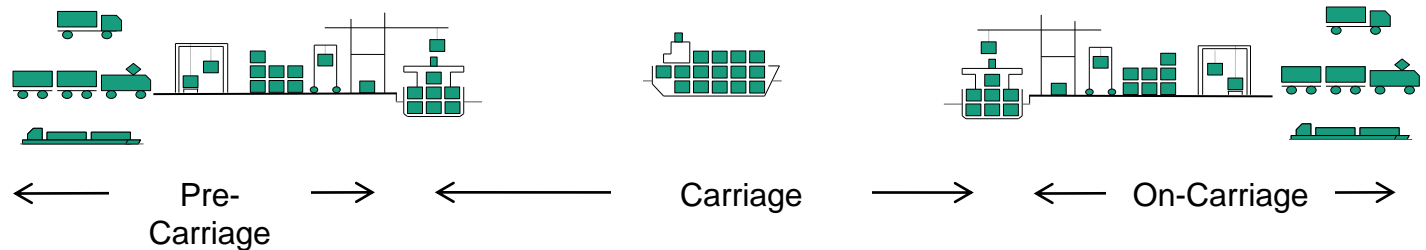
# Logistics



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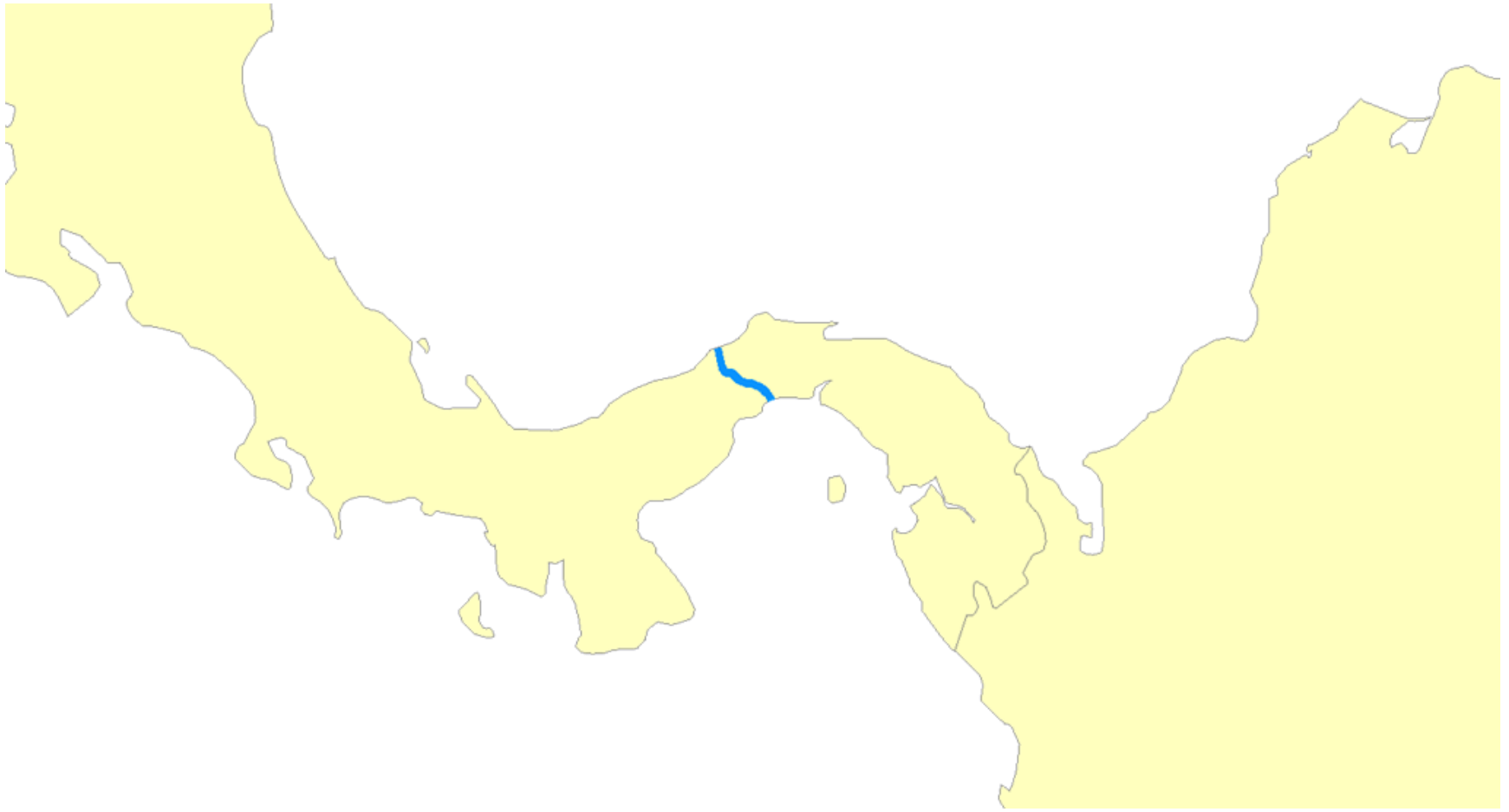


## 3. Goal of Logistics „6 Rs“

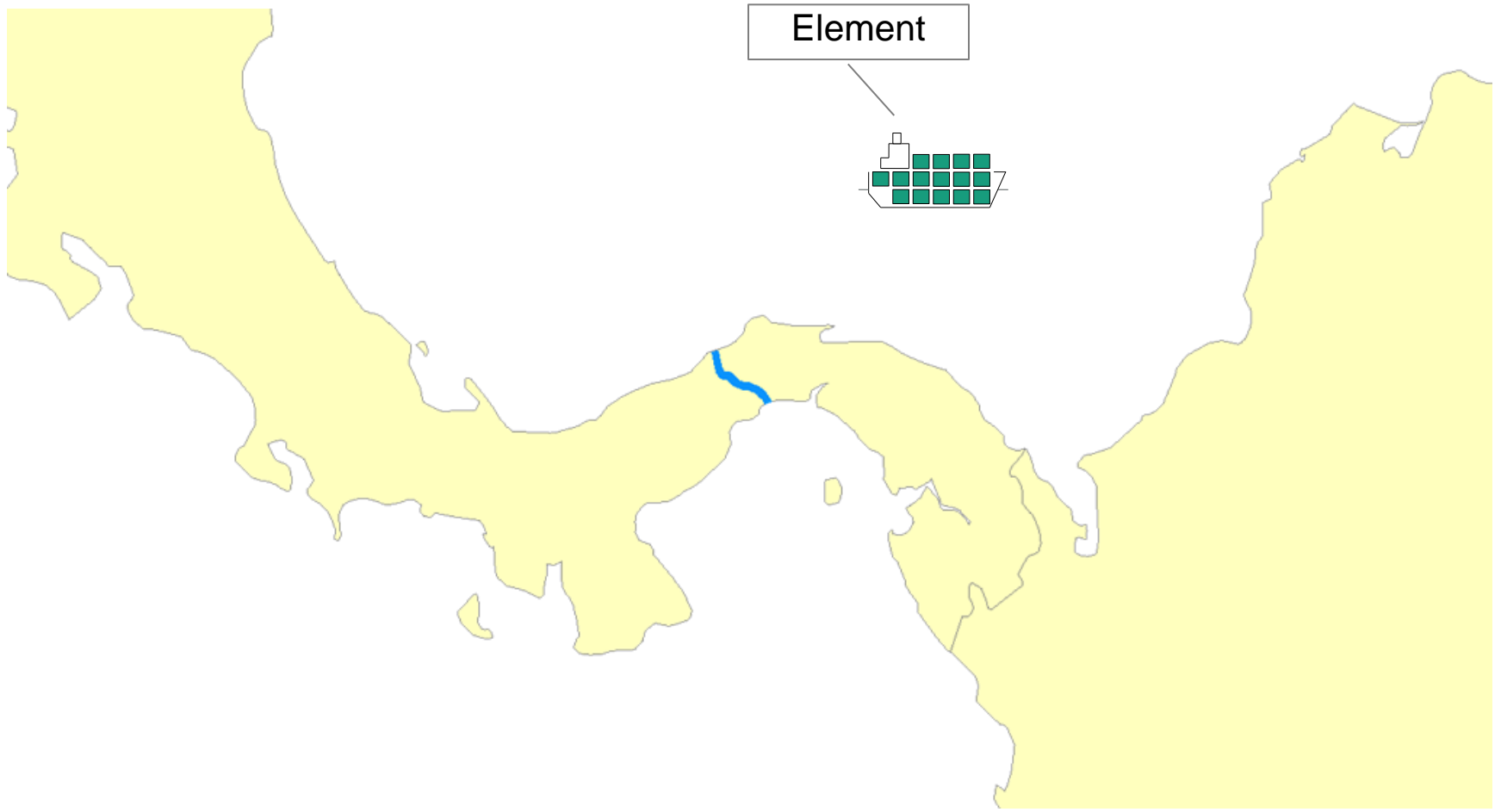
- |                  |               |
|------------------|---------------|
| 1 Right Goods    | 4 Right Time  |
| 2 Right Quantity | 5 Right Place |
| 3 Right Quality  | 6 Right Costs |

