

International Symposium of **Global Port Demand and Future Prospects**

일시(Date)

2011년 11월 11일 (금) 13:30

November 11, 2011 (Fri) 13:30

장소(Venue)

서울 팔래스 호텔, 로얄볼룸 홀 (1F)

Seoul Palace Hotel, Royal Ballroom (1st Fl.)

주최(Organized by)



국토해양부
Ministry of Land, Transport and Maritime Affairs



한국해양수산개발원
KOREA MARITIME INSTITUTE

Program

International Symposium of
Global Port Demand and Future Prospects

Session 1		Opening Event	
13:00~13:30		Registration	
13:30~14:00	Opening Remarks	Kim Hak-so	KMI, President
	Welcome Remarks	Ju Sung-ho	MLTM, Deputy Minister for Logistics and Maritime Affairs
Session 2		Presentation	
14:00~14:30	Presentation 1	Current and outlook of global container port market with a special focus on Asia Pacific region Truong Bui Drewry, Senior Consultant	
14:30~15:00	Presentation 2	Port Demand Forecast of Japan Mitsuhiko Okada OCDI, President	
15:00~15:30		Coffee Break	
15:30~16:00	Presentation 3	Port planning from a Rotterdam perspective Maurice Jansen STC, Head of Netherlands Maritime University	
16:00~16:30	Presentation 4	Forecasting method and outlook of port volumes in Korea Sim Ki-sup KMI, PDAC Associate Research Fellow	
Session 3		Discussion and Question & Answer	
16:30~17:30	Chair:	Chin Hyung-in	University of Incheon, Graduate School of Logistics, Professor
	Discussant:	Rajiv Biswas	IHS Global Insight, Senior Director
		Raymond Ong Ghim Ping	Singapore National University, Professor
		Choi Kee-choo	Ajou University, Professor
		Choi Myung-yong	MLTM, Director of Port Policy Division, Ports& Harbours Bureau

* The above program may be subject to change.



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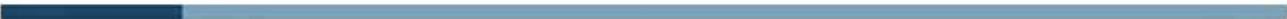
Presentation



Presentation_1

**Current and outlook of global container port market
with a special focus on Asia Pacific region**

Truong Bui
Drewry, Senior Consultant



Current and outlook of global container port market with a special focus on Asia Pacific region

Seoul, November 2011



Agenda



- Historical development of container volume and key drivers
- Container volume forecast
- Port capacity and utilization of ports in Asia
- Implications for Busan Port
- Conclusions



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- **Historical development of container volume and key drivers**
- Container volume forecast
- Port capacity and utilization of ports in Asia
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Organic trade growth	Substitution growth	Accidental growth	Induced growth
Globalisation; Outsourcing; Reduced trade barriers etc	Modal transfer from break-bulk	Trade imbalances & empty containers	Transshipment

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Trade drivers centered around Asia as exporting countries with developed world as their customers



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Average growth rate of 1980-2010: 9.3%



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Container penetration grew from 39% in 1990 to 67% in 2010

Future containerization will grow but at a lower rate



Source: Drewry Maritime Advisor

- Containerization level in developed countries has reached its peak
- However, the container penetration in developing nations such as India, Africa, Latin America is expected to continue to grow

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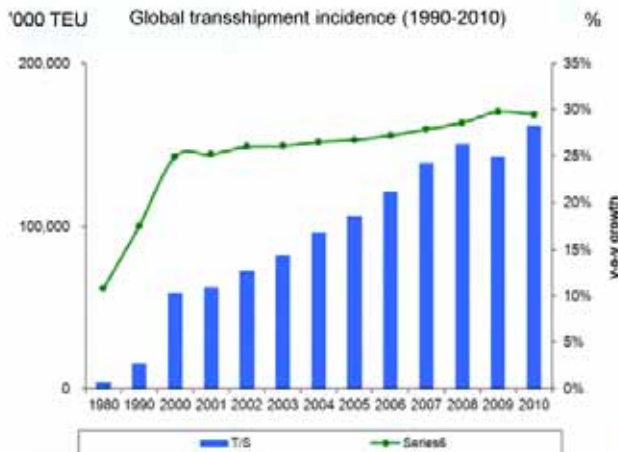
Empty container volumes remain stable ranging from 18% to 22% between 1990 and 2010



Source: Drewry Maritime Advisor

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Transshipment has increased from 18% to 27% between 1990 and 2010



Source: Drewry Maritime Advisor

Two types of distinct transshipment have evolved

Hub-and-spoke/feeder:

- **Description:** transportation of containers from the central hub to feeder ports, which are the ultimate origin/destination ports served by transshipment.
- **Key drivers:** direct vs. transshipment economics, ship size, volume at feeder location, port infrastructure, low risk to enter new markets and existence of 3rd party feeders
- **Competitive dynamics:** connectivity, efficiency and charges

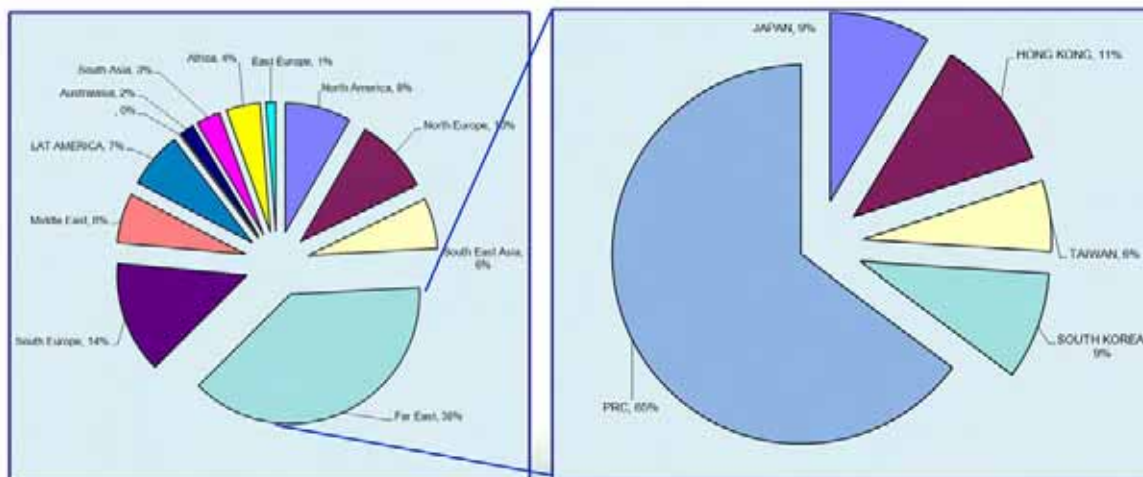
Relaying/interlining:

