



7th Framework Programme  
SST.2013.6-2. Towards a competitive and resource efficient port transport system  
Collaborative Project  
Grant Agreement no. 605176

Deliverable 6.4

## **Policy linkages, interrelations and benchmarking suggestions (Port users perceptions indicators)**

DOCUMENT ID  
PORTOPIA|D|6.4|DT|2017.10.31|V|FINAL

DUE DATE OF DELIVERABLE  
2017.09.29

ACTUAL SUBMISSION DATE  
31/10/17

DISSEMINATION LEVEL  
**PU (Public)**

DELIVERABLE 6.4

**POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)**

**AUTHORSHIP**

<b>Author(s)</b>	Dr George Vaggelas, Drs Evie Kladaki, Prof. Thanos Pallis
<b>Beneficiary Partner</b>	UoA
<b>Issue Date</b>	2017.10.31
<b>Revision</b>	2017.10.31 Yes – Following the reviewers comments
<b>Status</b>	FINAL
<b>Contributors</b>	/
<b>Pages</b>	39
<b>Figures</b>	/
<b>Tables</b>	24
<b>Annexes</b>	/

**SIGNATURES**

<b>Author(s)</b>	Dr George Vaggelas, Drs Evie Kladaki, Prof. Thanos Pallis
<b>Coordinator</b>	Michaël Doms

*Disclaimer*

*The information contained in this report is subject to change without notice and should not be construed as a commitment by any members of the PORTOPIA Consortium or the authors. In the event of any software or algorithms being described in this report, the PORTOPIA Consortium assumes no responsibility for the use or inability to use any of its software or algorithms.*

*The information is provided without any warranty of any kind and the PORTOPIA Consortium expressly disclaims all implied warranties, including but not limited to the implied warranties of merchantability and fitness for a particular use.*

*(c) COPYRIGHT 2013 The PORTOPIA Consortium*

*This document may be copied and reproduced without written permission from the PORTOPIA Consortium. Acknowledgement of the authors of the document shall be clearly referenced. All rights reserved.*

DELIVERABLE 6.4

**POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)**

**REVISION**

<b>Revision Date</b>	<b>Reviewer Name</b>	<b>Reviewer Signature</b>
2017.10.31	Bruno Moeremans	BMO

**HISTORY**

<b>Version Date</b>	<b>Version Id</b>	<b>Status</b>	<b>Comment</b>
2017.10.31	V0.1	[DRAFT]	[DRAFT]
2017.10.31	V1.0	[FINAL]	[FINAL]
2017.11.30	V1.1	[FINAL AFTER REVIEW]	[FINAL AFTER REVIEW]

DELIVERABLE 6.4

**POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)**

**SUMMARY REPORT**

Port management across Europe is recently faced with a plethora of challenges, in the middle of a difficult economic environment. The pressures on quality improvements are at the same time high. Work Package 6 has been practicing the implementation of a quality enhancer ICT Tool for port management, as part of the PORTOPIA platform.

Port performance indicators that have been used to measure port performance from the users' side revealed interesting interrelations with the perception of port performance and some food for thought for benchmarking. Moreover, some linkages with policies are also revealed.

A twofold approach has been used for the interrelations and the benchmarking suggestions: that of the users' side and that of the port management's. Interrelations explored deal with indicators' popularity and a revealed match with the outcomes of the "State on the European Ports" report as such presented in Deliverable 6.3. A widely and self-evident interrelation is also mentioned when it comes to the indicators used at the rest of the PORTOPIA WPs.

DELIVERABLE 6.4

## **POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)**

### **Table of contents**

DELIVERABLE 6.4

**POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)**

**List of Tables**

Table 1: Container market indicators ..... 10

Table 2: Ro/Ro market indicators..... 11

Table 3: Dry bulk market indicators ..... 12

Table 4: Liquid bulk market indicators ..... 12

Table 5: Break bulk market indicators ..... 13

Table 6: Cruise market indicators..... 14

Table 7: High linkages with port performance for the container market indicators, users’ perspectives. 16

Table 8: High linkages with port performance for the ro/ro market indicators, users’ perspectives..... 17

Table 9: High linkages with port performance for the dry bulk market indicators, users’ perspectives ... 18

Table 10: High linkages with port performance for the liquid bulk market indicators, users’ perspectives ..... 19

Table 11: High linkages with port performance for the break bulk market indicators, users’ perspectives ..... 20

Table 12: High linkages with port performance for the cruise market indicators, users’ perspectives..... 21

Table 13: Container market, popular indicators, PAs..... 23

Table 14: Ro/Ro market, popular indicators, PAs ..... 24

Table 15: Dry bulk market, popular indicators, PAs ..... 25

Table 16: Liquid bulk market, popular indicators, PAs ..... 26

Table 17: Break bulk market, popular indicators, PAs..... 27

Table 18: Cruise market, popular indicators, PAs ..... 28

Table 19: Container market matching range ..... 31

Table 20: Ro/ro market matching range..... 32

Table 21: Dry bulk market matching range..... 33

Table 22: Liquid bulk market matching range..... 34

Table 23: Break bulk market matching range ..... 35

Table 24: Cruise market matching rang..... 36

DELIVERABLE 6.4

## **POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)**

List of Figures

DELIVERABLE 6.4

**POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING  
SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)**

List of Glossary



DELIVERABLE 6.4

**POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING  
SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)**

List of Abbreviations

## **INTRODUCTION**

The measurement of port performance has long been a challenging topic for the port industry. Modern port management is faced with issues such as the increased use of containerization and the development of new production – distribution – consumption systems and markets, issues that, among others, have widely affected the way in which ports are organized, managed and operate. Moreover, the -only recently- recorded shift regarding the roles of Port Authorities, with an eye on Port Development Companies, paves the way for a more concise and coherent capture of all port management elements that are intertwined with the notions of efficiency, effectiveness and performance which in turn are considered as part of a port's quality.

Efficiency, is in the core of a port's strategy in its attempt to increase competitiveness and thus sustain and increase its market share. Performance, on the other hand, has been commonly associated with rather operational issues, such as the efficient use of infrastructure, superstructure and other available resources. This has affected the structuring of port performance measurement frameworks; the majority of the indexes discussed, and the exercises applied by those responsible for managing ports or providing port services are constructed to deal with the operational productivity of the assets, equipment and productivity factors available in a given port, or port system. Moreover, the existing industry practices on port performance - and to a large extent academic research – shed light mostly on the operational performance of a port, neglecting other possibly valuable aspects.

The PORTOPIA Work Package 6 aimed at filling this gap by exploring port performance as such reflected at the perception of the users of port services; The customer/port user satisfaction is of increasing importance, especially as several shipping markets are characterized by oligopolistic conditions due to the dominance of a small number of operators (see for example the container shipping and cruise shipping markets). Among the factors that ports are interested in, is to generate and provide value to their users by developing attributes the port users' needs. On the other hand, port users aim at maximizing the value they extract by the usage of a port. Work Package 6 came to bridge the gap between these two perceptions of value, by developing a framework for measuring port users' perceptions on port performance.

The deliverable is an attempt, after the consecutive development of the ICT tool and its pilot implementation towards the actual measurement of port performance through the prism of port users, to:

- i. Analyze the links between the port users' perceptions' indicators with port performance;
- ii. Provide benchmarking suggestions;
- iii. Identify possible policy linkages.

## INTERRELATIONS OF THE USERS’ PERCEPTIONS’ INDICATORS DEVELOPED WITH OTHER PORT PERFORMANCE INDICATORS AND PORT PERFORMANCE IN GENERAL

### REMINDING THE USERS’ PERCEPTIONS’ MEASUREMENT INDICATORS

The last fine tuning of the criteria as such presented in Deliverable 6.2 had three specific objectives:

- i. To better reflect the operational structure of a contemporary port,
- ii. To provide more options to PA’s by selecting the most proper criteria for each port case and
- iii. To focus on several port markets instead of concentrating on just container, Ro—Ro and cruise ports, according also to the directions of the evaluation results of deliverable 6.1.

