Ministry of Oceans and Fisheries

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Port Infrastructure Sufficiency Index

2022. 11. 23.

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1. Introduction

Development of Index

- The first stage of index
  - ✓ The first project begun to develop the index
  - ✓ Duration : 2018.08.14~2019.12.31

- Objectives
  - ✓ Development and Evaluation of Index on Domestic Level of Korea
    * Data Collection and Evaluation, Improvement Plan of Port Infrastructure, etc.
  - ✓ Index Development on Global Level
  - ✓ International Advisory Committees
    * UNCTAD, IAPH, IMO, World Bank, WTO, WMU, WEF, GATF, GSF, IAME, ICS, UN-ECLAC, UN-ESCAP, etc.

1. Introduction

Development of Index

- The second stage of index
  - ✓ The second project for revising the index and doing pilot project
  - ✓ Duration : 2020.01.01~2022.12.31

- Objectives
  - ✓ Continue to evaluate port infrastructure sufficiency based on the index on domestic Level of Korea
    * Data Collection and Evaluation, Improvement Plan of Port Infrastructure, etc.
  - ✓ Revise the Index on Global Level
    * Quantitative indicators to Qualitative indicators based on survey

2. Port Infrastructure Sufficiency Index

2. Port Infrastructure Sufficiency Index

Target Ports of the Pilot Project

- Global Major Container Ports
  - ✓ About 50 container ports based on throughput, location, etc.
  - ✓ According to the total throughput of container port in 2019 : Port of Shanghai ~ Port of Felixtowe
    * World's top 50 ports takes more than 62% of the total container throughput in the World
  - ✓ In addition, Ports of Melbourne(63), Durban(72), and Sydney(76) are added to balance on continental level

〈 Container Throughput of the World's Top 50 Ports (2019 Lloyd's List) 〉 '000TEUs

Rank	Port	Nation	Continent	Throughput
1	Shanghai	China	Asia	43,303
2	Singapore	Singapore	Asia	37,195
...				
...				
50	Felixstowe	UK	Europe	3,584
63	Melbourne	Australia	Oceania	2,967
72	Durban	S. Africa	S. Africa	2,769
76	Sydney	Australia	Oceania	2,572

2. Port Infrastructure Sufficiency Index

Pilot Project

- Indicators of Index
  - ✓ Initial indicators(11) : Punctuality(3), Eco-friendly Environment(2), Digitalization(6), etc.
  - ✓ Facing to difficulties collecting data sets
  - ✓ Revised indicators(10) : Punctuality(3), Safety and Security(3), Digitalization(4), etc.

〈 Indicators of Index 〉

<table>
<tr><th colspan="6">Indicators</th></tr>
<tr><th colspan="2">Initial</th><th colspan="4">Revised</th></tr>
<tr><td rowspan="3">Punctuality</td><td>Annual Average Waiting Time of Vessel(AWT)</td><td rowspan="3">Punctuality</td><td colspan="3">Annual Average Waiting Time of Vessel(AWT)</td></tr>
<tr><td>Annual Average Navigating Time of vessel(ANT)</td><td colspan="3">Annual Average Turn-over Time of vessel(ATT)</td></tr>
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<tr><td rowspan="2">Eco-friendly Environment</td><td>Air Quality(AQ)</td><td rowspan="2">Safety & Security</td><td>Equipments and Facilities</td><td colspan="2">Physical Equipments / Technology Adoption / Information Security / Maintenance</td></tr>
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<tr><td rowspan="6">Digitalization</td><td>Electric Power for Vessels(EPV)</td><td rowspan="6">Digitalization Level</td><td>Management</td><td colspan="2">Investment / Plan / Organization / Monitoring</td></tr>
<tr><td>Port Management Information System(P-MIS)</td><td rowspan="3">Indirect</td><td colspan="2">National Strategy</td></tr>
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2. Port Infrastructure Sufficiency Index