Source: Council of Logistics Management, [www.clm1.org/mission.html](http://www.clm1.org/mission.html), 1998

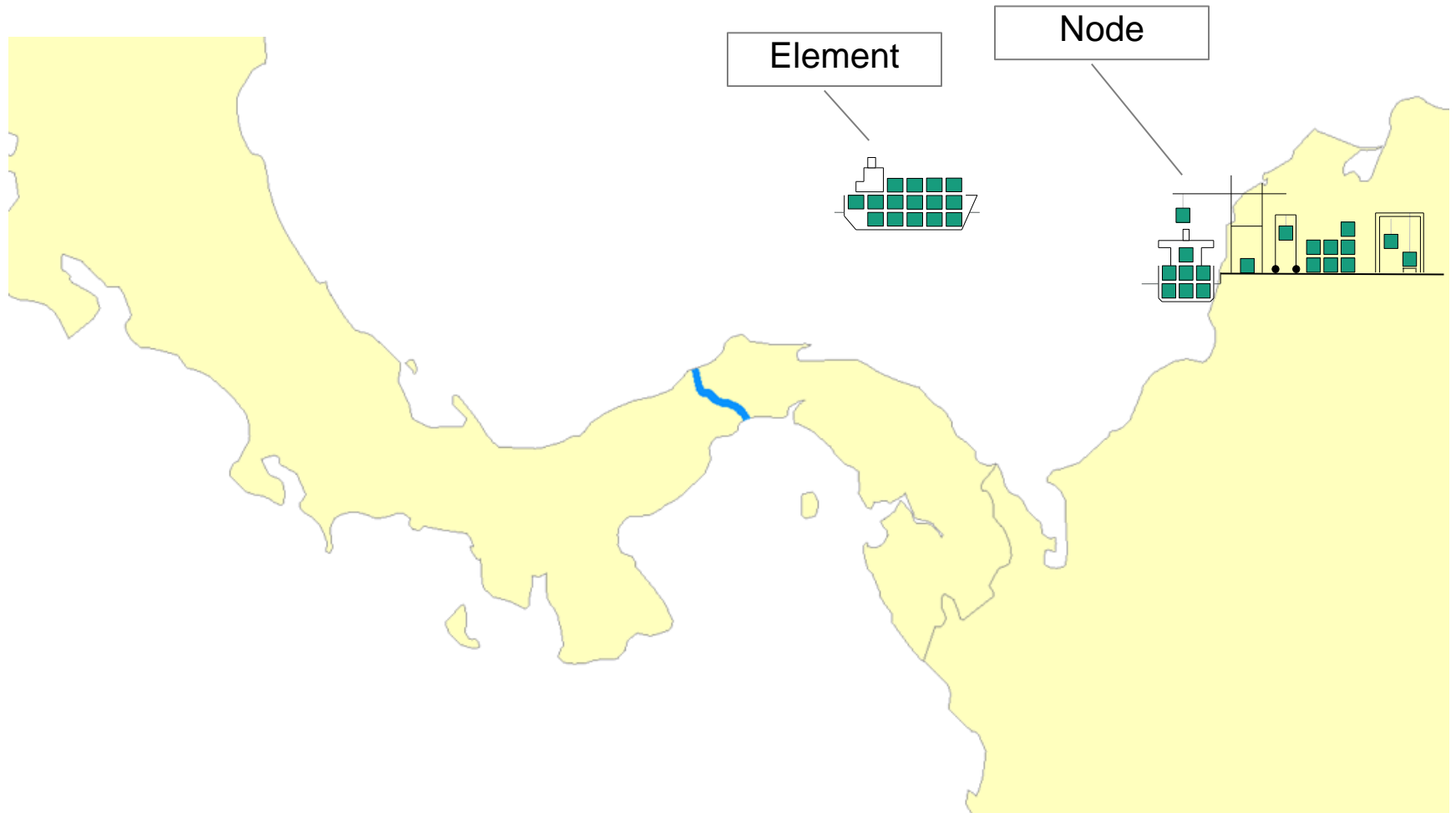
# Maritime Logistics System: Elements, Nodes and Lin



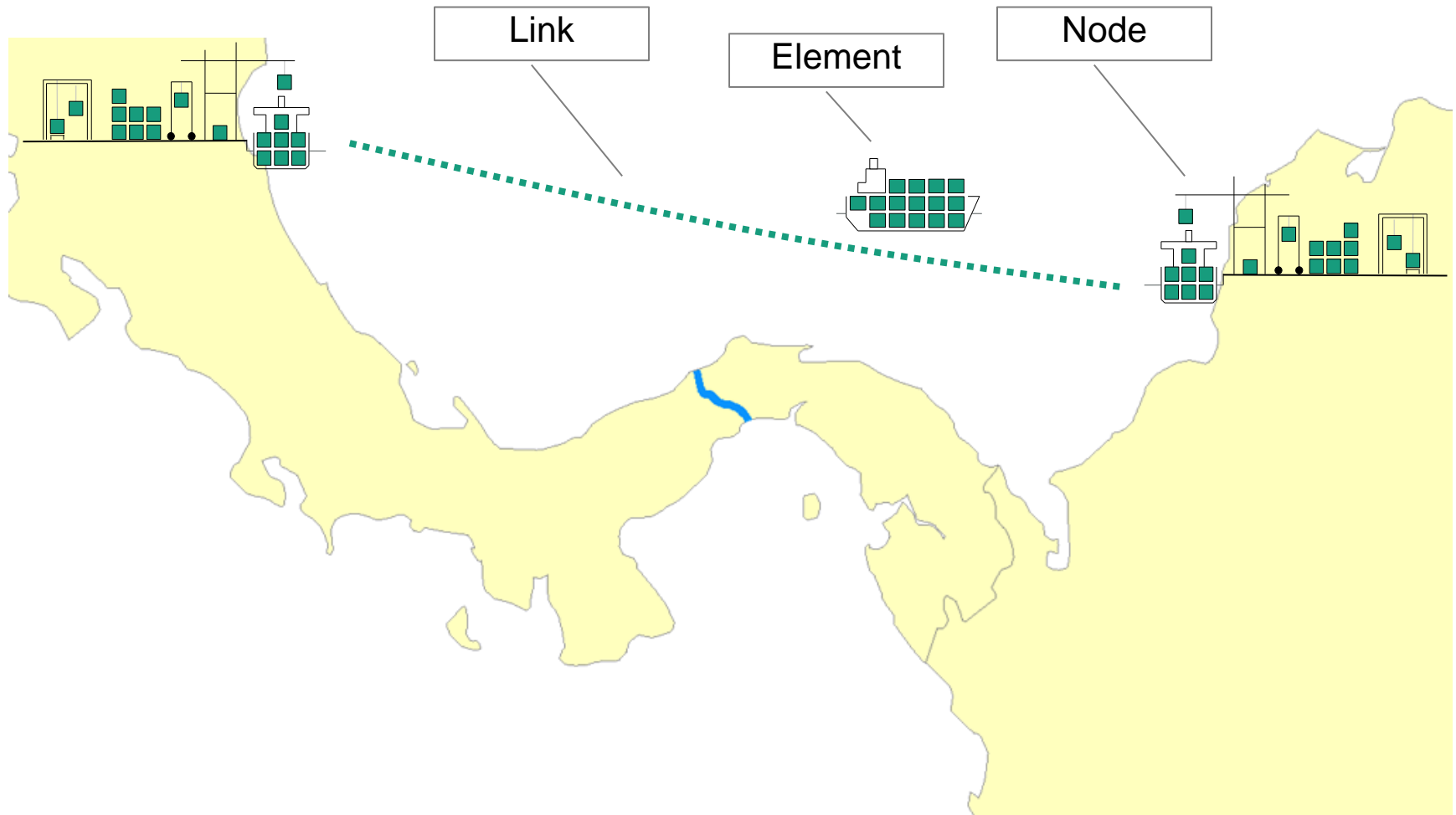
# Maritime Logistics System: Elements, Nodes and Lin