These indicators refer to six (6) different port markets, have been grouped in different categories and their structure is as follows:

<b>Container Market</b>	
<i>a. Ship to port interface</i>	<ul style="list-style-type: none"> <li>— Deep-sea container services</li> <li>— Feeder container services</li> <li>— Number of berths</li> <li>— Total length of quays</li> <li>— Operational depth</li> <li>— Port operating hours</li> <li>— On-time arrival</li> <li>— On-time departure</li> <li>— Efficiency (Quality-Cost) of Bunkering</li> <li>— Efficiency (Quality-Cost) of Ice-breaking</li> <li>— Efficiency (Quality-Cost) of Dredging</li> <li>— Efficiency (Quality-Cost) of Mooring</li> <li>— Efficiency (Quality-Cost) of Waste reception facilities</li> <li>— Efficiency (Quality-Cost) of Pilotage</li> <li>— Efficiency (Quality-Cost) of Towing</li> <li>— Vessel-related port costs</li> <li>— Efficiency of (un)loading operations</li> <li>— Number of operational gantry cranes</li> <li>— Container handling cost</li> </ul>
<i>b. Port</i>	<ul style="list-style-type: none"> <li>— Coordination of port community/stakeholders</li> <li>— Response to users’ requests</li> <li>— Response to innovativeness</li> <li>— Response to regulation changes</li> <li>— Transparency of port charges</li> <li>— On-time information</li> <li>— Online information</li> <li>— Accuracy of information</li> <li>— Port security</li> <li>— Port safety</li> </ul>

	<ul style="list-style-type: none"> <li>— Storage capacity for containers</li> <li>— Storage capacity for reefer containers</li> <li>— Number of operational stacking equipment</li> <li>— Container storage cost</li> <li>— Services for containers (added value services, emptying-filling a container etc)</li> <li>— Efficiency of container clearness procedure</li> </ul>
<i>c. Port to hinterland interface</i>	<ul style="list-style-type: none"> <li>— Hinterland intermodal connectivity</li> <li>— Customs operating hours</li> <li>— Connectivity to road network</li> <li>— Quality-efficiency of road transport services</li> <li>— Inland waterway network (number and frequency of service)</li> <li>— Quality-efficiency of the inland waterway services</li> </ul>

Table 1: Container market indicators

<b>Ro/Ro Market</b>	
<i>a. Ship to port interface</i>	<ul style="list-style-type: none"> <li>— Deep-sea Ro-Ro services</li> <li>— Feeder Ro-Ro services</li> <li>— Number of berths</li> <li>— Total length of quays</li> <li>— Operational depth</li> <li>— Port operating hours</li> <li>— On-time arrival</li> <li>— On-time departure</li> <li>— Efficiency (Quality-Cost) of Bunkering</li> <li>— Efficiency (Quality-Cost) of Ice-breaking</li> <li>— Efficiency (Quality-Cost) of Dredging</li> <li>— Efficiency (Quality-Cost) of Mooring</li> <li>— Efficiency (Quality-Cost) of Waste reception facilities</li> <li>— Efficiency (Quality-Cost) of Pilotage</li> <li>— Efficiency (Quality-Cost) of Towing</li> <li>— Vessel-related port costs</li> <li>— Efficiency of (un)loading operations</li> <li>— Trailer (truck) handling cost</li> </ul>
<i>b. Port</i>	<ul style="list-style-type: none"> <li>— Coordination of port community/stakeholders</li> <li>— Response to users' requests</li> <li>— Response to innovativeness</li> <li>— Response to regulation changes</li> <li>— Transparency of port charges</li> <li>— On-time information</li> <li>— Online information</li> <li>— Accuracy of information</li> <li>— Port security</li> <li>— Port safety</li> <li>— Storage capacity for trailers-trucks</li> <li>— Storage capacity for reefer trailers</li> <li>— Trailer-truck storage cost</li> <li>— Number of operational tractors</li> <li>— Services for trailers-trucks</li> <li>— Efficiency of trailer-truck clearness procedure</li> </ul>
<i>c. Port to hinterland interface</i>	<ul style="list-style-type: none"> <li>— Hinterland intermodal connectivity</li> <li>— Customs operating hours</li> </ul>

	<ul style="list-style-type: none"> <li>— Connectivity to road network</li> <li>— Inland waterway network (number and frequency of service)</li> <li>— Quality-efficiency of the inland waterway services</li> <li>— Connectivity to rail network (number and frequency of service)</li> <li>— Quality-efficiency of rail services</li> </ul>
--	--

Table 2: Ro/Ro market indicators

<b>Dry Bulk Market</b>	
<i>a. Ship to port interface</i>	<ul style="list-style-type: none"> <li>— Number of berths</li> <li>— Total length of quays</li> <li>— Operational depth</li> <li>— Port operating hours</li> <li>— On-time arrival</li> <li>— On-time departure</li> <li>— Efficiency (Quality-Cost) of Bunkering</li> <li>— Efficiency (Quality-Cost) of Ice-breaking</li> <li>— Efficiency (Quality-Cost) of Dredging</li> <li>— Efficiency (Quality-Cost) of Mooring</li> <li>— Efficiency (Quality-Cost) of Waste reception facilities</li> <li>— Efficiency (Quality-Cost) of Pilotage</li> <li>— Efficiency (Quality-Cost) of Towing</li> <li>— Vessel-related port costs</li> <li>— Efficiency of (un)loading operations</li> <li>— Dry bulk cargoes handling cost</li> </ul>
<i>b. Port</i>	<ul style="list-style-type: none"> <li>— On-time information</li> <li>— Coordination of port community/stakeholders</li> <li>— Response to users' requests</li> <li>— Response to innovativeness</li> <li>— Response to regulation changes</li> <li>— Transparency of port charges</li> <li>— Online information</li> <li>— Accuracy of information</li> <li>— Port security</li> <li>— Port safety</li> <li>— Storage capacity for dry bulk cargoes</li> <li>— Dry bulk cargoes storage cost</li> <li>— Number of operational cranes</li> <li>— Services for trucks (weighting etc)</li> <li>— Added value services to dry bulk cargoes</li> <li>— Efficiency of dry bulk cargo clearness procedure</li> </ul>
<i>c. Port to hinterland interface</i>	<ul style="list-style-type: none"> <li>— Hinterland intermodal connectivity</li> <li>— Customs operating hours</li> <li>— Connectivity to road network</li> <li>— Inland waterway network (number and frequency of service)</li> <li>— Quality-efficiency of the inland waterway services</li> <li>— Connectivity to rail network (number and frequency of service)</li> <li>— Quality-efficiency of rail services</li> </ul>

Table 3: Dry bulk market indicators

<b>Liquid Bulk Market</b>	
<i>a. Ship to port interface</i>	<ul style="list-style-type: none"> <li>— Number of berths-mooring bases</li> <li>— Total length of the quays</li> <li>— Operational depth</li> <li>— Port operating hours</li> <li>— On-time arrival</li> <li>— On-time departure</li> <li>— Efficiency (Quality-Cost) of Bunkering</li> <li>— Efficiency (Quality-Cost) of Ice-breaking</li> <li>— Efficiency (Quality-Cost) of Dredging</li> <li>— Efficiency (Quality-Cost) of Mooring</li> <li>— Efficiency (Quality-Cost) of Waste reception facilities</li> <li>— Efficiency (Quality-Cost) of Pilotage</li> <li>— Efficiency (Quality-Cost) of Towage</li> <li>— Vessel-related port costs</li> <li>— Efficiency of (un)loading operations</li> <li>— Liquid bulk cargoes handling cost</li> </ul>
<i>b. Port</i>	<ul style="list-style-type: none"> <li>— On-time information</li> <li>— Coordination of port community/stakeholders</li> <li>— Response to users' requests</li> <li>— Response to innovativeness</li> <li>— Response to regulation changes</li> <li>— Transparency of port charges</li> <li>— Online information</li> <li>— Accuracy of information</li> <li>— Port security</li> <li>— Port safety</li> <li>— Tank storage capacity</li> <li>— Tank storage cost</li> <li>— Number of operational pipelines</li> <li>— Efficiency of liquid bulk cargo clearness procedure</li> </ul>
<i>c. Port to hinterland interface</i>	<ul style="list-style-type: none"> <li>— Hinterland intermodal connectivity</li> <li>— Customs operating hours</li> <li>— Connectivity to pipelines</li> <li>— Inland waterway network (number and frequency of service)</li> <li>— Quality-efficiency of the inland waterway services</li> <li>— Connectivity to rail network (number and frequency of service)</li> <li>— Quality-efficiency of rail services</li> </ul>

Table 4: Liquid bulk market indicators

<b>Break Bulk Market</b>	
<i>a. Ship to port interface</i>	<ul style="list-style-type: none"> <li>— Number of berths</li> <li>— Total length of quays</li> <li>— Operational depth</li> <li>— Port operating hours</li> <li>— On-time arrival</li> <li>— On-time departure</li> </ul>