- **Description:** transfer of a container between mainline services serving different ports between originating and destination ports
- **Key drivers:** creation and optimization of global liner networks to maximize asset utilization
- **Competitive dynamics:** proximity to main East-West routes and connectivity

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**Total global port traffic
2010: 584m TEUs**

**Total Asia port traffic
2010: 303m TEUs**

**Total Far East port
traffic 2010: 209m TEUs**

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Total global container cargo volume 2010: ~152 M TEUs

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- Historical development of container volume and key drivers
- **Container volume forecast**
- Port capacity and utilization of ports in Asia
- Implications for Busan Port
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Demand

Overall demand for cargo flows will continue to grow based on end user demand across regions
• World container port throughput slumped by almost 10% between 2008 and 2009, but picked up strongly in 2010. The 546 million teu handled by ports worldwide in 2010 represented an upturn of around 15% compared with 2009. Almost all global container-terminal operators achieved higher throughputs across their various networks, as volumes recovered on most major trade lanes.

- The Far East is the world's biggest container-handling region, and throughput there rose to over 210 million teu in 2010, an increase of almost 18%. There was strong growth in South Asia, where throughput was also up by around 18%, and Latin America, where throughput was around 15% higher than in 2009. However, the fastest growing region in the world in 2010 was Eastern Europe, where throughput was over 30% above the preceding year albeit following a correspondingly large slump in 2009.
- While there are still threats to global economic recovery posed by the Eurozone crisis and US debt negotiations, the consensus is that global economic growth will be sustained for several years to come. Drewry has incorporated this more positive outlook into its forecasting and projects that global container port throughput will grow by an average of 7.6% a year over the next six years, rising to around 846 million teu in 2016. This would be a near-300 million teu increase on 2010 levels, equivalent to an uplift of 55% – a very substantial increase that shows the effect of mere single-digit annual growth now that the industry has grown to such a large scale

The current "hub and spoke model" is well-established and unlikely to change

- The on-going increasing of ship size would reinforce the importance of the hub and spoke model

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Forecast global container port demand growth to 2015

- 2009 will be the worst ever year for the industry in terms of growth
- 2010 has seen an unexpected rebound, with the market on track to grow by 15% compared with 2009
- Reasons to expect 2011 onwards to show a return to much healthier growth levels
- Global container port throughput will grow by an average of 7.5% a year over the next 4 years, rising to around 786 m teu in 2015



Source: Drewry Maritime Advisor

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Forecast North European container port demand growth to 2015



Source: Drewry Maritime Advisor

Forecast North American container port demand growth to 2015

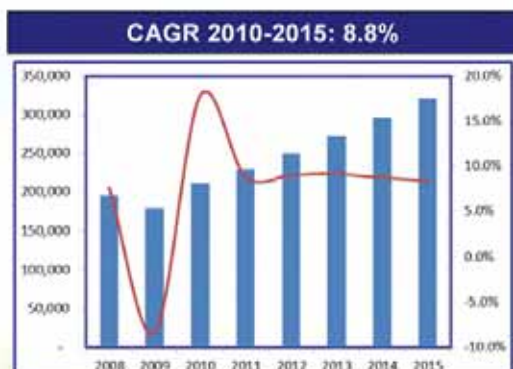


Source: Drewry Maritime Advisor

- North European and North American volumes show a similar pattern to the global picture.....slightly more severe decline in 2009
- Reliance on imports and consumer spending
- Northern America and Northern Europe are the two regions expected to perform least well, with a forecast of annual increase of around 5.0% to 5.7% respectively

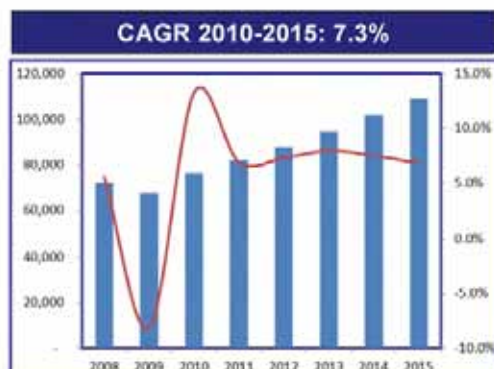
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Forecast Far Eastern container port demand growth to 2015



Source: Drewry Maritime Advisor

Forecast South East Asian container port demand growth to 2015



Source: Drewry Maritime Advisor

- Less sharp 2009 decline than globally, and stronger recovery
- Benefit of being the "world supplier", Far East is the world's biggest container handling region and throughput there rose to over 210 m teu in 2010.
- There has been a strong growth in South East Asia, where throughput is expected to increase by an average of 7.3% over the next 4 years.

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- Historical development of container volume and key drivers
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- **Port capacity and utilization of ports in Asia**
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Capacity expansion plans not sufficient

Supply

- ❖ The slow down pace of container terminal expansion across the regions... will take some time to gather momentum again
- ❖ The pressure on container terminal infrastructure that built up in the boom years has not eased as a result of the slowdown and has not as yet returned, to the same degree at least BUT the signs are there that it may not be far away.
- ❖ With the advantages of the natural geographic locations and high efficiency operations, the regional transshipment hub ports are already well established and continue to strengthen their positions with on-going expansion plans.