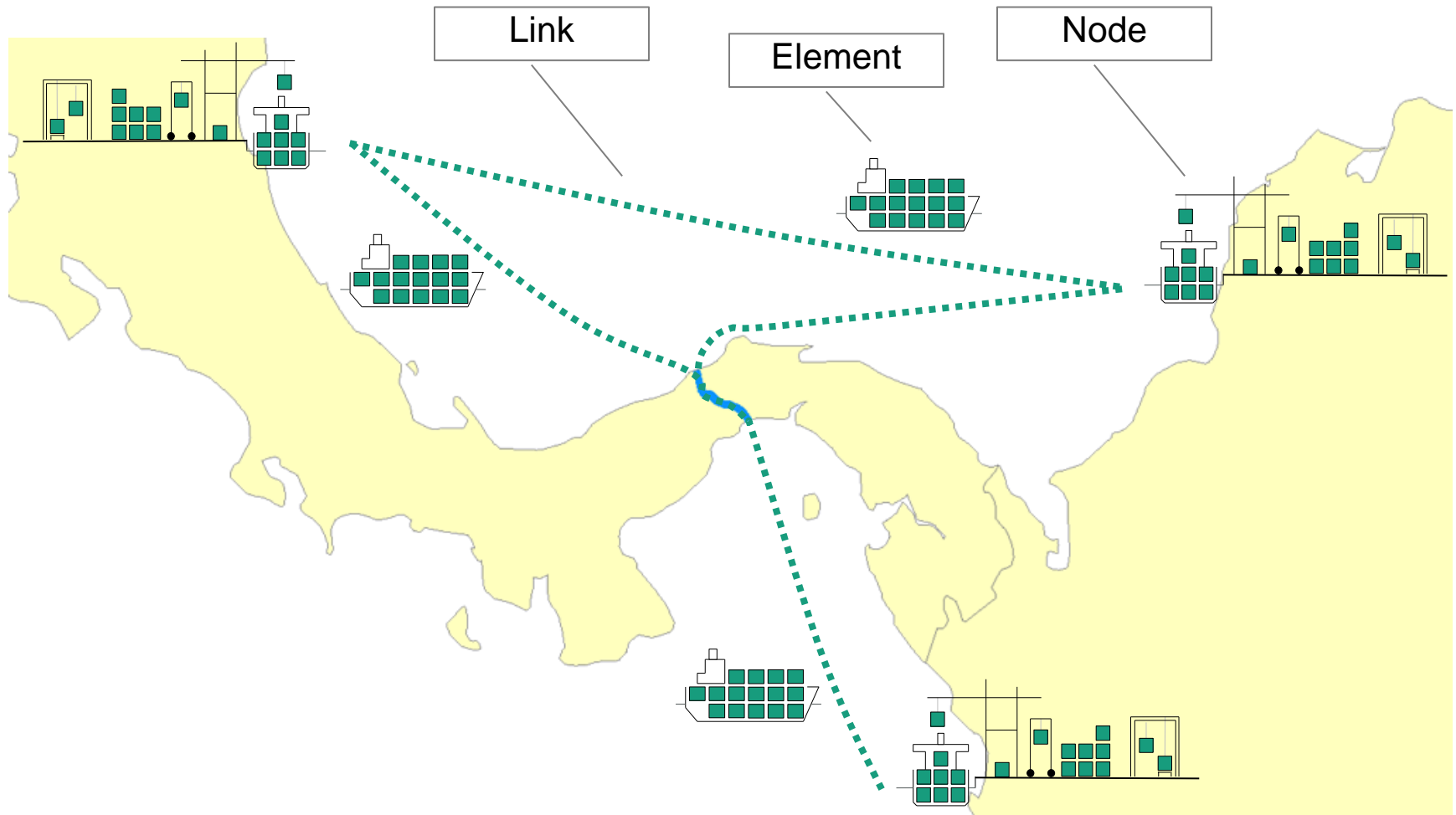
# Maritime Logistics System: Elements, Nodes and Lin



# Maritime Logistics System: Elements, Nodes and Link



# Maritime Logistics System: Complex, Dynamic System





# AGENDA



1. Introduction
2. The Ship-Port-System as a Logistics Issue
3. System Efficiency: Measures, Effects
4. Conclusion and Outlook

# Efficiency



“Efficiency means the ability to produce something with a minimum amount of effort.”<sup>1</sup>

Efficiency = Ratio Output / Input



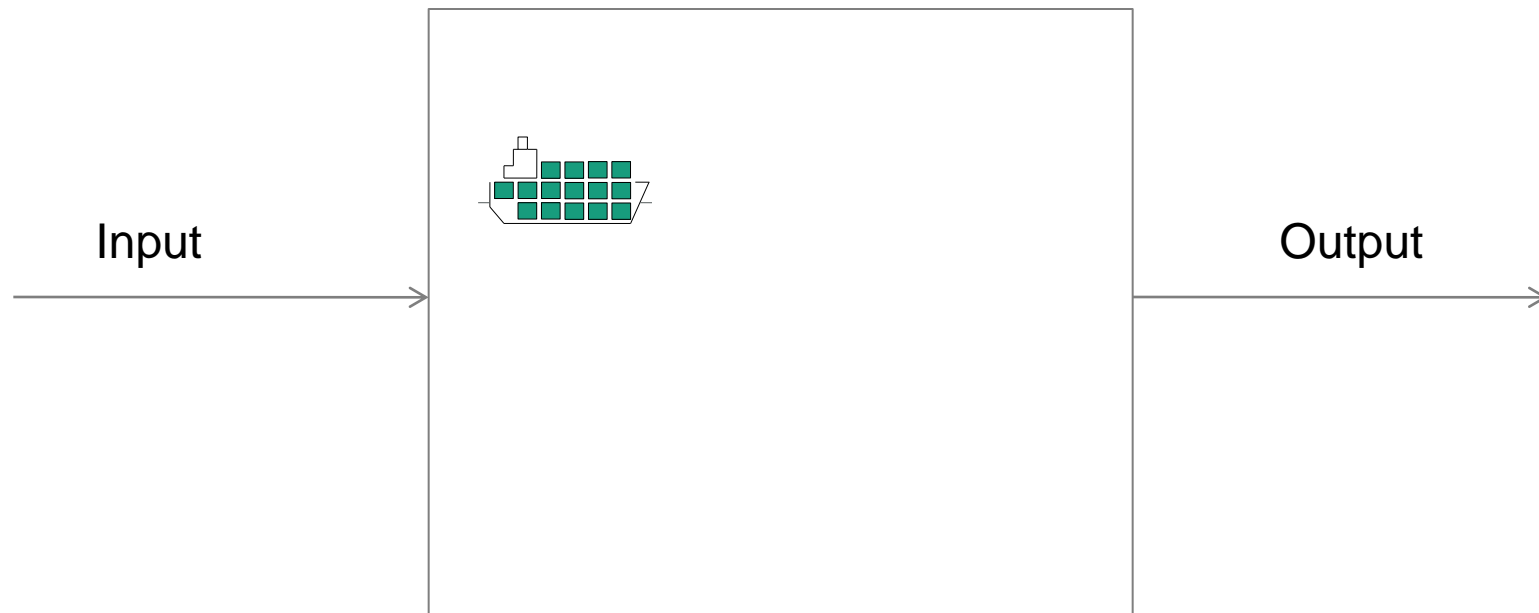
<sup>1</sup> Source: <http://www.yourdictionary.com/efficiency> 22.09.2011