	<ul style="list-style-type: none"> <li>— Efficiency (Quality-Cost) of Bunkering</li> <li>— Efficiency (Quality-Cost) of Ice-breaking</li> <li>— Efficiency (Quality-Cost) of Dredging</li> <li>— Efficiency (Quality-Cost) of Mooring</li> <li>— Efficiency (Quality-Cost) of Waste reception facilities</li> <li>— Efficiency (Quality-Cost) of Pilotage</li> <li>— Efficiency (Quality-Cost) of Towage</li> <li>— Vessel-related port costs</li> <li>— Efficiency of (un)loading operations</li> <li>— Number of operational cranes</li> <li>— Break-bulk cargoes handling cost</li> </ul>
<i>b. Port</i>	<ul style="list-style-type: none"> <li>— Coordination of port community/stakeholders</li> <li>— Response to users' requests</li> <li>— Response to innovativeness</li> <li>— Response to regulation changes</li> <li>— Transparency of port charges</li> <li>— On-time information</li> <li>— Online information</li> <li>— Accuracy of information</li> <li>— Port security</li> <li>— Port safety</li> <li>— Open storage capacity for break-bulk cargoes</li> <li>— Warehouse capacity for break-bulk cargoes</li> <li>— Break-bulk storage cost</li> <li>— Number of handling equipment for break-bulk storage</li> <li>— Services to break-bulk cargoes (weighting, added value services, (un)packing etc.)</li> <li>— Efficiency of break-bulk cargo clearness procedure</li> </ul>
<i>c. Port to hinterland interface</i>	<ul style="list-style-type: none"> <li>— Hinterland intermodal connectivity</li> <li>— Customs operating hours</li> <li>— Connectivity to road network</li> <li>— Quality-efficiency of road transport services</li> <li>— Inland waterway network (number and frequency of service)</li> <li>— Quality-efficiency of the inland waterway services</li> <li>— Connectivity to rail network (number and frequency of service)</li> <li>— Quality-efficiency of rail services</li> </ul>

Table 5: Break bulk market indicators

<b>Cruise Market</b>	
<i>a. Ship to port interface</i>	<ul style="list-style-type: none"> <li>— Number of berths</li> <li>— Efficiency of berth allocation system</li> <li>— Total length of the quays</li> <li>— Operational depth</li> <li>— Port operating hours</li> <li>— On-time arrival</li> <li>— On-time departure</li> <li>— Efficiency (Quality-Cost) of Bunkering</li> <li>— Efficiency (Quality-Cost) of Ice-breaking</li> <li>— Efficiency (Quality-Cost) of Dredging</li> <li>— Efficiency (Quality-Cost) of Mooring</li> <li>— Efficiency (Quality-Cost) of Waste reception facilities</li> </ul>

	<ul style="list-style-type: none"> <li>— Efficiency (Quality-Cost) of Pilotage</li> <li>— Efficiency (Quality-Cost) of Towage</li> <li>— Vessel-related port costs</li> <li>— Number of operational passenger terminals</li> <li>— Efficiency of passengers embarking/disembarking operations</li> <li>— Efficiency of baggage handling operations</li> <li>— Cruise passengers handling cost</li> <li>— Baggage handling cost</li> </ul>
<p><i>b. Port</i></p>	<ul style="list-style-type: none"> <li>— Coordination of port community/stakeholders</li> <li>— Response to users' requests</li> <li>— Response to innovativeness</li> <li>— Response to regulation changes</li> <li>— Transparency of port charges</li> <li>— On-time information</li> <li>— Online information</li> <li>— Accuracy of information</li> <li>— Port security</li> <li>— Port safety</li> <li>— Total available area for passengers</li> <li>— Total parking areas</li> <li>— Services to passengers</li> <li>— Efficiency of passengers' clearness procedure</li> </ul>
<p><i>c. Port to hinterland interface</i></p>	<ul style="list-style-type: none"> <li>— Hinterland intermodal connectivity</li> <li>— Customs operating hours</li> <li>— Connectivity to road network</li> <li>— Efficiency of land transport modes</li> </ul>

Table 6: Cruise market indicators

**LINKING USERS' PERCEPTIONS' MEASUREMENT INDICATORS WITH PORT PERFORMANCE: LESSONS FROM THE ICT TOOL PILOT IMPLEMENTATION EXPERIENCE AND THE "STATE ON THE EUROPEAN PORTS" REPORT**

The use of the indicators in a real-time exercise through the ICT Tool resulted in a "State on the European Ports" report, as such presented in Deliverable 6.3.

The results from the actual reporting provide a lot of feedback for the participant ports, providing at the same time a valuable view on the indicators that have been used as criteria for port performance measurement. A first example of this has been the contribution of the GAP Analysis that rated the *best performing markets*, which, in our pilot exercise have been the Cruise and the Liquid Bulk ones, indicating at the same time the room for corrective actions in more specific fields of services.

Attempting to link the indicators that have been used as port performance elements, for each market, the results of the exercise unveil that some of them are more crucial than others, since they uncover the weaknesses for each market, that is to say, the performance obscurities as such indicated by the port users' opinions.

Although all indicators that have been selected in the port performance measurement exercise for us, in a more academic wise manner, are, important, there is a twofold view that reveals a stronger link for some of them. The following paragraphs explain this in a more detailed manner.



As mentioned in a previous deliverable (Deliverable 6.2) the use of indicators at the exercise can provide us with a “double estimation” of perception regarding port performance: (a) the users’ side, but also, (b) the port’s.

To begin the analysis with the exploration of the users’ side, the key element for the linkages between the indicators used and port performance amelioration, is the conducted GAP Analysis. The insights gained from the analysis provide an indication that certain areas for each market are more related to the notion of port performance than others, from the side of the users.

To highlight this, we refined the results of the analysis in order to highlight specific indicators. We attribute a *linkage to port performance* to those indicators that gained the larger gaps at the analysis. The larger the gaps, the more important are those indicators for the users.

The following tables provide a view on that linkage; By denoting the results of the GAP analysis per market/per indicator, we select those that belong to the spectrum of the highest levels of importance/dissatisfaction for the users, therefore being the most appropriate for the measurement of port performance from their side. We attribute at those indicators the characteristic of having a *high linkage with port performance*.

For the cruise and the liquid bulk markets, the GAP analysis didn’t unveiled large gaps between the importance and the satisfaction that a port user attributes to each one of the indicators. On the contrary the other markets experiences indicators were the gap between the satisfaction and the importance is quite high, thus being a sign for ports, that they have to take actions towards the increasing of port users’ satisfaction.

Deliverable 6.4

POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)

<b>Group and indicator</b>	<b>GAP</b>	<b>High Linkage</b>	<b>Group and indicator</b>	<b>GAP</b>	<b>High Linkage</b>	<b>Group and indicator</b>	<b>GAP</b>	<b>High Linkage</b>
<b>"Ship to port" interface</b>			<b>"Port" interface</b>			<b>"Port to hinterland" interface</b>		
Container handling cost	2,50	x	Accuracy of information	2	x	Connectivity to road network	2,5	x
Deep-sea container services	- 1,50		Container storage cost	2,5	x	Customs operating hours	2,5	x
Efficiency (Quality-Cost) of Bunkering	1,00		Coordination of port community/stakeholders	1,5		Hinterland intermodal connectivity	2,5	x
Efficiency (Quality-Cost) of Dredging	1,00		Efficiency of container clearance procedure	3	x	Inland waterway network (number and frequency of service)	n/a	
Efficiency (Quality-Cost) of Ice-breaking	-		Number of operational stacking equipment	2		Quality-efficiency of road transport services	2,5	x
Efficiency (Quality-Cost) of Mooring	1,50		Online information	2	x			
Efficiency (Quality-Cost) of Pilotage	1,00		On-time information	1,5				
Efficiency (Quality-Cost) of Towage	1,50		Port safety	1,5				
Efficiency (Quality-Cost) of Waste reception facilities	1,50		Port security	1				
Efficiency of (un)loading operations	1,00		Response to innovativeness	2	x			
Feeder container services	1,50		Response to regulation changes	2	x			
Number of berths	1,50		Response to users' requests	2,5	x			
Number of operational gantry cranes	1,50		Services for containers (added value services, emptying-filling a container etc)	2	x			
On-time arrival	1,50		Storage capacity for containers	2	x			
On-time departure	1,50		Storage capacity for reefer containers	2,5	x			
Operational depth	2,00	x	Transparency of port charges	2	x			
Port operating hours	2,00	x		2				
Total length of quays	2,00	x		2,5				
Vessel-related port costs	1,50			1,5				

Table 7: High linkages with port performance for the container market indicators, users' perspectives

Deliverable 6.4

POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)