Capacity utilization

- ❖ Average utilization for global operators' terminals was around 66.5% in 2010
- ❖ If no additional expansion projects take place besides those that have been assessed by Drewry as being confirmed, then by 2016 average utilisation will have risen to over 84%.

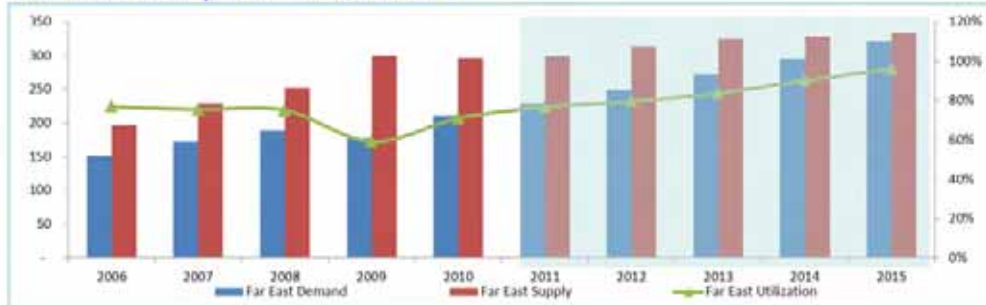
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Locations of major ports in Asia

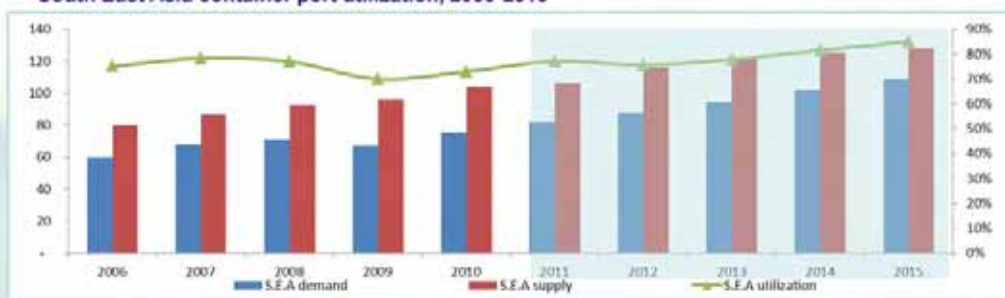


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Far East container port utilization, 2000-2015



South East Asia container port utilization, 2000-2015



Source: Drewry Maritime Advisor

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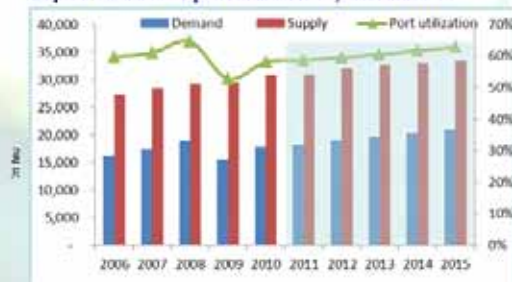
Hong Kong container port utilization, 2006-2015



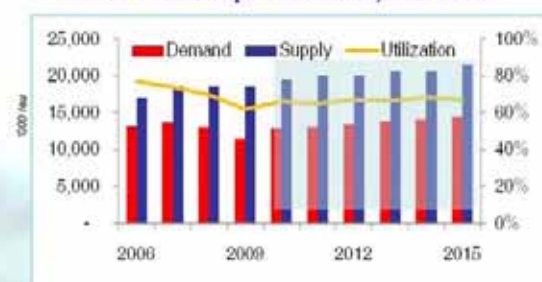
China container port utilization, 2006-2015



Japan container port utilization, 2006-2015



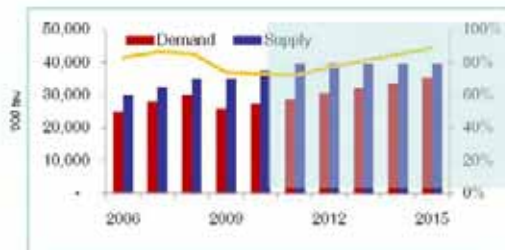
Taiwan container port utilization, 2006-2015



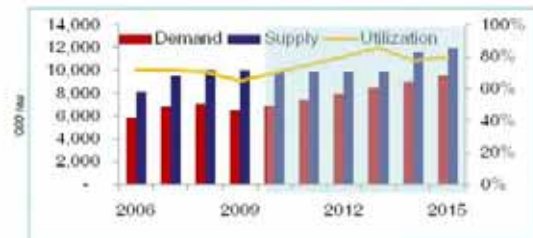
Source: Drewry Maritime Advisor

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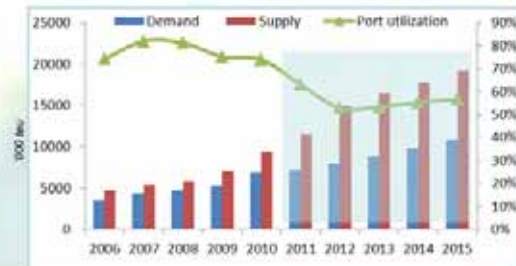
Singapore container port utilization, 2006-2015



Thailand container port utilization, 2006-2015



Vietnam container port utilization 2006-2015



Source: Drewry Maritime Advisor

Indonesia container port utilization 2006-2015



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- Historical development of container volume and key drivers
- Container volume forecast
- Port capacity and utilization of ports in Asia
- **Implications for Korean Ports**
- **Conclusions**



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Demand

- S. Korea economy growth had been fuelled by rapid industrialization: shipping building, automobile and construction. In the recent decade, the main contribution to S. Korea economy growth was high-technology industries. The key drivers for future S. Korea economy growth will be from private consumption and gross fixed investment. The growth rate is believed to gradually slow down.