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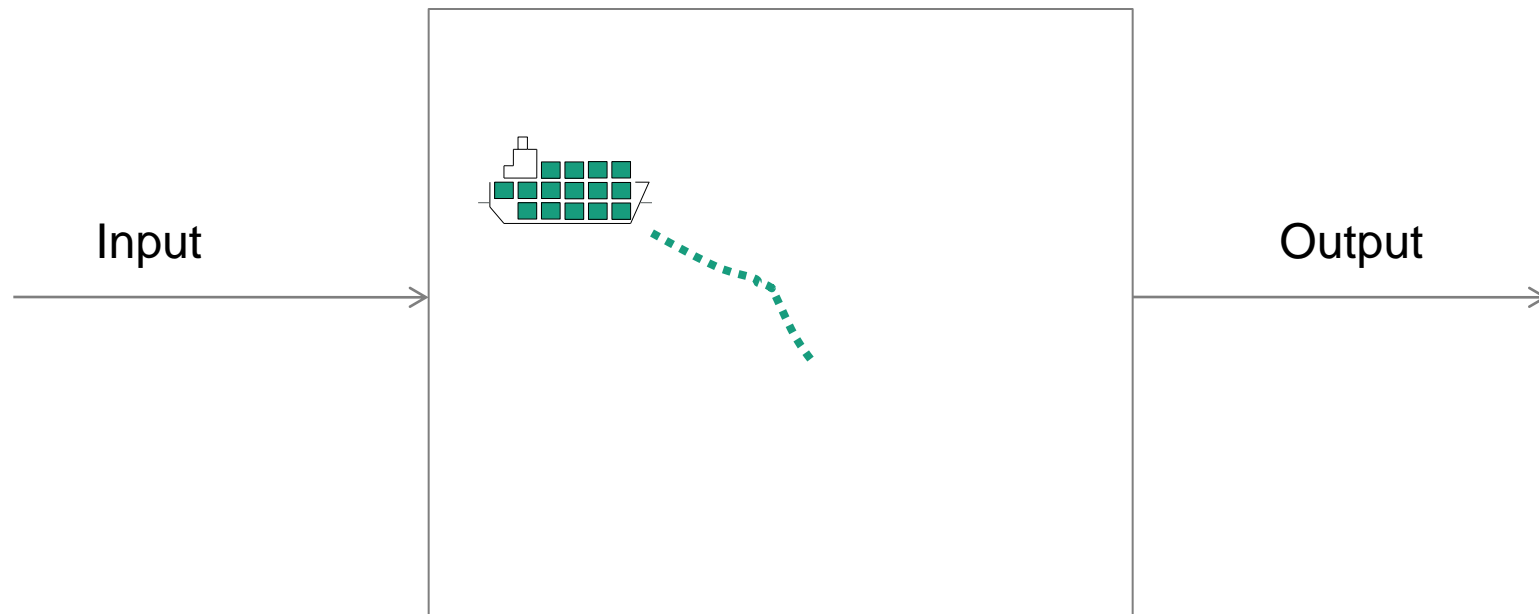
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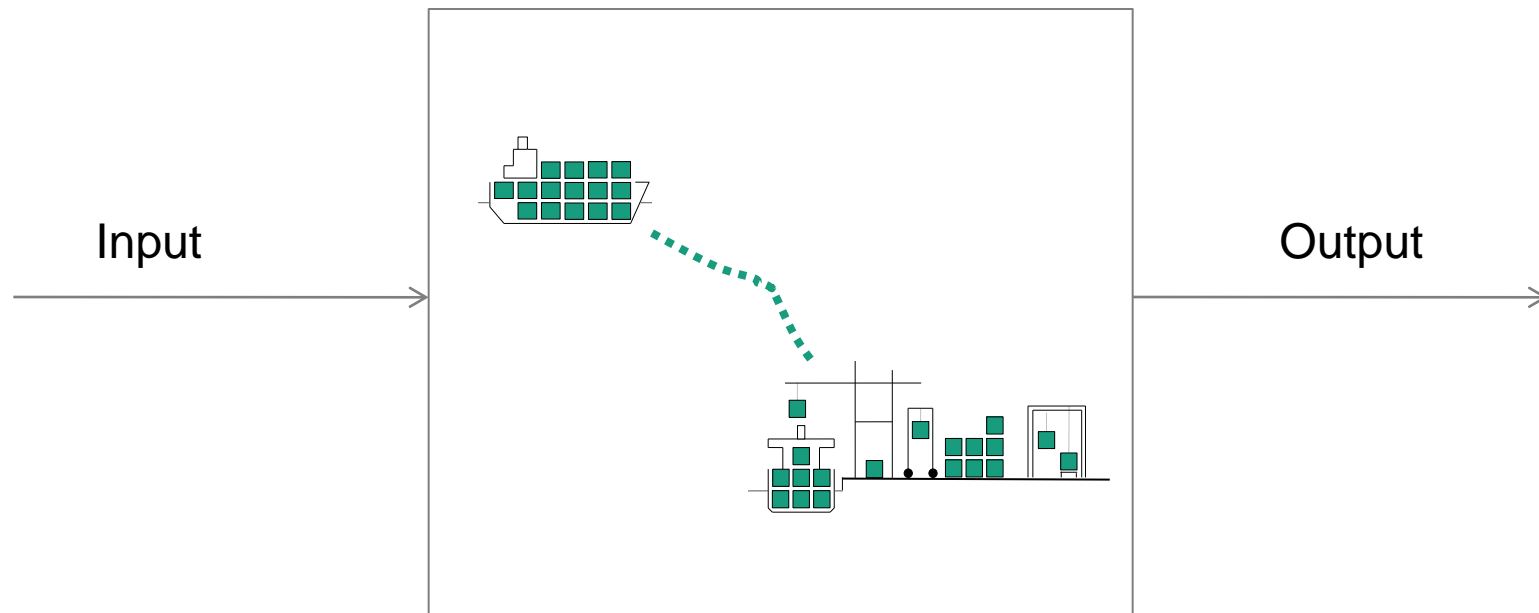
<sup>1</sup> Source: <http://www.yourdictionary.com/efficiency> 22.09.2011

# Efficiency



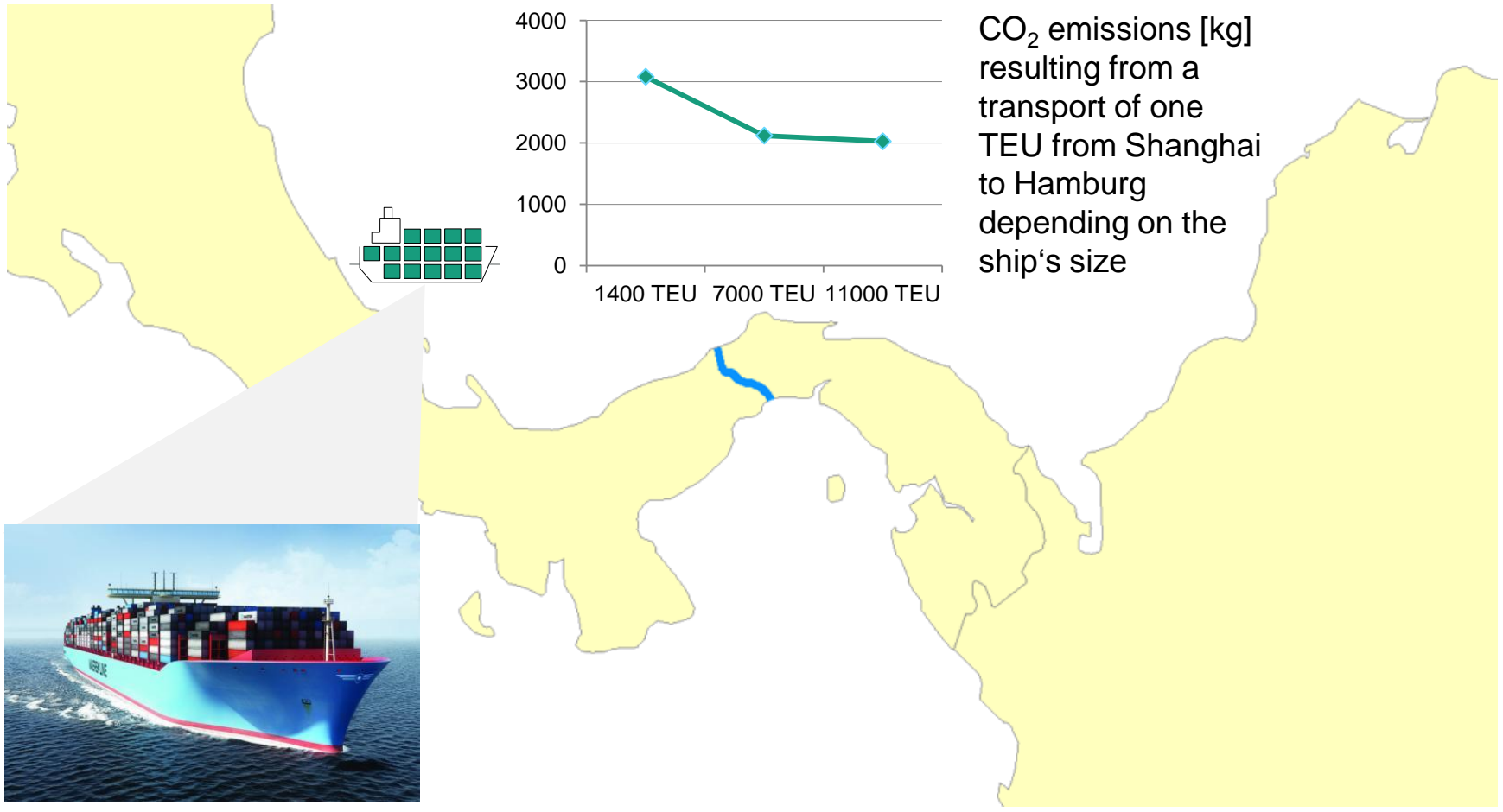
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<sup>1</sup> Source: <http://www.yourdictionary.com/efficiency> 22.09.2011

# Efficiency Measures: Ship Size



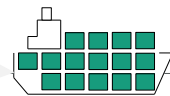
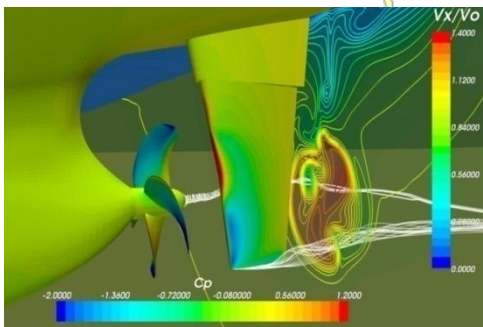
Source: ecotransit.org  
Picture: A. P. MOLLER - MAERSK GROUP  
© Fraunhofer