<i>Group and indicator</i>	<i>GAP</i>	<i>High Linkage</i>	<i>Group and indicator</i>	<i>GAP</i>	<i>High Linkage</i>	<i>Group and indicator</i>	<i>GAP</i>	<i>High Linkage</i>
"Ship to port" interface			"Port" interface			"Port to hinterland" interface		
Deep-sea Ro-Ro services	0,5		Accuracy of information	2	x	Connectivity to rail network (number and frequency of service)	1	
Efficiency (Quality-Cost) of Bunkering	2	x	Coordination of port community/stakeholders	2	x	Connectivity to road network	1,5	
Efficiency (Quality-Cost) of Dredging	-2		Efficiency of trailer-truck clearance procedure	2	x	Customs operating hours	1,5	
Efficiency (Quality-Cost) of Ice-breaking	1		Number of operational tractors	1		Hinterland intermodal connectivity	1,5	
Efficiency (Quality-Cost) of Mooring	0,5		Online information	2	x	Quality-efficiency of rail services	1	
Efficiency (Quality-Cost) of Pilotage	2	x	On-time information	1,5				
Efficiency (Quality-Cost) of Towage	1,5		Port safety	1				
Efficiency (Quality-Cost) of Waste reception facilities	1		Port security	1				
Efficiency of (un)loading operations	1		Response to innovativeness	1,5				
Feeder Ro-Ro services	0,5		Response to regulation changes	1,5				
Number of berths	1		Response to users' requests	2	x			
On-time arrival	1		Services for trailers-trucks	1,5				
On-time departure	1		Storage capacity for reefer trailers	1,5				
Operational depth	0,5		Storage capacity for trailers-trucks	1,5				
Port operating hours	1		Trailer-truck storage cost	1,5				
Total length of quays	1		Transparency of port charges	1,5				
Trailer (truck) handling cost	1,5							
Vessel-related port costs	2,5	x						

Table 8: High linkages with port performance for the Ro/Ro market indicators, users' perspectives

Deliverable 6.4

POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)

<i>Group and indicator</i>	<i>GAP</i>	<i>High Linkage</i>	<i>Group and indicator</i>	<i>GAP</i>	<i>High Linkage</i>	<i>Group and indicator</i>	<i>GAP</i>	<i>High Linkage</i>
"Ship to port" interface			"Port" interface			"Port to hinterland" interface		
Dry bulk cargoes handling cost	2,5	x	Accuracy of information	2	x	Connectivity to rail network (number and frequency of service)	2,5	x
Efficiency (Quality-Cost) of Bunkering	1,5		Added value services to dry bulk cargoes	1,5		Connectivity to road network	1,5	
Efficiency (Quality-Cost) of Dredging	3	x	Coordination of port community/stakeholders	2	x	Customs operating hours	2,5	x
Efficiency (Quality-Cost) of Ice-breaking	1,5		Dry bulk cargoes storage cost	2	x	Hinterland intermodal connectivity	1,5	
Efficiency (Quality-Cost) of Mooring	1,5		Efficiency of dry bulk cargo clearance procedure	1,5		Quality-efficiency of rail services	2,5	x
Efficiency (Quality-Cost) of Pilotage	1,5		Number of operational cranes	1,5				
Efficiency (Quality-Cost) of Towage	2	x	Online information	2	x			
Efficiency (Quality-Cost) of Waste reception facilities	1		On-time information	1,5				
Efficiency of (un)loading operations	2	x	Port safety	1				
Number of berths	1,5		Port security	1				
On-time arrival	1,5		Response to innovativeness	2	x			
On-time departure	1		Response to regulation changes	1,5				
Operational depth	2,5	x	Response to users' requests	2	x			
Port operating hours	1,5		Services for trucks (weighting etc)	1,5				
Total length of quays	2	x	Storage capacity for dry bulk cargoes	2	x			
Vessel-related port costs	2	x	Transparency of port charges	1,5				

Table 9: High linkages with port performance for the dry bulk market indicators, users' perspectives

Deliverable 6.4

POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)

<i>Group and indicator</i>	<i>GAP</i>	<i>High Linkage</i>	<i>Group and indicator</i>	<i>GAP</i>	<i>High Linkage</i>	<i>Group and indicator</i>	<i>GAP</i>	<i>High Linkage</i>
"Ship to port" interface			"Port" interface			"Port to hinterland" interface		
Efficiency (Quality-Cost) of Bunkering	0		Accuracy of information	0,5		Connectivity to pipelines	0	
Efficiency (Quality-Cost) of Dredging	0		Coordination of port community/stakeholders	-0,5		Connectivity to rail network (number and frequency of service)	0,5	
Efficiency (Quality-Cost) of Ice-breaking			Efficiency of liquid bulk cargo clearance procedure	0,5		Customs operating hours	0	
Efficiency (Quality-Cost) of Mooring	0,5		Number of operational pipelines	0		Hinterland intermodal connectivity	-0,5	
Efficiency (Quality-Cost) of Pilotage	1		Online information	0		Quality-efficiency of rail services	0,5	
Efficiency (Quality-Cost) of Towage	0,5		On-time information	0				
Efficiency (Quality-Cost) of Waste reception facilities	0,5		Port safety	0,5				
Efficiency of (un)loading operations	0,5		Port security	0				
Liquid bulk cargoes handling cost	1,5	x	Response to innovativeness	0,5				
Number of berths-mooring bases	1		Response to regulation changes	0,5				
On-time arrival	0		Response to users' requests	0				
On-time departure	0		Tank storage capacity	0				
Operational depth	1,5	x	Tank storage cost	1	x			
Port operating hours	0,5		Transparency of port charges	0,5				
Total length of the quays	0,5			0,5				
Vessel-related port costs	1,5	x		-0,5				

Table 10: High linkages with port performance for the liquid bulk market indicators, users' perspectives

Deliverable 6.4

POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)

<i>Group and indicator</i>	<i>GAP</i>	<i>High Linkage</i>	<i>Group and indicator</i>	<i>GAP</i>	<i>High Linkage</i>	<i>Group and indicator</i>	<i>GAP</i>	<i>High Linkage</i>
"Ship to port" interface			"Port" interface			"Port to hinterland" interface		
Break-bulk cargoes handling cost	1,5		Accuracy of information	1		Connectivity to rail network (number and frequency of service)	2	x
Efficiency (Quality-Cost) of Bunkering	1,5		Break-bulk storage cost	1,5		Connectivity to road network	2	x
Efficiency (Quality-Cost) of Dredging	-0,5		Coordination of port community/stakeholders	1,5		Customs operating hours	1,5	
Efficiency (Quality-Cost) of Ice-breaking	3,5	x	Efficiency of break-bulk cargo clearance procedure	1,5		Hinterland intermodal connectivity	1,5	
Efficiency (Quality-Cost) of Mooring	1		Number of handling equipment for break-bulk storage	2	x	Quality-efficiency of rail services	2	x
Efficiency (Quality-Cost) of Pilotage	1		Online information	1		Quality-efficiency of road transport services	1,5	
Efficiency (Quality-Cost) of Towing	1		On-time information	1				
Efficiency (Quality-Cost) of Waste reception facilities	1		Open storage capacity for break-bulk cargoes	1,5				
Efficiency of (un)loading operations	1,5		Port safety	0,5				
Number of berths	1,5		Port security	1				
Number of operational cranes	1,5		Response to innovativeness	0,5				
On-time arrival	1,5		Response to regulation changes	1				
On-time departure	1,5		Response to users requests	1,5				
Operational depth	1		Services to break-bulk cargoes (weighting, added value services, (un)packing etc.)	1,5				
Port operating hours	1,5		Transparency of port charges	1,5				
Total length of quays	1,5		Warehouse capacity for break-bulk cargoes	1				
Vessel-related port costs	1,5			1				

Table 11: High linkages with port performance for the break bulk market indicators, users' perspectives

Deliverable 6.4

POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)

<i>Group and indicator</i>	<i>GAP</i>	<i>High Linkage</i>	<i>Group and indicator</i>	<i>GAP</i>	<i>High Linkage</i>	<i>Group and indicator</i>	<i>GAP</i>	<i>High Linkage</i>
"Ship to port" interface			"Port" interface			"Port to hinterland" interface		
Baggage handling cost	-0,5		Accuracy of information	1		Connectivity to road network	0,5	
Cruise passengers handling cost	1	x	Coordination of port community/stakeholders	0		Customs operating hours	1	x
Efficiency (Quality-Cost) of Bunkering	0		Efficiency of passengers' clearance procedure	1		Efficiency of land transport modes	0,5	
Efficiency (Quality-Cost) of Dredging	0		Online information	0,5		Hinterland intermodal connectivity	0,5	
Efficiency (Quality-Cost) of Ice-breaking	1	x	On-time information	1				
Efficiency (Quality-Cost) of Mooring	0,5		Port safety	1				
Efficiency (Quality-Cost) of Pilotage	0,5		Port security	0,5				
Efficiency (Quality-Cost) of Towage	0,5		Response to innovativeness	0				
Efficiency (Quality-Cost) of Waste reception facilities	0,5		Response to regulation changes	1				
Efficiency of baggage handling operations	-0,5		Response to users' requests	0,5				
Efficiency of berth allocation system	0,5		Services to passengers	1,5	x			
Efficiency of passengers embarking/disembarking operations	1	x	Total available area for passengers	1				
Number of berths	0		Total parking areas	1,5	x			
Number of operational passenger terminals	0		Transparency of port charges	0,5				
On-time arrival	0,5							
On-time departure	0							
Operational depth	0,5							
Port operating hours	-0,5							
Total length of the quays	0							
Vessel-related port costs	0,5							

Table 12: High linkages with port performance for the cruise market indicators, users' perspectives

Now for the port's side approach, for which has been unavoidable not to deal with, the groups of indicators provide another viewpoint regarding the perception of port performance.