According to newly updated IMF 2011 September number, in the next five years, Korea economy is expected to be growing at slightly above 4% every year

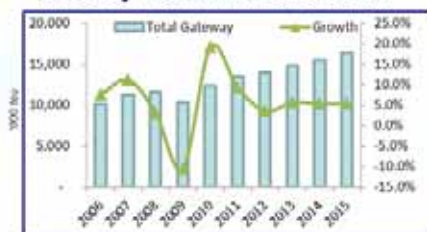
- Historical information suggests the market share between laden and empty container remains at a constant 72% vs. 28%. With no indication of significant changes in Korea trading pattern.
- Being strategically located at the confluence of the two giant economies China and Japan, it has been well positioned to serve these two major markets via a well established connectivity network linking to North and South American countries.

Impacts on S. Korean Ports (esp Busan Port)

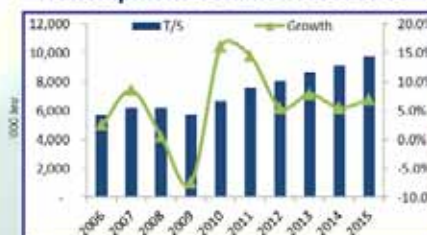
- ... increasing competition from regional feeder ports and other regional hub ports
 - North China ports have in recent years built new port facilities to attract MLOs providing direct shipment of containers to North America, thus reducing the dependence on Busan transshipment.
 - Kaohsiung Port is working on the plan to restructure their port to regain the transshipment market share
 - Vietnam ports have introduced a number of direct call to North America

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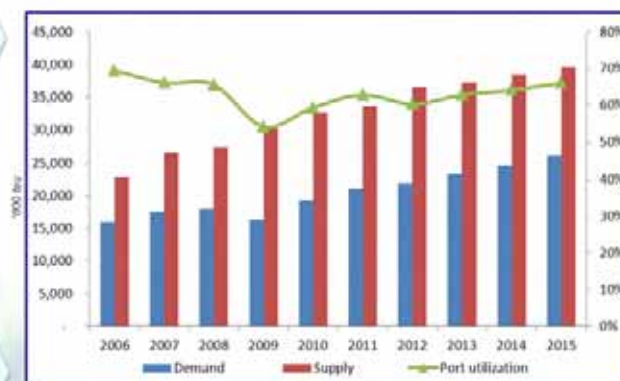
Gateway volume forecast 06-15



Transshipment volume forecast 06-15



Total Korean container volume forecast 06-15



Source: Drewry Maritime Advisor

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- Historical development of container volume and key drivers
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- ❖ Global container port throughput will grow by an average of 7.6% a year over the next six years, rising to around 846 million teu in 2016
- ❖ The on-going increasing of ship size would reinforce the importance of the hub and spoke model
- ❖ The slow down pace of container terminal expansion across the regions... will take some time to gather momentum again
- ❖ The pressure on container terminal infrastructure that built up in the boom years has not eased as a result of the slow-down and has not as yet returned, to the same degree at least BUT the signs are there that it may not be far away.
- ❖ We see that container volumes at Far East and South East Asian countries recover and grow much faster than other regions.
- ❖ Port capacity utilization in Asian countries remain to be relative high and stable.
- ❖ Port demand in S Korea is

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Thank you very much



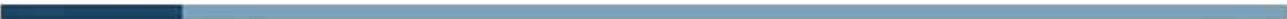
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Presentation_2

Port Demand Forecast of Japan

Mitsuhiko Okada
OCDI, President



Port Demand Forecast

Mitsuhiko Okada
OCDI, Japan



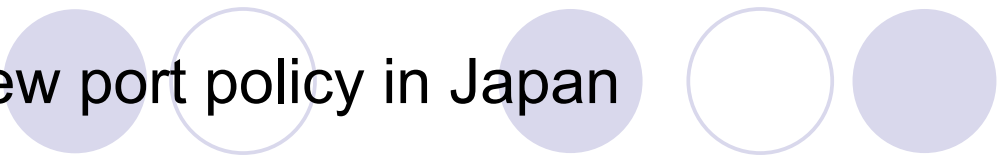
What's OCDI?

- Non-profit organization established in 1976
- Expertise in port engineering/management, cargo handling, shipping, logistics, security
- Experience in 60+ countries
- Provide solutions for challenges in the port/logistics sector



Outline of the presentation

- New port policy in Japan
- Demand forecast methods applied by Japanese researchers
 - Japanese ports
 - Overseas ports

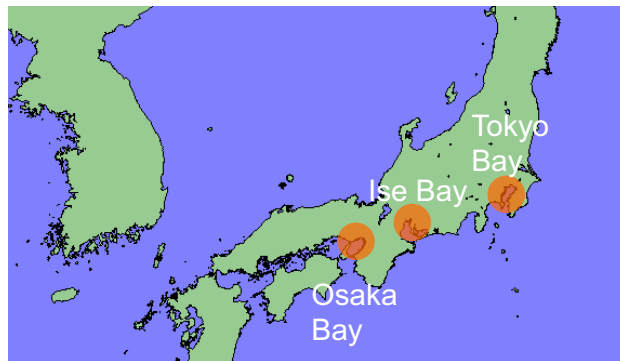


New port policy in Japan

Japanese ports

- Major container ports in Japan

- Tokyo Bay (Tokyo, Yokohama, Kawasaki)
- Ise Bay (Nagoya, Yokkaichi)
- Osaka Bay (Kobe, Osaka)



New policy

- Revision of the Port and Harbors Act (2011)