# Efficiency Measures: Ship Technology

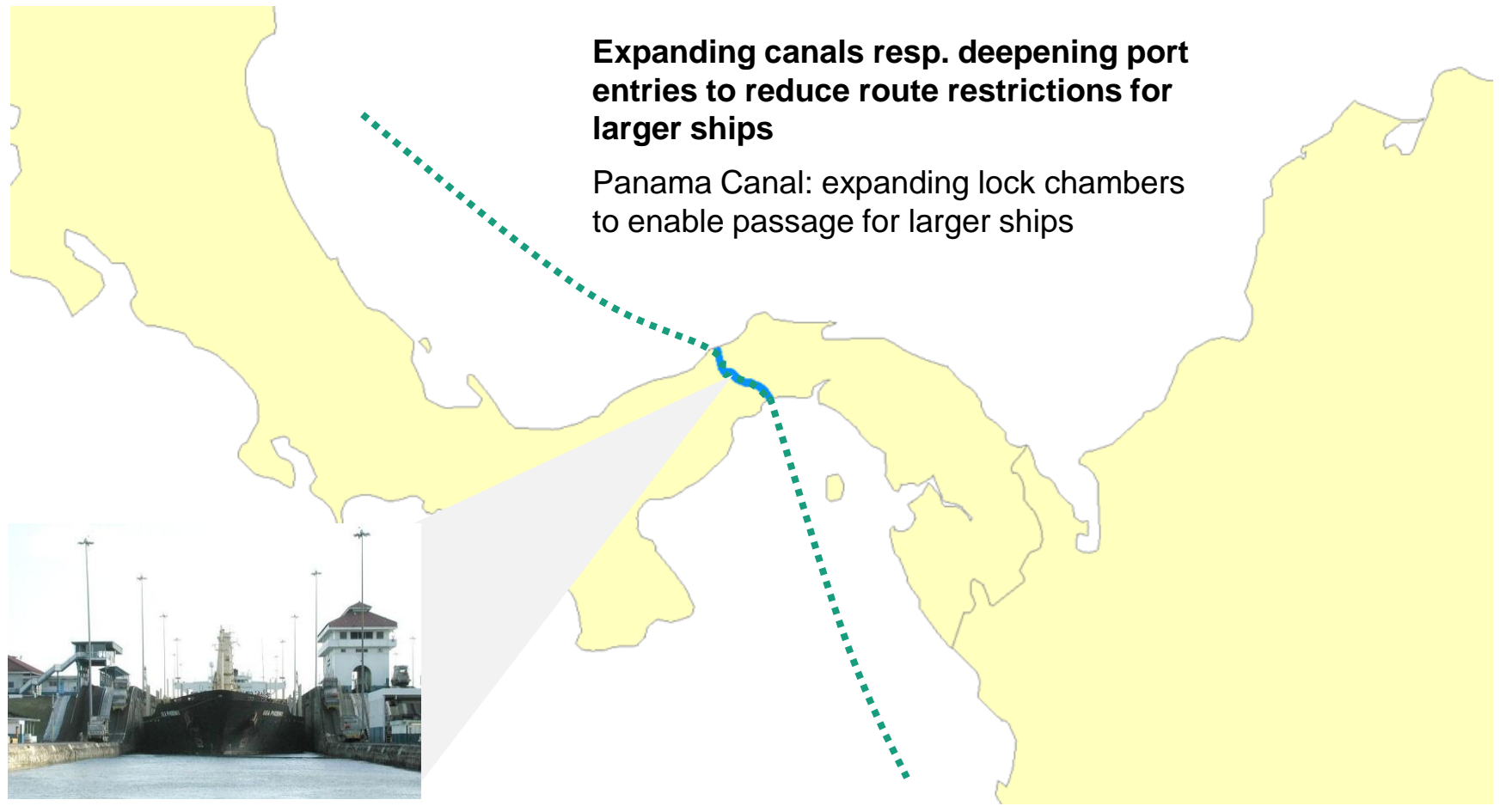


## Improvement and optimization of

- Propulsion systems  
(Diesel-electric pod propulsion: up to 15 % savings; use of wind energy: up to 50 % savings)
- Ship design  
(Propeller, rudder design: 1-5 % savings; hull design: 1-5 % savings) to reduce fuel consumption and CO<sub>2</sub> emissions.



# Efficiency Measures: Ship Route



Picture: Johantheghost, Picture taken from S/V Moonrise of Inverness

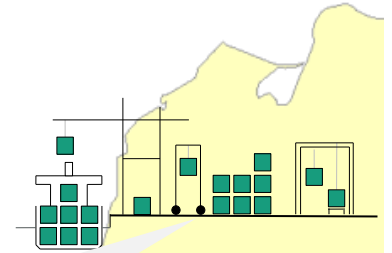


# Efficiency Measures: Port Technology (e.g. Automati



## Increasing the degree of automation

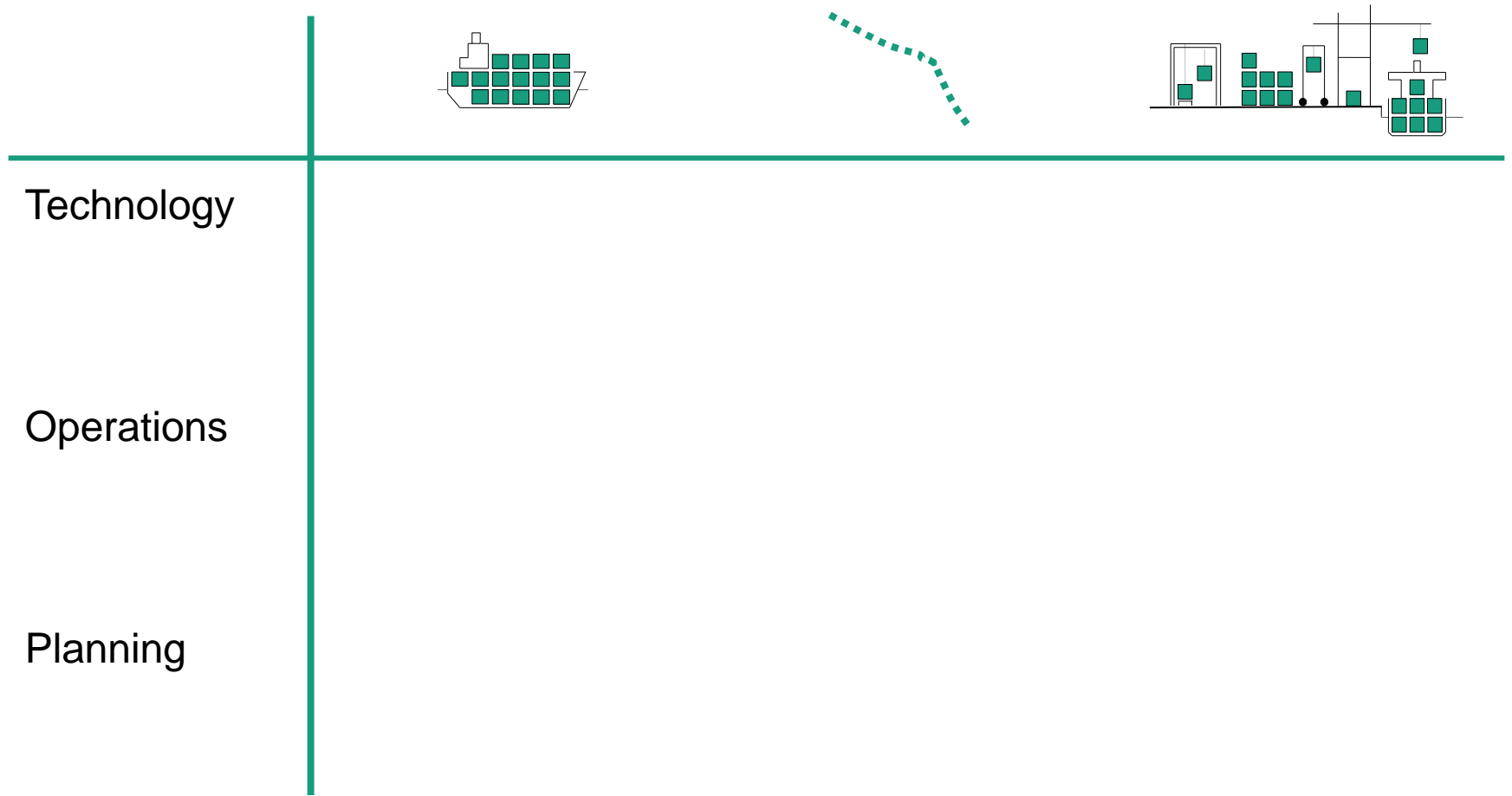
Degree of automation: usage of Automated Guided Vehicles (AGV) to increase reliability and a certain working hours independence, reducing staff costs



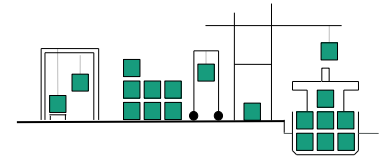
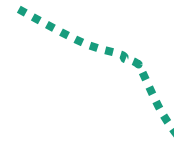
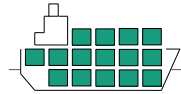
Picture: HHLA