Pilot Project

- Safety and Security
  - ✓ Consist of three sub-categories : Equipments and Facilities(4), Human Factors(3), Management(4)
  - ✓ Methodology : 5 levels(Strongly Disagree – Disagree – Neither agree or disagree – Agree – Strongly Agree)

〈 Evaluation Factors of Safety and Security 〉

Factors		Description	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
Equipments & Facilities	Physical Equipments	The safety and security of facilities(equipments) such as CCTV, fence, light, or sensor at port area are well equipped.	①	②	③	④	⑤
	Technology Adoption	The latest technologies and equipment related to safety and security are being introduced.	①	②	③	④	⑤
	Information Security	The information security system of port is well established.	①	②	③	④	⑤
	Maintenance	Periodic inspection and maintenance of equipment and facilities are being performed.	①	②	③	④	⑤
Human Factors	Knowledge	Personnel of safety and security have specialized knowledge.	①	②	③	④	⑤
	Sufficiency	Safety and security personnel are adequate for the size of the terminal(port).	①	②	③	④	⑤
	Education & Training	Education and training of safety and security for personnel(workers) is conducted regularly.	①	②	③	④	⑤
Management	Investment	Investments in safety and security are being made sufficiently.	①	②	③	④	⑤
	Plan	An emergency plan for safety and security accidents is well established, and members(workers) are familiar with the plan.	①	②	③	④	⑤
	Organization	There is an organization of emergency response for safety and security incidents.	①	②	③	④	⑤
	Monitoring	Supervision and monitoring of compliance with safety and security regulations at terminal(port) are well established.	①	②	③	④	⑤

2. Port Infrastructure Sufficiency Index

Pilot Project

- Digitalization
  - ✓ Divide into two groups : Indirect(5) and Direct(6)
  - ✓ Methodology : 5 levels(Very Low – Low – Middle – High – Very High)

〈 Evaluation Factors of Digitalization 〉

Group	Factors		Description	No	Yes				
					1 (Very Low)	2 (Low)	3 (Mid.)	4 (High)	5 (Very High)
Indirect (Context, enabling framework, soft infrastructure, etc.)	National Strategy	National Digitalization Strategy	National strategy or related policy level of digitalization						
		National Port Digitalization Strategy	National strategy or related policy level of digitalization for port						
	Human Capital	IT Education	IT education level of citizen						
		IT Capabilities	Citizen's capability level of IT usage						
		IT Training & Education Opportunities	Education circumstance and infrastructure level of IT in nation						
Direct (Hardware, IT tools and technology, etc.)	Functionality	Communications Infrastructure	Infrastructure level of data communication through wireless in port (see Apx. 1)						
		Information of Status	Information (location, status, etc.) provision level of resources such as facility, equipment, etc. in port. (see Apx. 2)						
		On-time of Information	Information (location, status, etc.) provision frequency of resources such as facility, equipment, etc. in port. (see Apx. 3)						
		Operating System	Levels of operations and systems (TOS, etc.) in terms of port operations (see Apx. 4)						
		Investment	Investment level of technology in the port sector compared to other SOC sectors (choose 3 if similar to other SOC sectors)						
	Technology		The level of technology being utilized within the port (see Apx.5)						

2. Port Infrastructure Sufficiency Index

Pilot Project Result : Punctuality

- Using AIS data sets to measure times related to container vessels
- Measurement Criteria of times at port area
  - ✓ Turn-around Time : entering to a port line ~ leaving from the port line
  - ✓ Berthing Time : completing to berth ~ leaving from the berth
  - ✓ Waiting Time : Turn-around time minus Berthing Time
- Sampling
  - ✓ Top 20 ports of Global Container Throughput(add Incheon and Gwangyang)

    * The case of LA/LB Ports is consolidated

Port	Throughput('000TEUs)
Shanghai	43,503
Singapore	36,871
Ningbo	28,709
Guangzhou	23,186
Qingdao	22,040
Busan	21,824
Tianjin	18,351
Hong Kong	17,969
Rotterdam	14,349
Port Kelang	13,244
Antwerp	12,023
Xiamen	11,463
Tanjung Pelepas	9,846
Saigon	9,724
Kaohsiung	9,622
LALB	16,874
Hamburg	8,522
Laem Chabang	7,598
Incheon	3,249
Gwangyang	2,151