Given the fact that among the groups of indicators that the participant PAs at the exercise were provided with, they had the freedom to create their own custom surveys, an interesting connection can be extracted: the interrelation that can be noted among the most popular indicators with the notion of port performance, as such perceived by port management bodies.

The following (per market) tables depict the most popular indicators that have been selected from the (aggregated) sample of participant ports to build their surveys for the pilot exercise and provide us with the information on what -at least in a way- PAs consider essential when perceiving performance.

The indicators have been attributed with the percentage of popularity for each and this percentage has been then expressed as a "popularity range":

- Indicators that have been chosen from the 80% - 100% of the participant ports to construct their surveys are perceived as highly popular, therefore of *High* importance for ports,
- Indicators that have been chosen from the 60% - 79% of the participants ports to construct their surveys are perceived as moderately popular, therefore of *Medium* importance for ports,
- Indicators that have been chosen from the 40% - 59% of the participants ports to construct their surveys are perceived as poorly popular, therefore of *Low* importance for ports.

The tables per market follow to depict the strongest and the weakest links between port performance and the indicators, from the port management side. The columns that indicate "Selected by all PAs" are those indicators that gain 100% popularity.



Deliverable 6.4

POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)

<i>Group and indicator</i>	<i>Popularity among PAs</i>	<i>Selected by all PAs</i>	<i>Group and indicator</i>	<i>Popularity among PAs</i>	<i>Selected by all PAs</i>	<i>Group and indicator</i>	<i>Popularity among PAs</i>	<i>Selected by all PAs</i>
"Ship to port" interface			"Port" interface			"Port to hinterland" interface		
Container handling cost	High	x	Accuracy of information	High	x	Connectivity to road network	High	x
Deep-sea container services	Low		Container storage cost	High	x	Customs operating hours	High	x
Efficiency (Quality-Cost) of Bunkering	Medium		Coordination of port community/stakeholders	High	x	Hinterland intermodal connectivity	High	x
Efficiency (Quality-Cost) of Dredging	Low		Efficiency of container clearance procedure	High	x	Inland waterway network (number and frequency of service)	Low	
Efficiency (Quality-Cost) of Ice-breaking	Low		Number of operational stacking equipment	Medium		Quality-efficiency of road transport services	High	x
Efficiency (Quality-Cost) of Mooring	High	x	Online information	High	x	Quality-efficiency of the inland waterway services	Low	
Efficiency (Quality-Cost) of Pilotage	High	x	On-time information	High	x			
Efficiency (Quality-Cost) of Towing	High	x	Port safety	High	x			
Efficiency (Quality-Cost) of Waste reception facilities	High	x	Port security	High	x			
Efficiency of (un)loading operations	High	x	Response to innovativeness	High	x			
Feeder container services	High	x	Response to regulation changes	High	x			
Number of berths	High	x	Response to users' requests	High	x			
Number of operational gantry cranes	High	x	Services for containers (added value services, emptying-filling a container etc)	Medium				
On-time arrival	High	x	Storage capacity for containers	High	x			
On-time departure	High	x	Storage capacity for reefer containers	Medium				
Operational depth	High	x	Transparency of port charges	High	x			
Port operating hours	High	x						
Total length of quays	High	x						
Vessel-related port costs	High	x						

Table 13: Container market, popular indicators, PAs

Deliverable 6.4

POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)

<i>Group and indicator</i>	<i>Popularity among PAs</i>	<i>Selected by all PAs</i>	<i>Group and indicator</i>	<i>Popularity among PAs</i>	<i>Selected by all PAs</i>	<i>Group and indicator</i>	<i>Popularity among PAs</i>	<i>Selected by all PAs</i>
"Ship to port" interface			"Port" interface			"Port to hinterland" interface		
Deep-sea Ro-Ro services	Low		Accuracy of information	High		Connectivity to rail network (number and frequency of service)	Medium	
Efficiency (Quality-Cost) of Bunkering	Medium		Coordination of port community/stakeholders	High	x	Connectivity to road network	High	x
Efficiency (Quality-Cost) of Dredging	Low		Efficiency of trailer-truck clearance procedure	Medium		Customs operating hours	High	x
Efficiency (Quality-Cost) of Ice-breaking	Low		Number of operational tractors	Medium		Hinterland intermodal connectivity	High	x
Efficiency (Quality-Cost) of Mooring	High	x	Online information	High	x	Inland waterway network (number and frequency of service)		
Efficiency (Quality-Cost) of Pilotage	High	x	On-time information	High		Quality-efficiency of rail services	Medium	
Efficiency (Quality-Cost) of Towage	High	x	Port safety	High		Quality-efficiency of the inland waterway services		
Efficiency (Quality-Cost) of Waste reception facilities	High		Port security	High	x			
Efficiency of (un)loading operations	High	x	Response to innovativeness	High	x			
Feeder Ro-Ro services	Medium		Response to regulation changes	High				
Number of berths	High		Response to users' requests	High	x			
On-time arrival	High		Services for trailers-trucks	Medium				
On-time departure	Medium		Storage capacity for reefer trailers	Medium				
Operational depth	High		Storage capacity for trailers-trucks	Medium				
Port operating hours	High	x	Trailer-truck storage cost	Medium				
Total length of quays	High	x	Transparency of port charges	High	x			
Trailer (truck) handling cost	Medium							
Vessel-related port costs	Medium							

Table 14: Ro/Ro market, popular indicators, PAs

Deliverable 6.4

POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)

<i>Group and indicator</i>	<i>Popularity among PAs</i>	<i>Selected by all PAs</i>	<i>Group and indicator</i>	<i>Popularity among PAs</i>	<i>Selected by all PAs</i>	<i>Group and indicator</i>	<i>Popularity among PAs</i>	<i>Selected by all PAs</i>
"Ship to port" interface			"Port" interface			"Port to hinterland" interface		
Dry bulk cargoes handling cost	High	x	Accuracy of information	High	x	Connectivity to rail network (number and frequency of service)	High	
Efficiency (Quality-Cost) of Bunkering	High		Added value services to dry bulk cargoes	High		Connectivity to road network	High	x
Efficiency (Quality-Cost) of Dredging	Low		Coordination of port community/stakeholders	High	x	Customs operating hours	High	x
Efficiency (Quality-Cost) of Ice-breaking	Low		Dry bulk cargoes storage cost	High	x	Hinterland intermodal connectivity	High	x
Efficiency (Quality-Cost) of Mooring	High	x	Efficiency of dry bulk cargo clearance procedure	High	x	Inland waterway network (number and frequency of service)		
Efficiency (Quality-Cost) of Pilotage	High	x	Number of operational cranes	High		Quality-efficiency of rail services	High	
Efficiency (Quality-Cost) of Towage	High	x	Online information	High	x	Quality-efficiency of the inland waterway services		
Efficiency (Quality-Cost) of Waste reception facilities	High	x	On-time information	High	x			
Efficiency of (un)loading operations	High	x	Port safety	High	x			
Number of berths	High	x	Port security	High	x			
On-time arrival	High	x	Response to innovativeness	High	x			
On-time departure	High	x	Response to regulation changes	High	x			
Operational depth	High	x	Response to users' requests	High	x			
Port operating hours	High	x	Services for trucks (weighting etc)	High				
Total length of quays	High	x	Storage capacity for dry bulk cargoes	High	x			
Vessel-related port costs	High	x	Transparency of port charges	High	x			

Table 15: Dry bulk market, popular indicators, PAs

Deliverable 6.4

POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)