© Fraunhofer

# Efficiency Measures Matrix (Examples)



# Efficiency Measures Matrix (Examples)



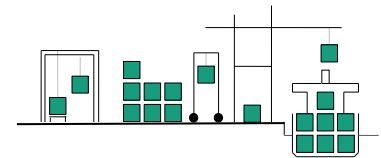
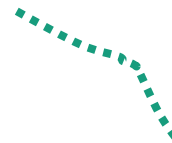
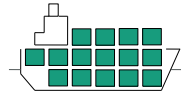
Technology

- Size
- Propulsion
- Hull
- North-West Passage (Ice-Breaker)
- Dredging
- Container
- Gantry Cranes
- AGVs

Operations

Planning

# Efficiency Measures Matrix (Examples)



## Technology

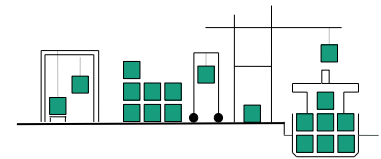
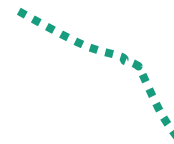
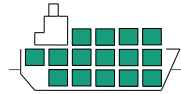
- Size
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- North-West Passage (Ice-Breaker)
- Dredging
- Container
- Gantry Cranes
- AGVs

## Operations

- Slow Steaming
- Weather Routing
- Intelligent Routing
- Canal Passage
- Vessel Traffic Service
- Truck Appointment System
- Straddle-Carrier Pooling

## Planning

# Efficiency Measures Matrix (Examples)



## Technology

- Size
- Propulsion
- Hull
- North-West Passage (Ice-Breaker)
- Dredging
- Container
- Gantry Cranes
- AGVs

## Operations

- Slow Steaming
- Weather Routing
- Intelligent Routing
- Canal Passage
- Vessel Traffic Service
- Truck Appointment System
- Straddle-Carrier Pooling

## Planning

- Stowage Planning
- Fleet Planning / Management
- Inland Water Way Development (China)
- Yard Planning
- Stowage Planning

# Inefficiencies in Maritime Logistics System



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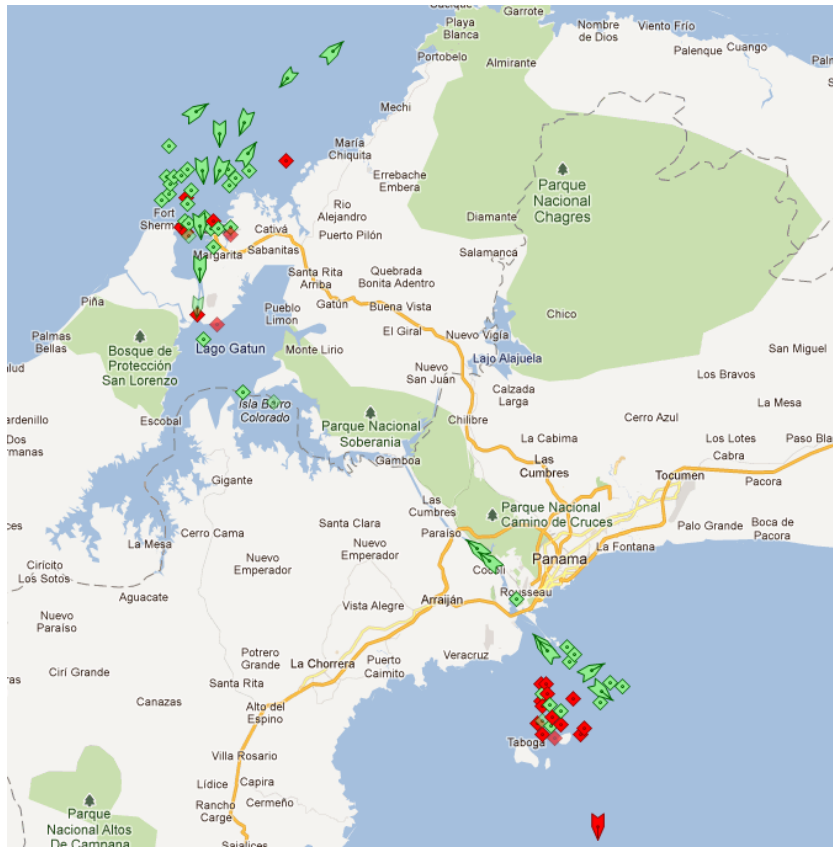
Picture: [www.marinetraffic.com](http://www.marinetraffic.com) 20.09.2011