- Objectives

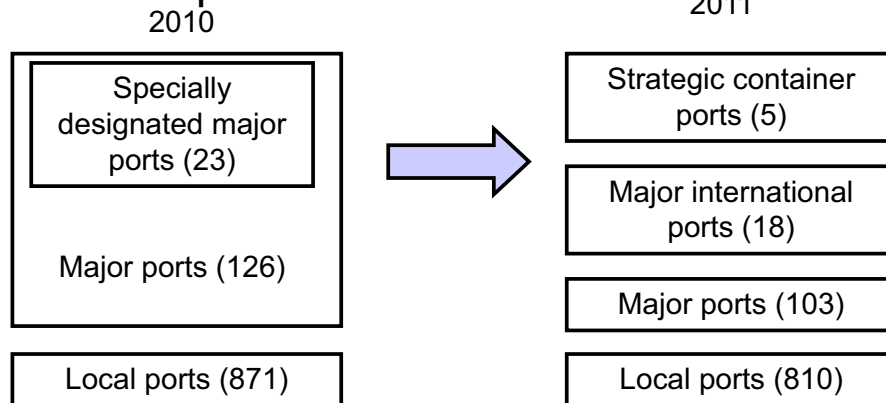
- To enhance ports' competitiveness
- To reduce transport costs

- Measures

- Concentrated investment (Select and focus)
- Privatization

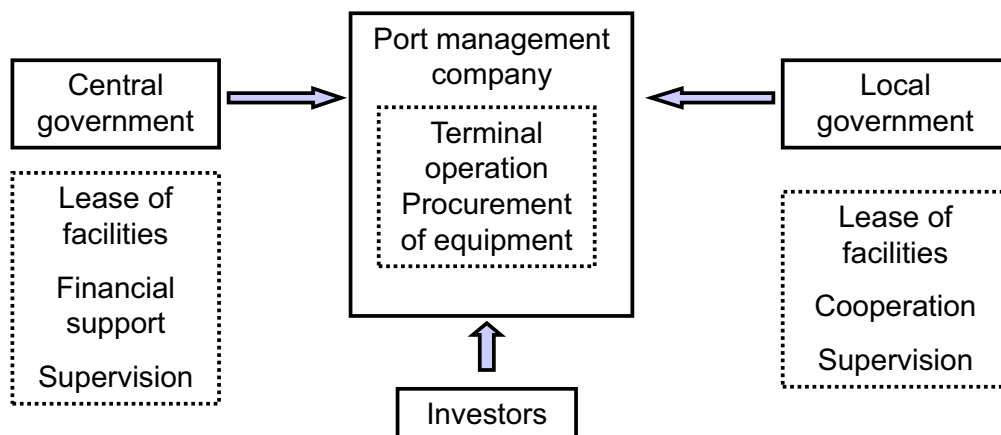
Concentrated investment

- Introduction of new port classification
- Greater government investment in strategic container ports



Privatization

- Port management company will be set up in strategic container ports and major international ports



Government support

- FY 2011 state budget for strategic container ports (Tokyo, Kawasaki, Yokohama, Osaka, Kobe)
 - 31.6 billion yen for port infrastructure
 - 0.3 billion yen for superstructure
 - 0.8 billion yen for feeder functions
- Tax incentives for port privatization and feeder container transportation
- Support from local governments
 - Reduction of port charge, wharfage etc. for feeder vessels

Port demand forecast

Role of the central government and local governments

- Local governments have principal authority over port development
- Local governments establish development plans and seek the approval of the central government
- The central government verifies the demand forecast of local governments

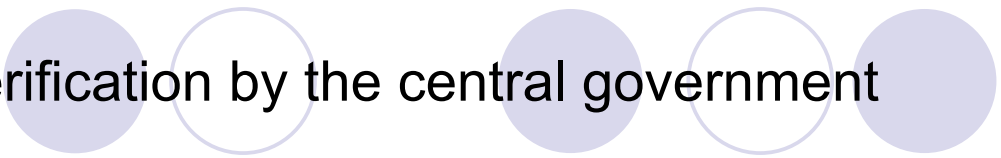
Distribution of cargo demand

- Aimed to:
 - Avoid duplication of port investment
 - Enhance ports' competitiveness
- Port and Harbor Act stipulates:
 - The Minister of MLIT shall formulate a basic policy for the development, utilization and preservation of ports and harbors including the location, functions and capacities of ports and harbors



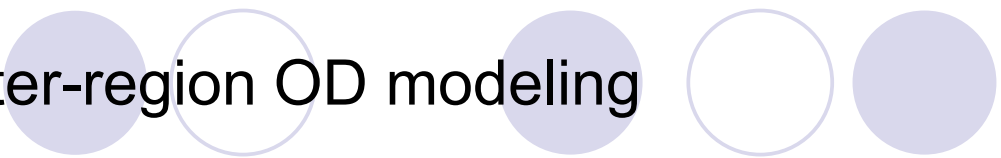
Demand forecast by local governments

- Development plan of local governments
 - Tokyo Port (2006)
 - Yokohama Port (2006)
- Regression analysis (port efficiency improvement is taken into account)
 - Tokyo Port → 4.6 million TEU (2015)
 - Yokohama Port → 4.0 million TEU (2015)



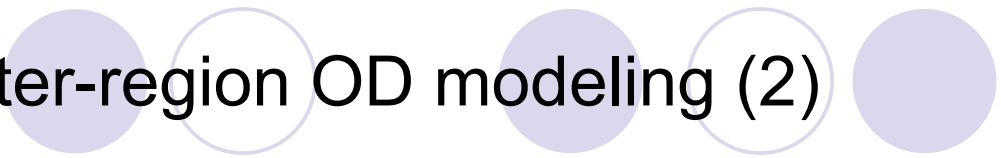
Verification by the central government

- NILIM (National Institute for Land and Infrastructure Development) developed **a container cargo flow simulation model**
 - *Dr. Ryuichi Shibasaki, NILIM (shibasaki-r92y2@ysk.nilim.go.jp)
 - Trade Forecast: GTAP (Global Trade Analysis Project Model)
 - Inter-region OD modeling
 - Cargo distribution among target ports