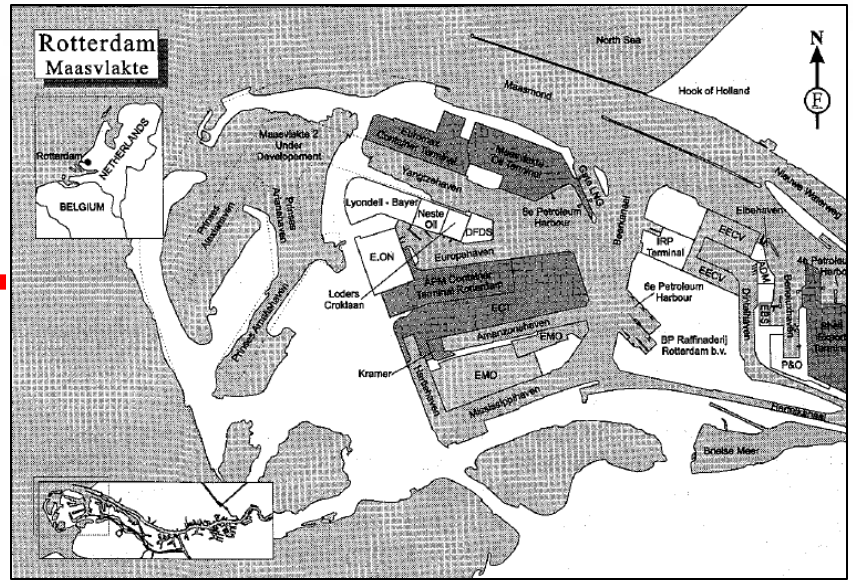
2. Port Infrastructure Sufficiency Index

Pilot Project Result : Punctuality

- Setting up coordinates of port line and berth for each port by using AIS data and google map
  - ✓ First, analyzing a port line and berth location by using IHSmarkit's Port and Terminal Guide and AIS Data
  - ✓ Then coordinating areas of port and berth on the Google map
  - ✓ However, since IHSmarkit's data sources do not include all berth data sets, satellite view of google map was used
  - ✓ Also, some ports with no official data sets, AIS data sets were used to coordinates of port lines