<i>Group and indicator</i>	<i>Popularity among PAs</i>	<i>Selected by all PAs</i>	<i>Group and indicator</i>	<i>Popularity among PAs</i>	<i>Selected by all PAs</i>	<i>Group and indicator</i>	<i>Popularity among PAs</i>	<i>Selected by all PAs</i>
"Ship to port" interface			"Port" interface			"Port to hinterland" interface		
Efficiency (Quality-Cost) of Bunkering	High		Accuracy of information	High	x	Connectivity to pipelines	High	x
Efficiency (Quality-Cost) of Dredging	Low		Coordination of port community/stakeholders	High	x	Connectivity to rail network (number and frequency of service)	High	x
Efficiency (Quality-Cost) of Ice-breaking	Low		Efficiency of liquid bulk cargo clearance procedure	High	x	Customs operating hours	High	x
Efficiency (Quality-Cost) of Mooring	High	x	Number of operational pipelines	High		Hinterland intermodal connectivity	High	x
Efficiency (Quality-Cost) of Pilotage	High	x	Online information	High	x	Inland waterway network (number and frequency of service)		
Efficiency (Quality-Cost) of Towage	High	x	On-time information	High	x	Quality-efficiency of rail services	High	x
Efficiency (Quality-Cost) of Waste reception facilities	High	x	Port safety	High	x	Quality-efficiency of the inland waterway services		
Efficiency of (un)loading operations	High	x	Port security	High	x			
Liquid bulk cargoes handling cost	High	x	Response to innovativeness	High	x			
Number of berths-mooring bases	High	x	Response to regulation changes	High	x			
On-time arrival	High	x	Response to users' requests	High	x			
On-time departure	High	x	Tank storage capacity	High				
Operational depth	High	x	Tank storage cost	High				
Port operating hours	High	x	Transparency of port charges	High	x			
Total length of the quays	High	x						
Vessel-related port costs	High	x						

Table 16: Liquid bulk market, popular indicators, PAs

Deliverable 6.4

POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)

<i>Group and indicator</i>	<i>Popularity among PAs</i>	<i>Selected by all PAs</i>	<i>Group and indicator</i>	<i>Popularity among PAs</i>	<i>Selected by all PAs</i>	<i>Group and indicator</i>	<i>Popularity among PAs</i>	<i>Selected by all PAs</i>
"Ship to port" interface			"Port" interface			"Port to hinterland" interface		
Break-bulk cargoes handling cost	High	x	Accuracy of information	High		Connectivity to rail network (number and frequency of service)	High	
Efficiency (Quality-Cost) of Bunkering	Medium		Break-bulk storage cost	High	x	Connectivity to road network	High	x
Efficiency (Quality-Cost) of Dredging	Low		Coordination of port community/stakeholders	High	x	Customs operating hours	High	x
Efficiency (Quality-Cost) of Ice-breaking	Low		Efficiency of break-bulk cargo clearance procedure	High	x	Hinterland intermodal connectivity	High	x
Efficiency (Quality-Cost) of Mooring	High	x	Number of handling equipment for break-bulk storage	High		Inland waterway network (number and frequency of service)		
Efficiency (Quality-Cost) of Pilotage	High	x	Online information	High	x	Quality-efficiency of rail services	High	
Efficiency (Quality-Cost) of Towage	High	x	On-time information	High	x	Quality-efficiency of road transport services	High	x
Efficiency (Quality-Cost) of Waste reception facilities	High		Open storage capacity for break-bulk cargoes	High	x	Quality-efficiency of the inland waterway services		
Efficiency of (un)loading operations	High	x	Port safety	High	x			
Number of berths	High	x	Port security	High	x			
Number of operational cranes	High		Response to innovativeness	High	x			
On-time arrival	High		Response to regulation changes	High				
On-time departure	High		Response to users' requests	High	x			
Operational depth	High	x	Services to break-bulk cargoes (weighting, added value services, (un)packing etc.)	High	x			
Port operating hours	High	x	Transparency of port charges	High	x			
Total length of quays	High	x	Warehouse capacity for break-bulk cargoes	High	x			
Vessel-related port costs	High	x						

Table 17: Break bulk market, popular indicators, PAs

Deliverable 6.4

POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)

<i>Group and indicator</i>	<i>Popularity among PAs</i>	<i>Selected by all PAs</i>	<i>Group and indicator</i>	<i>Popularity among PAs</i>	<i>Selected by all PAs</i>	<i>Group and indicator</i>	<i>Popularity among PAs</i>	<i>Selected by all PAs</i>
"Ship to port" interface			"Port" interface			"Port to hinterland" interface		
Baggage handling cost	High		Accuracy of information	High		Connectivity to road network	High	x
Cruise passengers handling cost	High	x	Coordination of port community/stakeholders	High	x	Customs operating hours	High	
Efficiency (Quality-Cost) of Bunkering	Medium		Efficiency of passengers' clearance procedure	High	x	Efficiency of land transport modes	High	x
Efficiency (Quality-Cost) of Dredging	Low		Online information	High	x	Hinterland intermodal connectivity	High	x
Efficiency (Quality-Cost) of Ice-breaking	Low		On-time information	High	x			
Efficiency (Quality-Cost) of Mooring	High	x	Port safety	High	x			
Efficiency (Quality-Cost) of Pilotage	High	x	Port security	High	x			
Efficiency (Quality-Cost) of Towing	High	x	Response to innovativeness	High	x			
Efficiency (Quality-Cost) of Waste reception facilities	High	x	Response to regulation changes	High				
Efficiency of baggage handling operations	High		Response to users' requests	High	x			
Efficiency of berth allocation system	High	x	Services to passengers	High	x			
Efficiency of passengers embarking/disembarking operations	High	x	Total available area for passengers	High	x			
Number of berths	High	x	Total parking areas	High	x			
Number of operational passenger terminals	High	x	Transparency of port charges	High	x			
On-time arrival	High							
On-time departure	High							
Operational depth	High	x						
Port operating hours	High	x						
Total length of the quays	High	x						
Vessel-related port costs	High							

Table 18: Cruise market, popular indicators, PAs

## **INTERRELATIONS AMONG INDICATORS: LINKS BETWEEN USERS' PERCEPTIONS AND OTHER PORTOPIA INDICATORS**

The PORTOPIA project's fundamental objective is to incorporate into the existing perspectives of port performance indicators' new and innovative approaches for the industry's stakeholders. All Work Packages have dealt with different approaches of indicators around the notion of port performance, namely (a) Market Trends and Structure indicators, (b) Socio-economic indicators, (c) Environmental and Safety indicators, (d) Logistics chain and operational performance indicators and (e) Users Perceptions of port performance.

The core of WP6 is in fact the development of sets of indicators attributed under the umbrella of a tool to capture port performance measurement from the perspective of the users. It is, however, quite lengthy and perhaps not that useful an attempt to try to find links with those criteria in a one-by-one matching effort. Moreover, the criteria selected for the measurement of port performance from the perspectives of the users already encompass a plethora of approaches for port performance measurement.

The interrelation, therefore with at least the majority of WPs in terms of indicators, is, in other words, self-evident.

We can, however, interlink more specifically the relationship with the several approaches mentioned above as being more and less related; The more related, hence, are the indicators under the groups of *Market Trends and Structure* and *Logistics Chain and Operational Performance* indicators with those included in the users' perceptions measurement. For example, indicators included in the users' perceptions groups referring to: *Hinterland intermodal connectivity*, or, *Efficiency of land transport modes* can be perfectly matched with the *Logistics Chain and Operational Performance* indicators' group, and, likewise, such indicators as *Coordination of port community/stakeholders* and *Coordination of port community/stakeholders* match with those included under the approach of *Governance*.

Little to non-existent, is, however, the relevance between indicators used to measure port performance under the *Socio-economic* approach, since this approach is not quite close to what the port users could feel like important for the services they enjoy.

The approach adopted in WP6 can be a valuable input to the other Work Packages of PORTOPIA as the output of the port users' perception on port performance can be an input or a supplement to the other notions of port performance indicators examined in the various Work Packages. The WP6 results and/or the methodological framework can be used for a more holistic approach of port performance from a logistics, environmental, social etc. point of view by bringing into the exercise the notion of port user perception.

## **SUGGESTIONS ON THE USE OF THE ICT TOOL**

One of the elements dealing with the present deliverable is the exploitation of benchmarking suggestions across port performance indicators. The twofold approach has been revealed rather inevitable in our analysis, that is to say, the involvement of port management at the structure of the surveys with their unique selection of indicators has unavoidably provided an aspect of what they consider important when measuring port performance.

The present chapter therefore deals with a first exploration of benchmarking the already measured users' perceptions -as per the pilot exercise- and reveal the matching links with the perspectives of port management entities.

## **LINKS BETWEEN USERS' PERCEPTIONS AND REVEALED PORT MANAGEMENT PERCEPTIONS: INTERRELATIONS BETWEEN INDICATORS**

At the first section of the present deliverable, aiming to outline port performance in general through the work done in practice, we broke it down to two elements; One refers to the core of WP6, the perception of the users on port performance and the gaps identified during the pilot phase. These gaps unveil the indicators for which the pilot ports should focus on, based on the difference between the rating of importance and satisfaction by the port users. Tables 7-12 depict those linkages.