Inter-region OD modeling

- Commodity-wise bilateral trade value (48 countries/regions, 10 commodities)
 - Future trade value is given by GTAP (Trade facilitation is considered)
 - Japanese cargo is divided to 47 prefectures

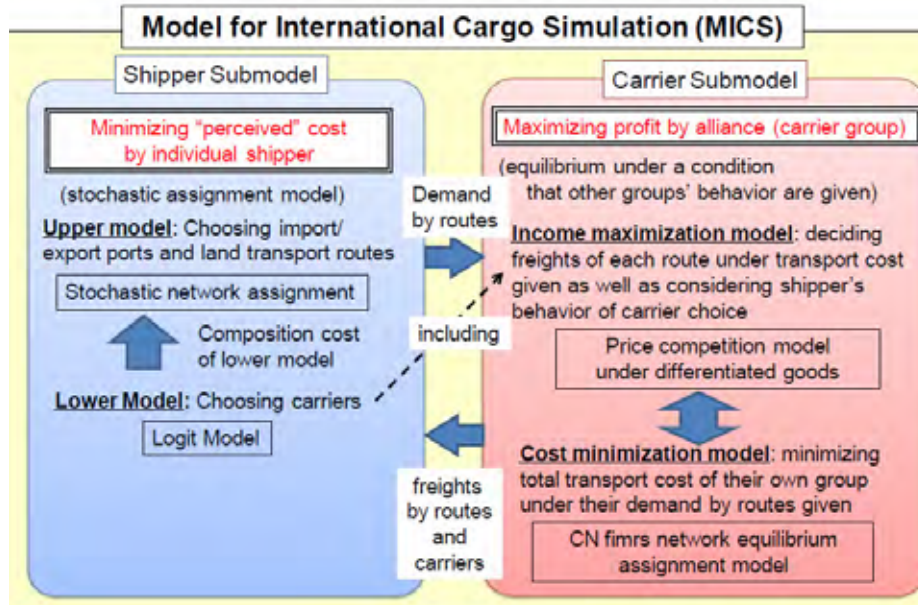


Inter-region OD modeling (2)

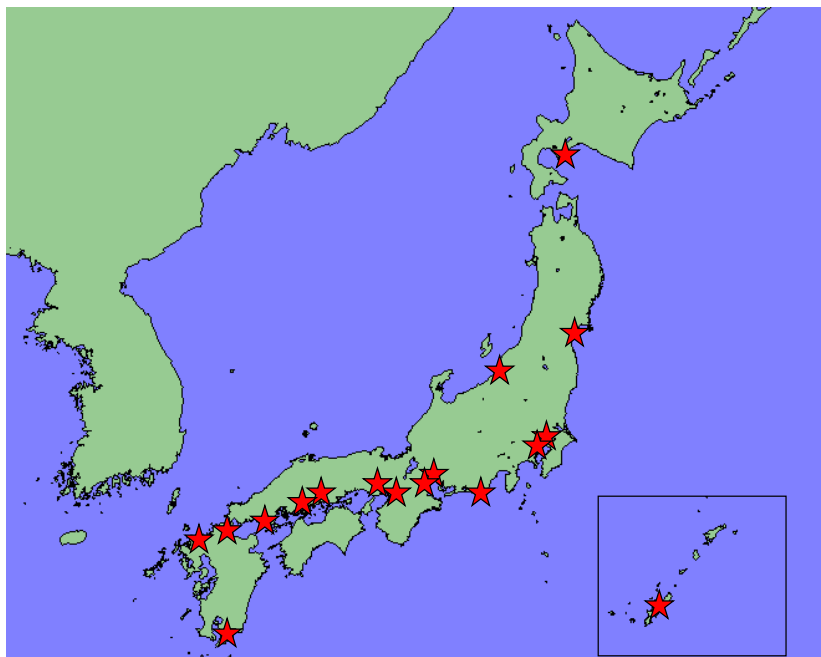
- Conversion of the trade value to container traffic based on:
 - Maritime transportation ratio
 - Value-tonnage conversion coefficient
 - Containerization ratio
 - TEU-tonnage conversion coefficient
 - Cargo is further distributed to OD ports:
 - 17 (Japan), 23 (Asia), 10 (Other areas)
 - initial value of the model

Cargo distribution method

(Ryuichi Shibasaki, NILIM)



OD ports in Japan



Cargo distribution method

- Shippers choose a port for each route minimizing the cost (**cost minimization**)
- Shipping companies determine the ocean freight based on the shipping cost and shippers' port selection (**profit maximization**)
- Shipping companies determine their shipping route network (**cost minimization**)
- Computation is repeated until reaching an equilibrium (Nash equilibrium)
- Evaluation at Japanese ports: $R^2 > 0.93$ (2003)

Required data

- Maritime transport network (World)
 - Distance between ports
 - Ship size
 - Carrier alliance
 - Port draft
- Land transport network (Japan)
- Costs and time for transport
- Time value of cargo