<AIS Data>

<Port and Terminal Guide>



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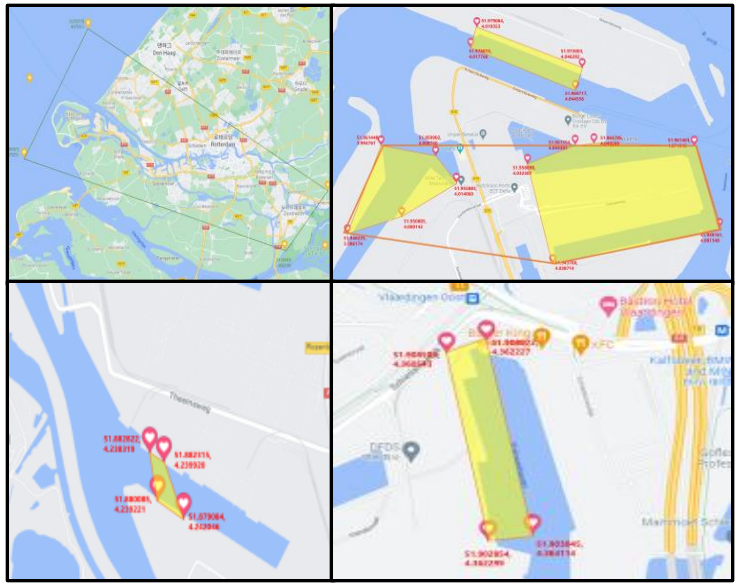
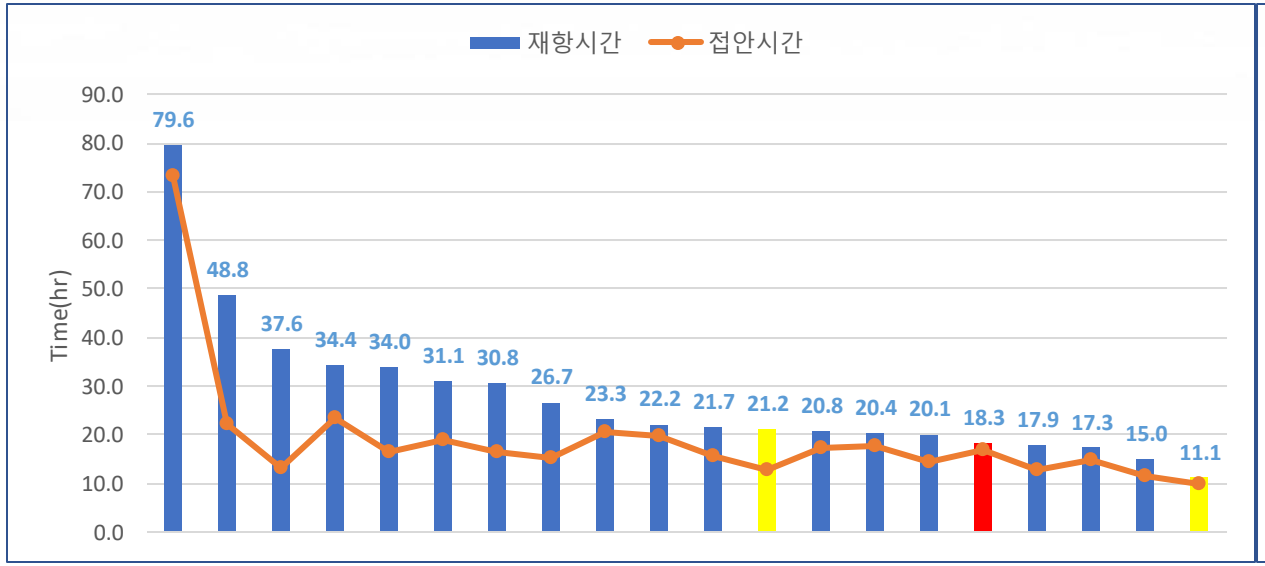