Another has been the revealed priorities for port management bodies, as such extracted by a range of selection (popularity) of indicators. Tables 14-18 depict a certain range of importance of those indicators for ports, showing a common ground for the PAs participated in the pilot phase, based on the selection of the indicators

It is interesting, therefore, to explore the linkage between those highly chosen indicators by ports and the impact that these had for the users. This information although is rather not that robust respecting the reality that "not one size fits all", provides however with a better understanding of the point where perceptions might possibly meet. The following tables, provide these associations by benchmarking what has been explored in section 1 of the present.

To achieve this, we juxtapose the indicators for each market and evaluate a *matching point*: the popularity of indicators for PAs as such measured in percentages, is juxtaposed with the high linkages referring to the users' perceptions. These indicators that coincide are those with the *perfect match*.

For some markets, the *perfect match* approach provides more fruitful results as a certain number of indicators is within the range of that match, such as the Container, Liquid and Dry bulk markets. The Cruise and the Break Bulk markets reveal a very poor picture in this benchmarking suggestion.

The perfect match unveils those indicators that have been selected by all the PAs of the sample and at the same time they have the biggest gaps between importance and satisfaction for the port users, meaning that are the indicators in which PA's should focus on in order to improve their performance. The results, i.e. the perfect match, has a double reading. These indicators selected by the PA's might considered to be the most important for them in terms of evaluating the port user's port performance, but at the same time these indicators have a negative impact on the total port performance based on the port user's evaluations. All in all, these indicators might be important for the PAs but also are the indicators that the PAs must focus on in order to take corrective actions aiming at reducing the gap.



Deliverable 6.4

POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)

<i>Group and indicator</i>	<i>Perfect Match</i>	<i>Group and indicator</i>	<i>Perfect Match</i>	<i>Group and indicator</i>	<i>Perfect Match</i>
"Ship to port" interface		"Port" interface		"Port to hinterland" interface	
Container handling cost	x	Accuracy of information	x	Connectivity to road network	x
Deep-sea container services		Container storage cost	x	Customs operating hours	x
Efficiency (Quality-Cost) of Bunkering		Coordination of port community/stakeholders		Hinterland intermodal connectivity	x
Efficiency (Quality-Cost) of Dredging		Efficiency of container clearance procedure	x	Inland waterway network (number and frequency of service)	
Efficiency (Quality-Cost) of Ice-breaking		Number of operational stacking equipment		Quality-efficiency of road transport services	x
Efficiency (Quality-Cost) of Mooring		Online information	x	Quality-efficiency of the inland waterway services	
Efficiency (Quality-Cost) of Pilotage		On-time information			
Efficiency (Quality-Cost) of Towage		Port safety			
Efficiency (Quality-Cost) of Waste reception facilities		Port security			
Efficiency of (un)loading operations		Response to innovativeness	x		
Feeder container services		Response to regulation changes	x		
Number of berths		Response to users' requests	x		
Number of operational gantry cranes		Services for containers (added value services, emptying-filling a container etc)			
On-time arrival		Storage capacity for containers	x		
On-time departure		Storage capacity for reefer containers			
Operational depth	x	Transparency of port charges	x		
Port operating hours	x				
Total length of quays	x				
Vessel-related port costs					

Table 19: Container market matching range

Deliverable 6.4

POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)

<i>Group and indicator</i>	<i>Perfect Match</i>	<i>Group and indicator</i>	<i>Perfect Match</i>	<i>Group and indicator</i>	<i>Perfect Match</i>
"Ship to port" interface		"Port" interface		"Port to hinterland" interface	
Deep-sea Ro-Ro services		Accuracy of information	x	Connectivity to rail network (number and frequency of service)	
Efficiency (Quality-Cost) of Bunkering		Coordination of port community/stakeholders	x	Connectivity to road network	x
Efficiency (Quality-Cost) of Dredging		Efficiency of trailer-truck clearance procedure		Customs operating hours	x
Efficiency (Quality-Cost) of Ice-breaking		Number of operational tractors		Hinterland intermodal connectivity	x
Efficiency (Quality-Cost) of Mooring		Online information	x	Inland waterway network (number and frequency of service)	
Efficiency (Quality-Cost) of Pilotage	x	On-time information		Quality-efficiency of rail services	
Efficiency (Quality-Cost) of Towage		Port safety		Quality-efficiency of the inland waterway services	
Efficiency (Quality-Cost) of Waste reception facilities		Port security			
Efficiency of (un)loading operations		Response to innovativeness			
Feeder Ro-Ro services		Response to regulation changes			
Number of berths		Response to users' requests	x		
On-time arrival		Services for trailers-trucks			
On-time departure		Storage capacity for reefer trailers			
Operational depth		Storage capacity for trailers-trucks			
Port operating hours		Trailer-truck storage cost			
Total length of quays		Transparency of port charges			
Trailer (truck) handling cost					
Vessel-related port costs					

Table 20: Ro/ro market matching range

Deliverable 6.4

POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)

<i>Group and indicator</i>	<i>Perfect Match</i>	<i>Group and indicator</i>	<i>Perfect Match</i>	<i>Group and indicator</i>	<i>Perfect Match</i>
"Ship to port" interface		"Port" interface		"Port to hinterland" interface	
Dry bulk cargoes handling cost	x	Accuracy of information	x	Connectivity to rail network (number and frequency of service)	x
Efficiency (Quality-Cost) of Bunkering		Added value services to dry bulk cargoes		Connectivity to road network	
Efficiency (Quality-Cost) of Dredging	x	Coordination of port community/stakeholders	x	Customs operating hours	x
Efficiency (Quality-Cost) of Ice-breaking		Dry bulk cargoes storage cost	x	Hinterland intermodal connectivity	
Efficiency (Quality-Cost) of Mooring		Efficiency of dry bulk cargo clearance procedure		Inland waterway network (number and frequency of service)	
Efficiency (Quality-Cost) of Pilotage		Number of operational cranes		Quality-efficiency of rail services	x
Efficiency (Quality-Cost) of Towage	x	Online information	x	Quality-efficiency of the inland waterway services	
Efficiency (Quality-Cost) of Waste reception facilities		On-time information			
Efficiency of (un)loading operations	x	Port safety			
Number of berths		Port security			
On-time arrival		Response to innovativeness	x		
On-time departure		Response to regulation changes			
Operational depth	x	Response to users' requests	x		
Port operating hours		Services for trucks (weighting etc)			
Total length of quays	x	Storage capacity for dry bulk cargoes	x		
Vessel-related port costs	x	Transparency of port charges			

Table 21: Dry bulk market matching range

Deliverable 6.4

POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)

<i>Group and indicator</i>	<i>Perfect Match</i>	<i>Group and indicator</i>	<i>Perfect Match</i>	<i>Group and indicator</i>	<i>Perfect Match</i>
"Ship to port" interface		"Port" interface		"Port to hinterland" interface	
Efficiency (Quality-Cost) of Bunkering		Accuracy of information		Connectivity to pipelines	
Efficiency (Quality-Cost) of Dredging		Coordination of port community/stakeholders		Connectivity to rail network (number and frequency of service)	x
Efficiency (Quality-Cost) of Ice-breaking		Efficiency of liquid bulk cargo clearance procedure		Customs operating hours	
Efficiency (Quality-Cost) of Mooring		Number of operational pipelines		Hinterland intermodal connectivity	
Efficiency (Quality-Cost) of Pilotage		Online information		Inland waterway network (number and frequency of service)	
Efficiency (Quality-Cost) of Towage		On-time information		Quality-efficiency of rail services	x
Efficiency (Quality-Cost) of Waste reception facilities		Port safety		Quality-efficiency of the inland waterway services	
Efficiency of (un)loading operations		Port security			
Liquid bulk cargoes handling cost	x	Response to innovativeness			
Number of berths-mooring bases		Response to regulation changes			
On-time arrival		Response to users' requests			
On-time departure		Tank storage capacity			
Operational depth	x	Tank storage cost	x		
Port operating hours		Transparency of port charges			
Total length of the quays					
Vessel-related port costs	x				