Verification

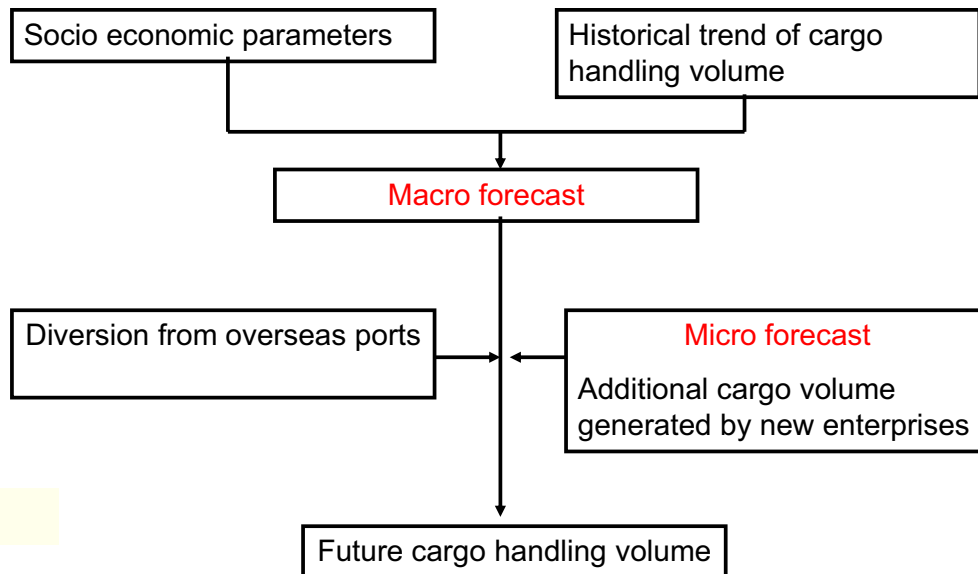
- 2004 Basic Policy established by MLIT
 - Container volume target in Tokyo Bay
→ 8-9 million TEU (2015)
 - Target was established based on a sacrifice model
- 2011 Basic Policy established by MLIT
 - Container volume target in Tokyo Bay
→ 8-10 million TEU (2020)
 - Target was established based on a sacrifice model (local container) and the Shibasaki model (transshipment container)

Demand forecast at an overseas port

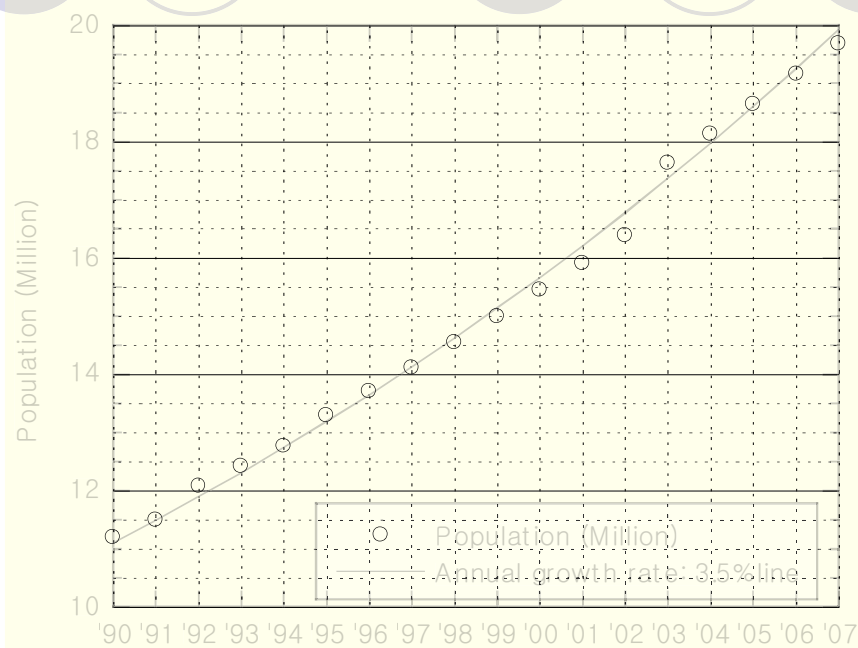
Example 1

- A small African port

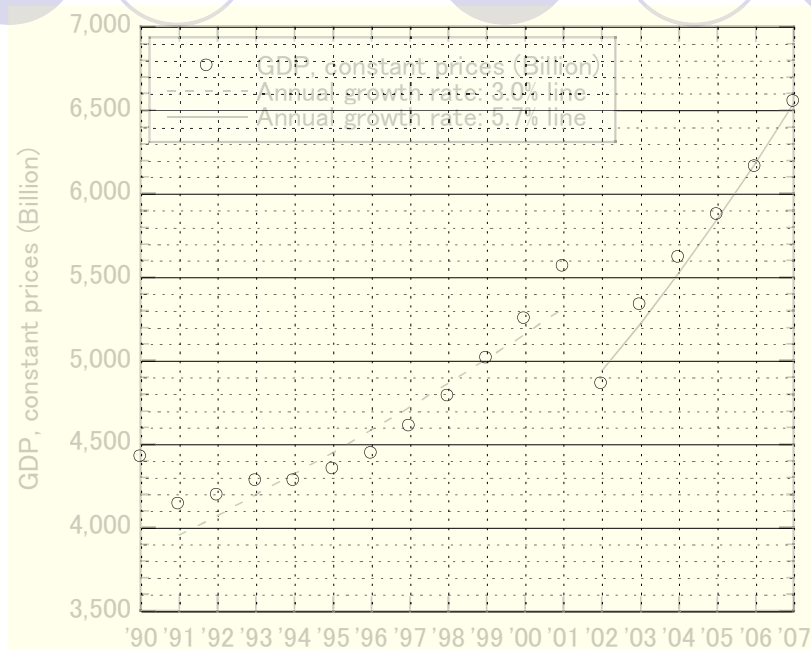
Conventional method



Socio economic data (population)



Socio economic data (GDP)



Analysis of container cargo demand

● GDP annual growth

Term	GDP growth
2002-2007	5.7 %/year
2007	6.4 %/year
National development plan (2007-2011)	7.0 %/year

⇒ 7.0 %/year (2008-2020)

Analysis of container cargo demand (2)