2. Port Infrastructure Sufficiency Index

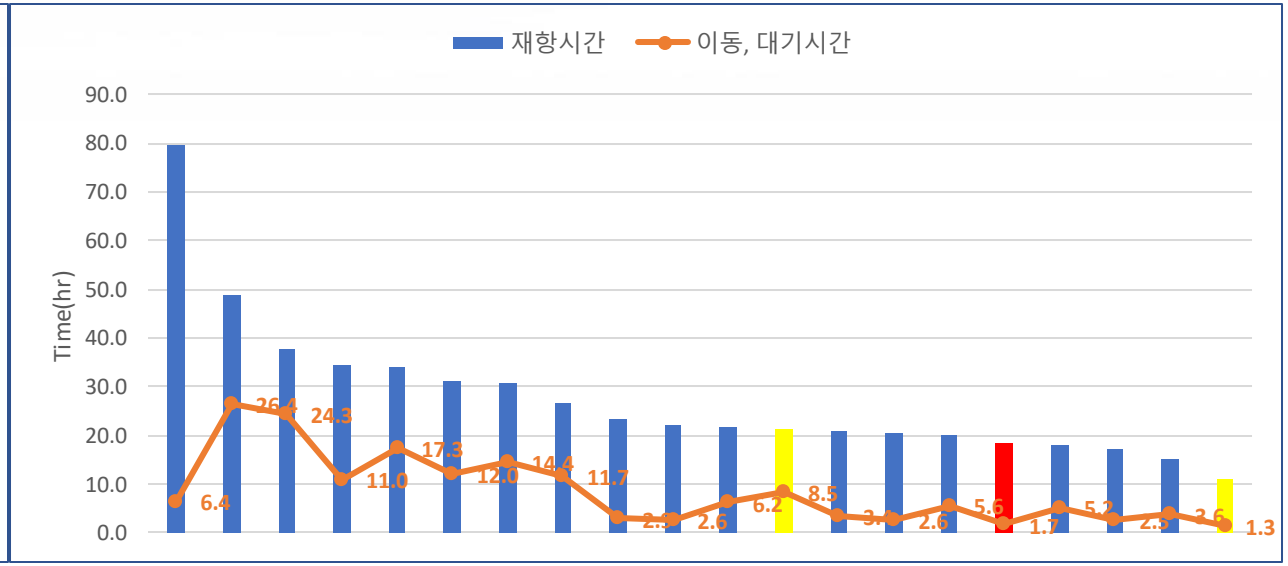
Pilot Project Result : Punctuality

- As a result, average turn-around time of sample container ports is 27.6hr and average berthing time is 19.1hr
  - ✓ Busan Port : average turn-around time is 18.3hr and average berthing time is16.7hr
    * Average waiting time including navigation(pilot) time from anchorage(pilot point) to berth is 5.6hr