# Inefficiencies in Maritime Logistics System

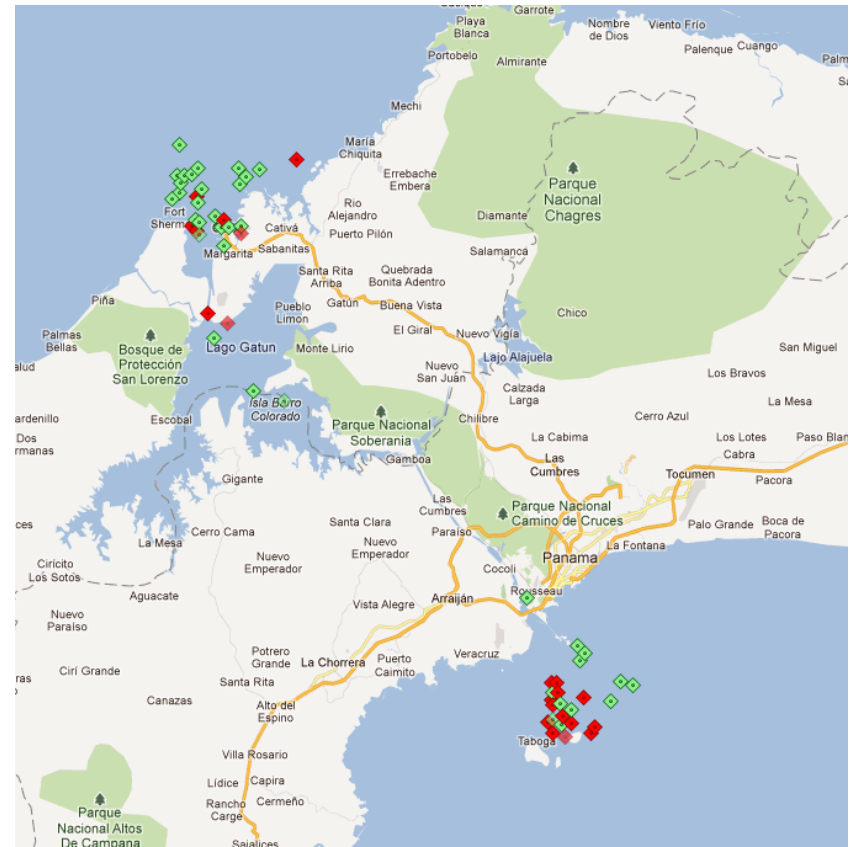
## Waiting Ships – Panama Canal



79 ships (cargo and tanker) at Panama Canal



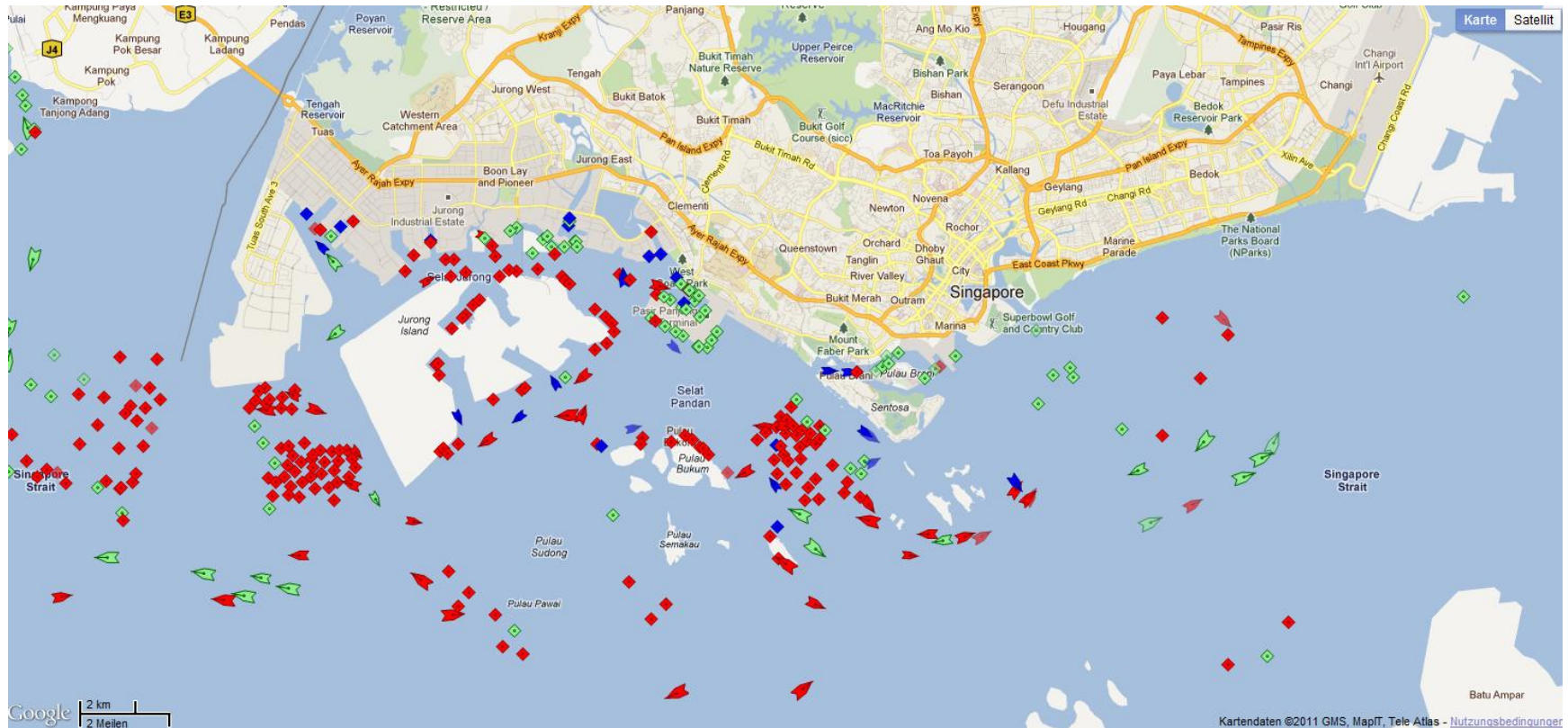
61 ships (cargo and tanker) waiting



Picture: [www.marinetraffic.com](http://www.marinetraffic.com) 20.09.2011

# Inefficiencies in Maritime Logistics System

## 347 Ships – Road of Singapore



Picture: www.marinetraffic.com 20.09.2011



# Example: Insufficient Information Causes Waiting Time in the Roads



Aframax 1	Aframax 2
Insufficient information	Accurate information
15 kn	12 kn
3.7 days	4.7 days
232.2 t fuel	148.4 t fuel

**Savings:**  
83.8 t fuel (36 %)  
\$ 35,700



Source: International Harbour Masters' Association

# AGENDA



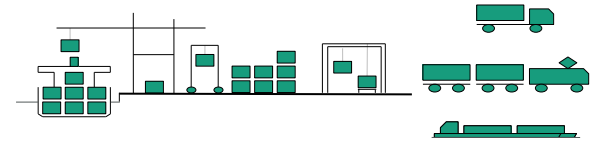
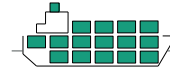
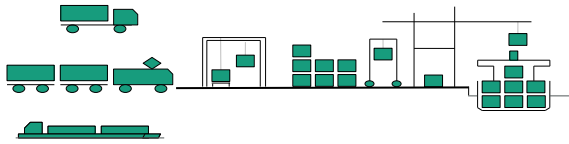
1. Introduction
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# Conclusions

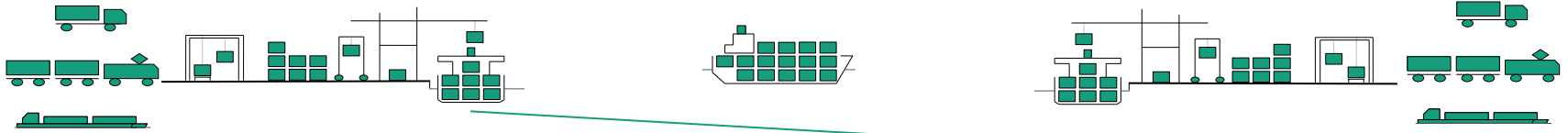


1. Maritime logistics system is a complex, dynamic system.
2. Efficiency of maritime transport is influenced by various parameters.
3. Lots of measures to improve efficiency are in use and in development.
4. Synchronization of system elements is a logistics challenge with high potential.
5. To cope with complexity and dynamics an integrated tool to model, plan and simulate maritime logistics (sub-) systems is a promising approach.

# Outlook: Integrated Planning and Simulation System



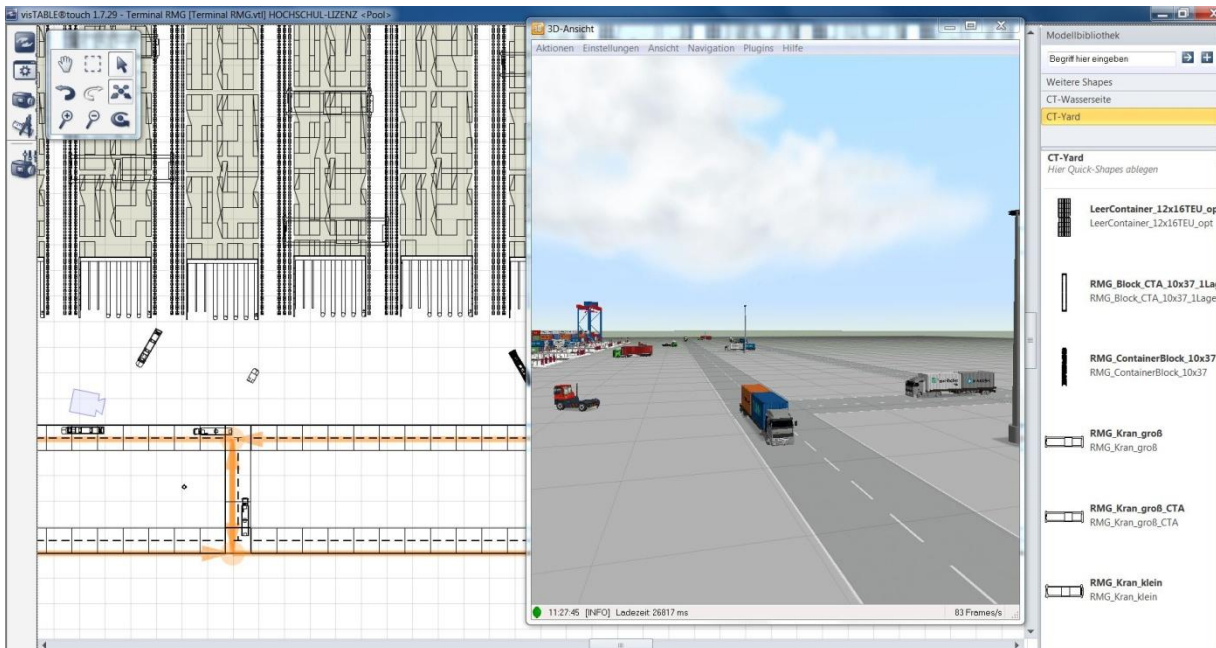
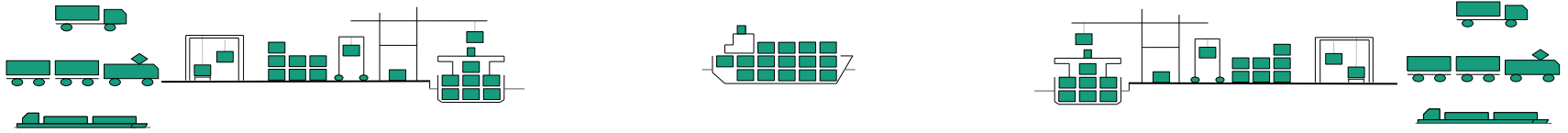
# Outlook: Integrated Planning and Simulation System



Port Planning  
and Visualization

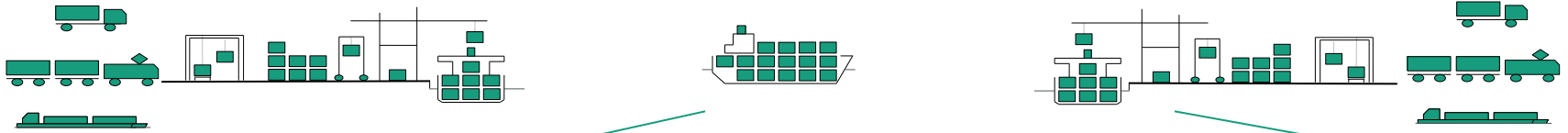


# Outlook: Integrated Planning and Simulation System

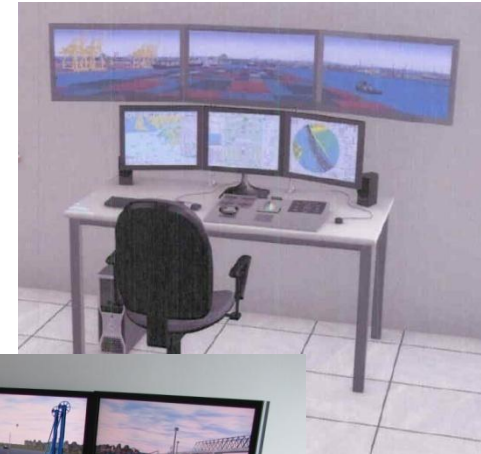


Port and  
Hinterland  
Process  
Simulation

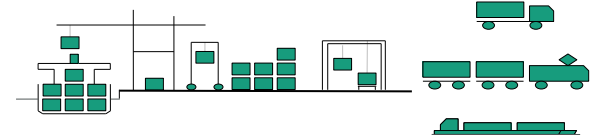
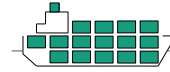
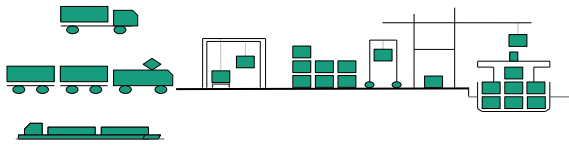
# Outlook: Integrated Planning and Simulation System