Table 22: Liquid bulk market matching range

<i>Group and indicator</i>	<i>Perfect Match</i>	<i>Group and indicator</i>	<i>Perfect Match</i>	<i>Group and indicator</i>	<i>Perfect Match</i>
"Ship to port" interface		"Port" interface		"Port to hinterland" interface	
Break-bulk cargoes handling cost		Accuracy of information		Connectivity to rail network (number and frequency of service)	x
Efficiency (Quality-Cost) of Bunkering		Break-bulk storage cost		Connectivity to road network	x
Efficiency (Quality-Cost) of Dredging		Coordination of port community/stakeholders		Customs operating hours	
Efficiency (Quality-Cost) of Ice-breaking		Efficiency of break-bulk cargo clearance procedure		Hinterland intermodal connectivity	
Efficiency (Quality-Cost) of Mooring		Number of handling equipment for break-bulk storage	x	Inland waterway network (number and frequency of service)	
Efficiency (Quality-Cost) of Pilotage		Online information		Quality-efficiency of rail services	x
Efficiency (Quality-Cost) of Towing		On-time information		Quality-efficiency of road transport services	
Efficiency (Quality-Cost) of Waste reception facilities		Open storage capacity for break-bulk cargoes		Quality-efficiency of the inland waterway services	
Efficiency of (un)loading operations		Port safety			
Number of berths		Port security			
Number of operational cranes		Response to innovativeness			
On-time arrival		Response to regulation changes			
On-time departure		Response to users' requests			
Operational depth		Services to break-bulk cargoes (weighting, added value services, (un)packing etc.)			
Port operating hours		Transparency of port charges			
Total length of quays		Warehouse capacity for break-bulk cargoes			
Vessel-related port costs					

Table 23: Break bulk market matching range

Deliverable 6.4

POLICY LINKAGES, INTERRELATIONS AND BENCHMARKING SUGGESTIONS (PORT USERS PERCEPTIONS INDICATORS)

<i>Group and indicator</i>	<i>Perfect Match</i>	<i>Group and indicator</i>	<i>Perfect Match</i>	<i>Group and indicator</i>	<i>Perfect Match</i>
"Ship to port" interface		"Port" interface		"Port to hinterland" interface	
Baggage handling cost		Accuracy of information		Connectivity to road network	
Cruise passengers handling cost	x	Coordination of port community/stakeholders		Customs operating hours	x
Efficiency (Quality-Cost) of Bunkering		Efficiency of passengers' clearance procedure		Efficiency of land transport modes	
Efficiency (Quality-Cost) of Dredging		Online information		Hinterland intermodal connectivity	
Efficiency (Quality-Cost) of Ice-breaking		On-time information			
Efficiency (Quality-Cost) of Mooring		Port safety			
Efficiency (Quality-Cost) of Pilotage		Port security			
Efficiency (Quality-Cost) of Towage		Response to innovativeness			
Efficiency (Quality-Cost) of Waste reception facilities		Response to regulation changes			
Efficiency of baggage handling operations		Response to users' requests			
Efficiency of berth allocation system		Services to passengers	x		
Efficiency of passengers embarking/disembarking operations	x	Total available area for passengers			
Number of berths		Total parking areas	x		
Number of operational passenger terminals		Transparency of port charges			
On-time arrival					
On-time departure					
Operational depth					
Port operating hours					
Total length of the quays					
Vessel-related port costs					

Table 24: Cruise market matching rang

The ICT tool can be a valuable tool for the PAs in order to evaluate their performance from the port users' point of view and taking the necessary actions to improve it. Also the tool can be used for the evaluation of a new process, infrastructure etc in a port, as the exercise can run even for one and only indicator for which the port users' they will provide their feedback.

Also, the ICT tool can be used for a variety of purposes, from a Port Authority. Apart from using the ICT tool with an eye on port users, a PA can use the tool for performing evaluation processes internally. For example, running an exercise on the PA's employees' regarding their perception on the operation and the performance of the port. The tool can be used for any purpose aiming at evaluating a decision, process, infrastructure or service in a port, being a useful component in a decision making process.

The ICT tool can also be used for purposes dealing with the port-city relations, through its application for evaluating the society's perception on the various roles that a port plays. Such evaluations can measure the acceptance of a port and of port activities by the local society or to be used for conducting regular polls aiming at exploring the society's perceptions. By using the appropriate indicators the ICT tool can be adopted to serve the societal integration of ports, which is a topic that shapes the contemporary agenda in the European port industry. The importance of the societal integration of ports is evident in the ESPO award, an initiative aiming at recognizing and disseminating good practices in European ports for the enhancement of city port relations. Also several sustainability issues that are interlinked with the society are at the core of relevant port policies and as such the ICT tool can be used in a modified version in order to capture the society's perception on several port performance aspects.

## **EXPLORING THE RELATION BETWEEN THE USERS PERCEPTIONS EXERCISE AND INDICATORS WITH POLICY OBJECTIVES**

### **CONTRIBUTION TO THE ULTIMATE PROJECT OBJECTIVE: A EUROPEAN PORTS OBSERVATORY**

As a part of the PORTOPIA project, Work Package 6 aims to endorse the core objective of the project, the creation of a European Ports Observatory, with the highest possible consensus from industry stakeholders.

We are, from the results extracted as per Deliverable 6.3, convinced that the results with the form of the "State of the European Ports" report, can pragmatically contribute to the improvement of the efficiency of resources and the effectiveness of the European Port System. Moreover, several testimonials from PAs provide the feedback that, the ICT tool of Users Perceptions has been welcomed with interest and curiosity and the port management bodies have been really eager for the results.

The evaluation of port users' perception on port performance can and must be part of a European Ports Observatory as it is a set of indicators that clearly reflects the satisfaction of port users' by engaging their view on port performance issues, instead of relying almost exclusively on port generated data. Work Package 6 brings in the missing link in the existing port performance measurement initiatives, towards a more holistic approach where the users can also interact and rate the various attributes of port performance. The results of the work package contributes in the dialogue regarding port performance,

going beyond the typical efficiency approach and bringing into the scene, the port users' perception on port performance, thus examining the issue from an effectiveness point of view.

The development of a European Ports Observatory is the first step towards the creation of a level playing field in the European port industry at least regarding the creation of a common ground for port performance measurement. Being a vital part of a port's competitiveness, performance is at the core of port strategies, but usually the approaches used are different, depending on each port peculiar characteristics, needs and requests, and more over are isolated, meaning that are not unveiled to the public and are not used for, at least, an aggregated approach towards port performance in the modern port industry. The proposed ICT tool, its flexibility and adaptation and the proposed framework can be used for the development of a widely accepted approach towards the measurement of, at least, port users' perception on port performance.

The European Ports Observatory will be the point of reference for the European port industry as regards, at least in a first phase, port performance issues. The ability to elaborate port performance data in an aggregated way can create the first benchmarking tool for European ports, overcoming the different approaches that currently used for port performance measurement.

Finally, one could think of an ECOPORTS-like certification: e.g. if a port runs the campaign three years in a row leading to scientifically valid results based on a minimum number of criteria, it could get certification from ESPO/PORTOPIA.

## **A NON-UNIFIED APPROACH AND AUTONOMY ENHANCER**

The work accomplished in WP6, along with the wide range of indicators selected and the results from the "State of European Ports" report strengthen a special element that has recently gained a lot of support from the EU policy initiatives for ports: That a no "one size fits all" approach is essential when it comes for the European port system. The per market / per port approach given by the Users Perceptions ICT Tool enhances this support. Moreover, the whole approach favours the fact that the choice of indicators is fully at the hands of the individual ports, fact that shifts a bit the balance in policy discussion more towards the ports themselves.

These features highlights the flexibility of the ICT tool, enhancing its adaptability in every port in Europe operating in one of the six port market segments that have been examined in the WP6. This flexibility allows for a more specialized approach in every port, thus embracing the principle that each port has unique characteristics and that the "one size fits all approach" can't be applied.

## **ENHANCING PORTS' QUALITY**

There has been a lot of dialogue done lately regarding the improving of quality of port services and the adoption of sustainable development goals. More recently, a coalition of thirty European transport organisations has launched a campaign for a "strong connecting Europe Facility for the next financial period 2021-2028". The slogan is "*More EU budget for transport, the best investment plan for Europe*", a move that reveals an urgent need for quality adjustments within a lack of finance resources. In addition, the



international port community is taking up the challenge towards a more sustainable port industry, by setting up the “World Ports Sustainability Program”.

Ports’, as any other commercial entity, are seeking for quality in order to increase their competitiveness and at the end, their viability in a strongly competitive environment. Port performance, on the other hand, is an attribute of quality and as such, exploiting the measurement of port performance is essential for understanding the notion of quality.

The Users Perceptions are a strong link in the enhancement of quality of port services as a strategic tool, along with the interoperability of the whole platform. The commercial nature of it in the near future can be therefore endorsed. The integration of the measurement of port users’ perceptions on port performance in a PA’s Total Quality Management (TQM) system, can offer additional perspectives regarding port’s effectiveness and quality schemes.