<Average Turn-around Time and Berthing Time(all vessels)>



<Average Turn-around Time and Waiting Time(all vessels)>

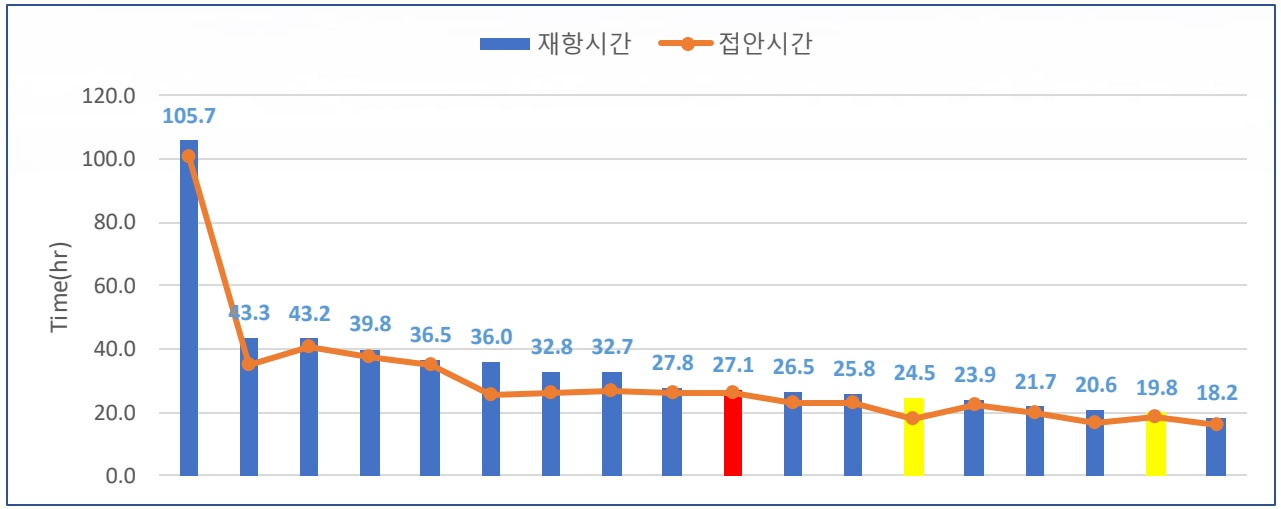


2. Port Infrastructure Sufficiency Index

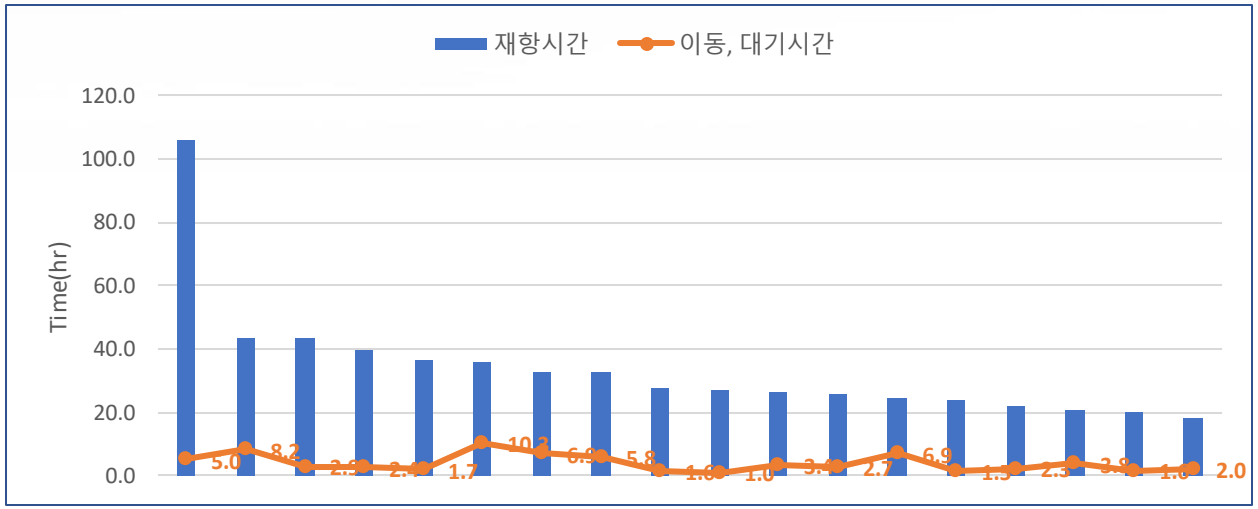
Pilot Project Result : Punctuality

- Analyzing for a large container vessels(+8,000TEU)
  - ✓ Average turn-around time is 33.7hr, average berthing time is 29.8hr, and average waiting time is 3.9hr