Ship Handling  
Simulation



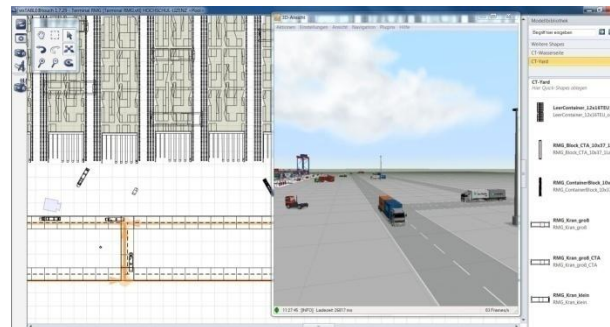
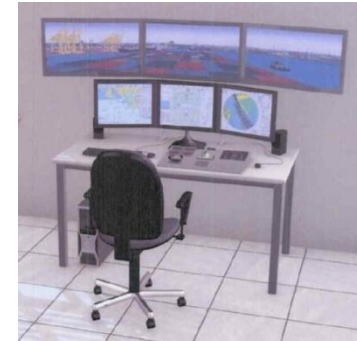
# Outlook: Integrated Planning and Simulation System



Port Planning  
and  
Visualization



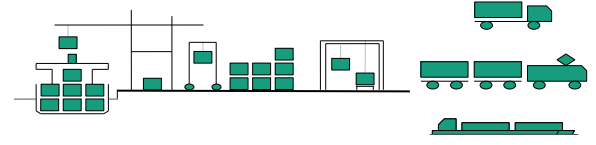
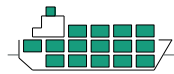
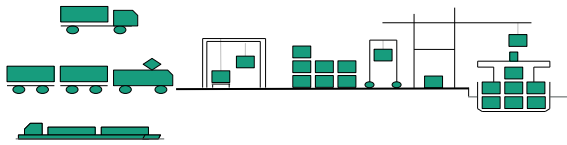
Ship Handling  
Simulation



Port and Hinterland  
Process Simulation



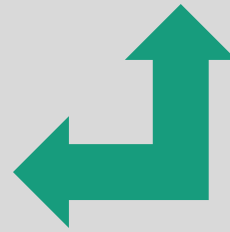
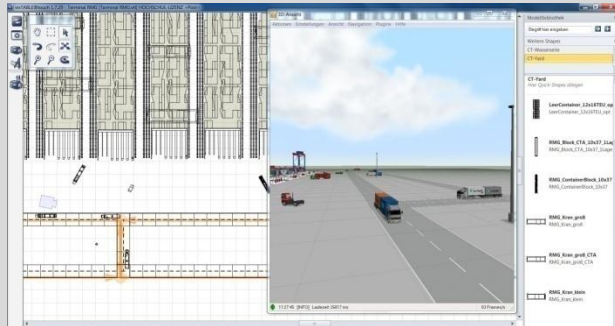
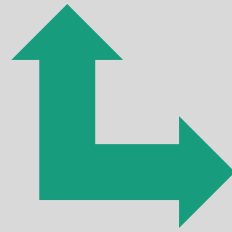
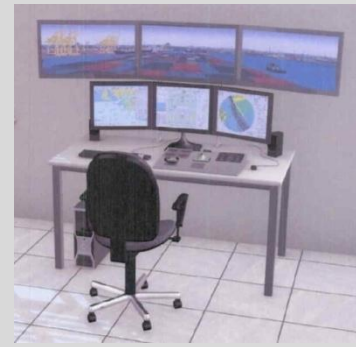
# Outlook: Integrated Planning and Simulation System



Port Planning  
and  
Visualization



Ship Handling  
Simulation



Port and Hinterland  
Process Simulation

# Thank You Very Much For Your Attention!



# Contact



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21073 Hamburg  
Germany

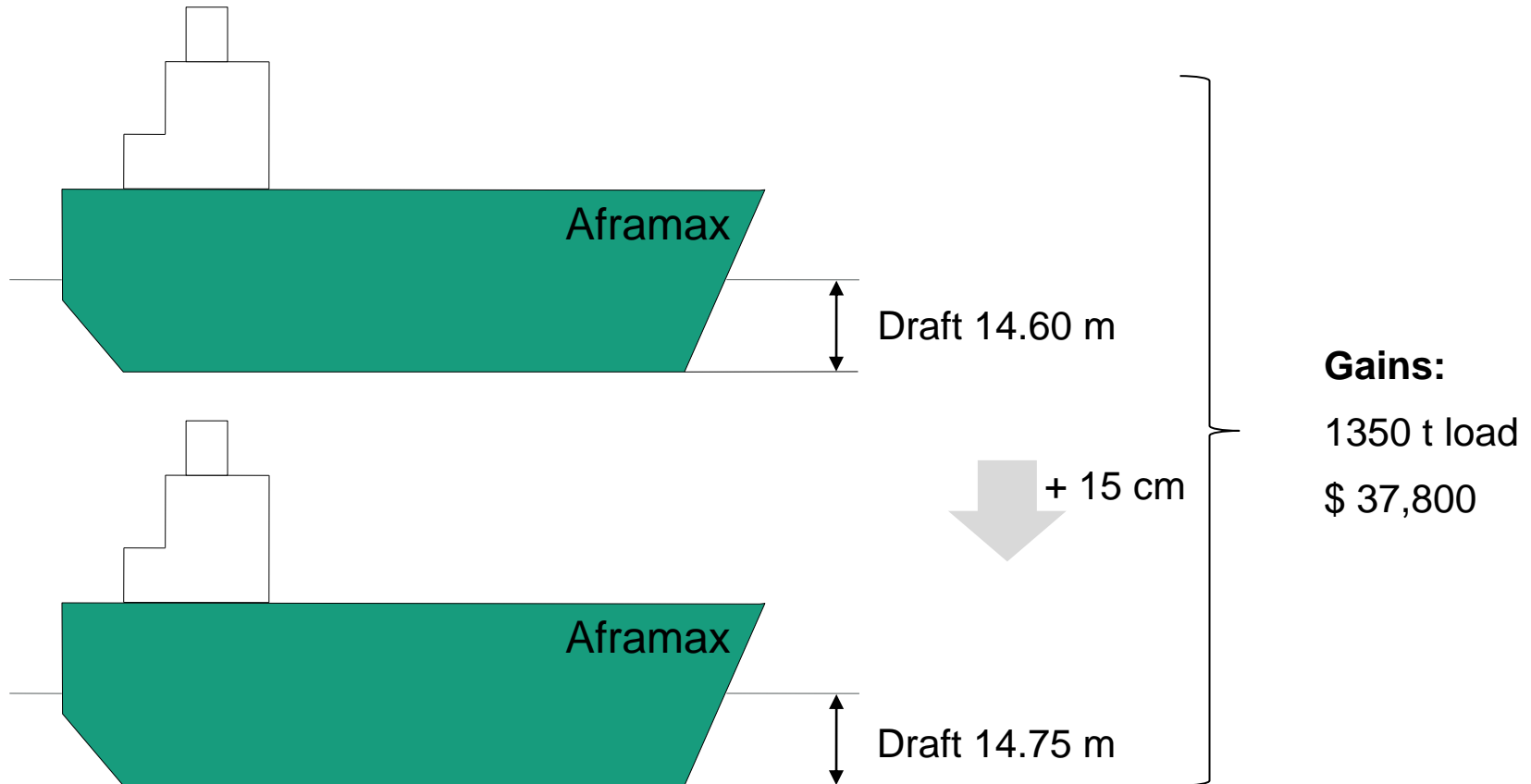
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Fax: +49 40 / 42878 4452

Email: [carlos.jahn@tu-harburg.de](mailto:carlos.jahn@tu-harburg.de)

[www.tu-harburg.de/mls](http://www.tu-harburg.de/mls)

# Example: Interrelations between Draft and Load



Source: International Harbour Masters' Association