<Average Turn-around Time and Berthing Time(+8,000TEU)>



<Average Turn-around Time and Waiting Time(+8,000TEU)>

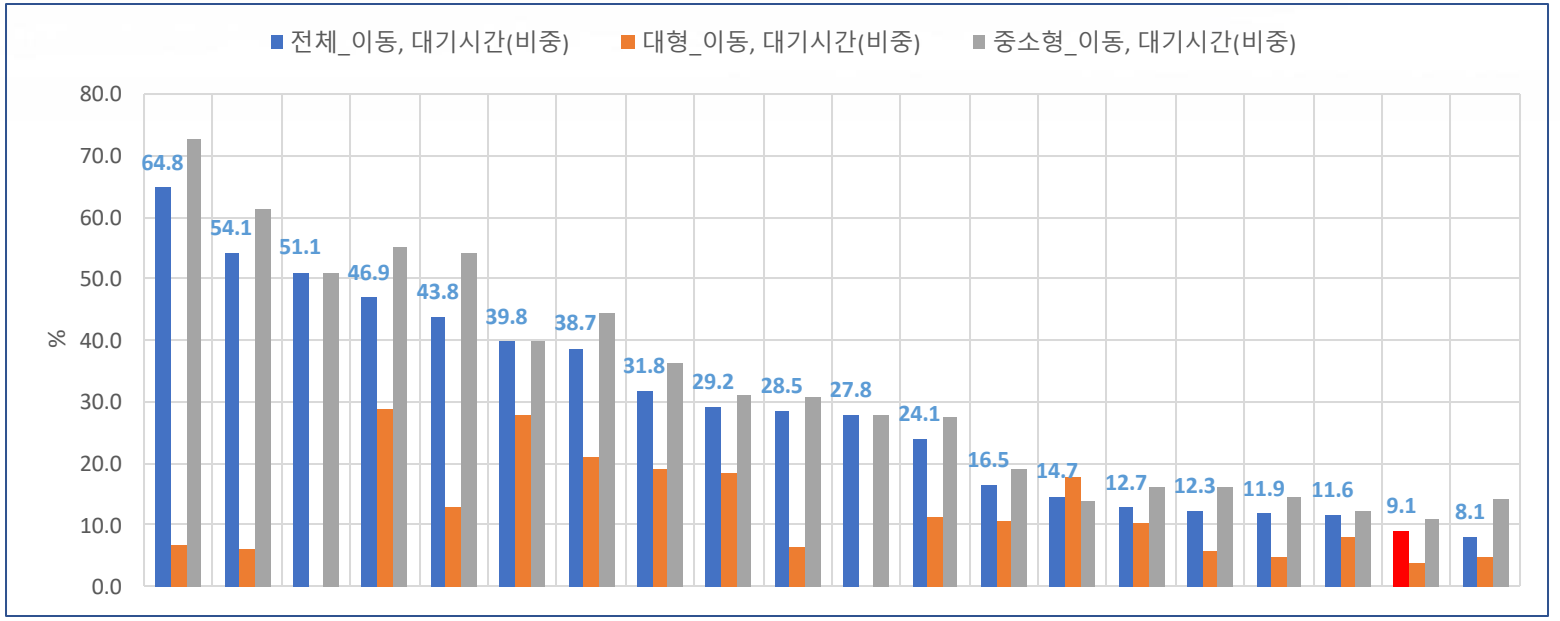


2. Port Infrastructure Sufficiency Index

Pilot Project Result : Punctuality

- Comparing to the vessels larger than 8,000TEU, waiting time is shorter than the other group
  - ✓ Case of Busan Port : Ratio of Waiting Time for +8,00TEU is 3.7% while the other group is 10.8%
    * Relatively higher berth productivity, better service quality to the major shipping companies, etc.
    * Busan New Port has higher waiting time than North Port where normally handles feeders

<Ratio of Waiting Time>

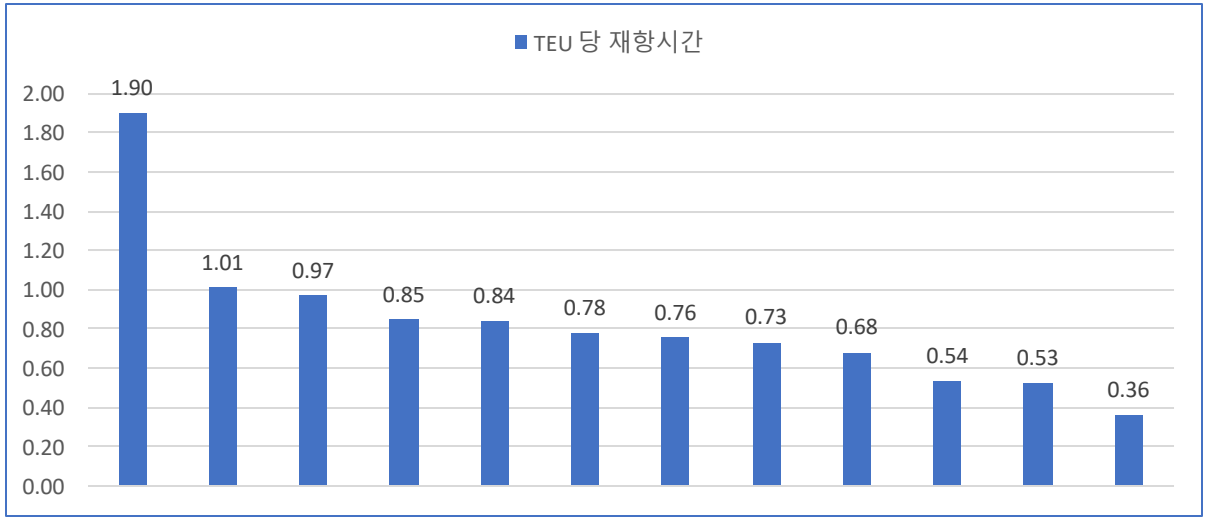


2. Port Infrastructure Sufficiency Index

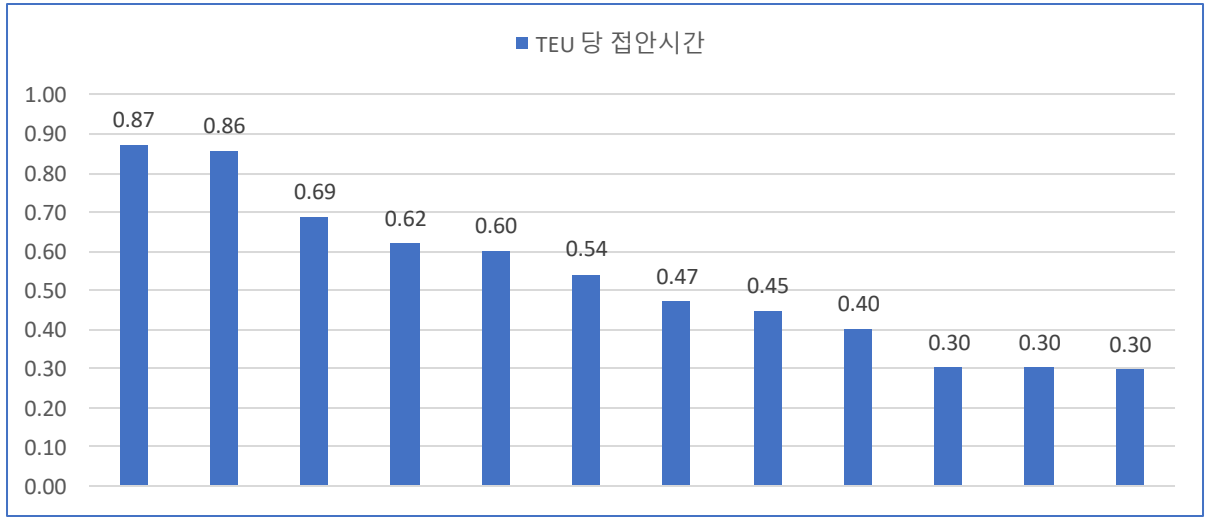
Pilot Project Result : Punctuality

- Solving limitation of overall average time, standardization is required
  - ✓ 1st step : Total throughput is divided by total times, then times per TEU can be found
  - ✓ 2nd step : Analyzing IHSmarkit's Berth Productivity data to find TEUs/min by using 1.6(VAN-TEU)
  - ✓ 3rd step : Comparing numbers between 1st step and 2nd step to increase reliability of evaluation
- As a result, evaluation methodology of this study is reliable
  - ✓ Total 12 ports have very similar results on 1st and 2nd steps

<Average Turn-around Time per TEU(min)>



<Average Berthing Time per TEU(min)>



2. Port Infrastructure Sufficiency Index

Pilot Project Result : Punctuality

- Among sample ports, Port A is 126 points, Port B 124 points, and Port C 111 points

	Port A	Port B	Port 3
Throughput ('000TEU)	00,000	00,000	00,000
Punctuality (point)	30	33	10
Safety & Security (point)	49	49	52
Digitalization (point)	45	44	49
Total	**124**	**126**	**111**

3. Future Plan

3. Future Plan

An official report will be published with UNCTAD in 1st Quoter of 2023

- Very limited information(results) will be in the official report for the publication
  - ✓ However, details of the results will provide to all participants of survey regardless of target ports
- Report will be free of charge
  - ✓ The official report would be available on a website(TBD) without payment
  - ✓ Detailed report will only provide to the participants of survey with either printed or electric version(TBD)

Organization of following project is in progress

- KMOF already confirmed to continue the project from 2023 to 2025
- Establishing a formal body of the index such as WPSP
  - ✓ Building wide networks with ports in the World
  - ✓ Developing systematic plan for the index(evaluation) with consideration of port perspectives
  - ✓ Creating articles of body, governance, web-site, events, etc

Thank You!!

Q&A