- Elastic coefficient, E

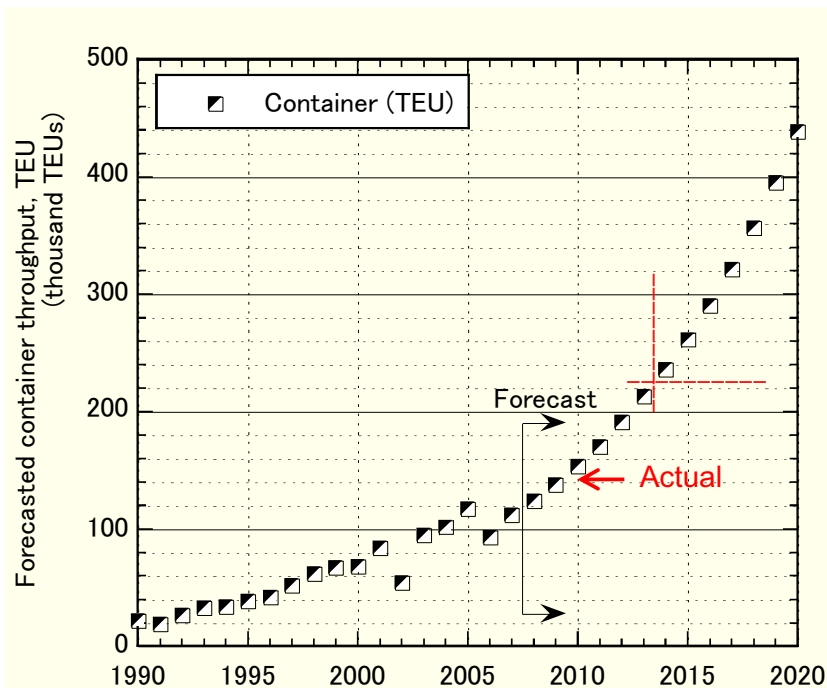
= Growth rate of container cargo / GDP growth rate

Port	Term	Growth Rate		E
		GDP	TEU	
Target port	2002-2007	5.7 %	8.5 %	1.5
Ho Chi Minh	2001-2005	13 %	25 %	1.9
Leam Chabang	2001-2005	11 %	13 %	1.2

Analysis of container cargo demand (3)

- GDP Annual Growth Rate = 7.0 %
- E = 1.5
- Container Cargo Growth Rate = 11 %/year

Macro forecast of container cargo



New enterprises in the region (Micro forecast)

Material/Product	Quantity	Load /Unload	Cargo type
Nickel metal	3,330 TEU/year	Load	Container
Cobalt metal	310 TEU/year		
Ammonium Sulfate	190,000 ton/year		
Sulfur	690,000 ton/year	Unload	Dry Bulk
Coal	430,000 ton/year		
Limestone	1,720,000 ton/year		
Total	3,640 TEU/year 3,030,000 ton/year		

Demand forecast at an overseas port

Example 2

- A large Asian port

International container

- Regression model

$$Y = a + bX$$

a, b: constants

X: independent variable

Y: dependent variable

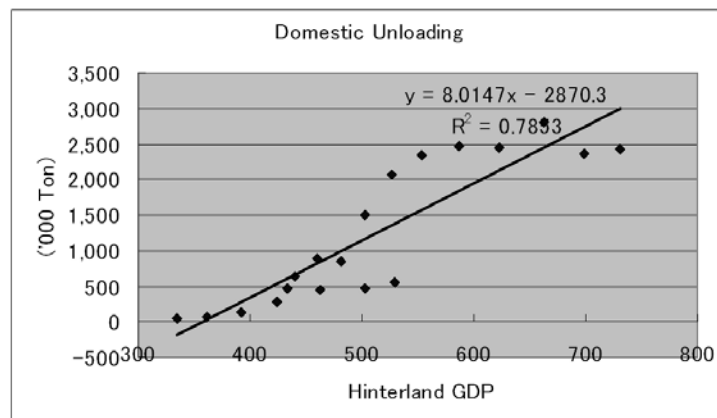
- Independent variables

- Export: GDP of trade partners ($R^2 = 0.97$)

- Import: GRDP of the hinterland ($R^2 = 0.87$)

Domestic container (1)

- Simple regression model yielded poor correlation ($R^2 < 0.8$)



Domestic container (2)

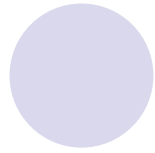
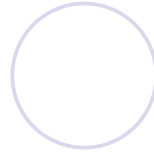
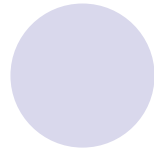
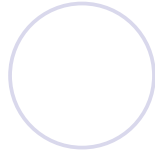
- Multiple regression model
$$Y = a + bX + cD$$

a, b, c: constants

X: independent variable

Y: dependent variable

D: dummy variable (0-1)
- Independent variables
 - GRDP of the hinterland ($R^2 = 0.9$ for unloading, 0.93 for loading)



감사합니다



Presentation_3

Port planning from a Rotterdam perspective

Maurice Jansen

STC, Head of Netherlands
Maritime University

STC-Group Netherlands Maritime University

MEMBER OF THE  STC-GROUP

Maurice Jansen MSc
Seoul, 11 november 2011

Presentation has been made
in cooperation with



ROTTERDAM WORLDPORTWORLD CITY ROTTERDAM WORLDPORTWORLD CITY ROTTERDAM



Port planning from a Rotterdam perspective

Maurice Jansen MSc
STC-Group / Netherlands Maritime University



History of Port planning



Port forecasting and scenario thinking



Port compass:
World outlook in 2030



Challenges and strategy agenda



Port planning from a Rotterdam perspective

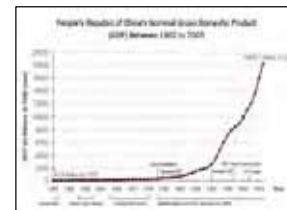
In 1990:



Internet ?



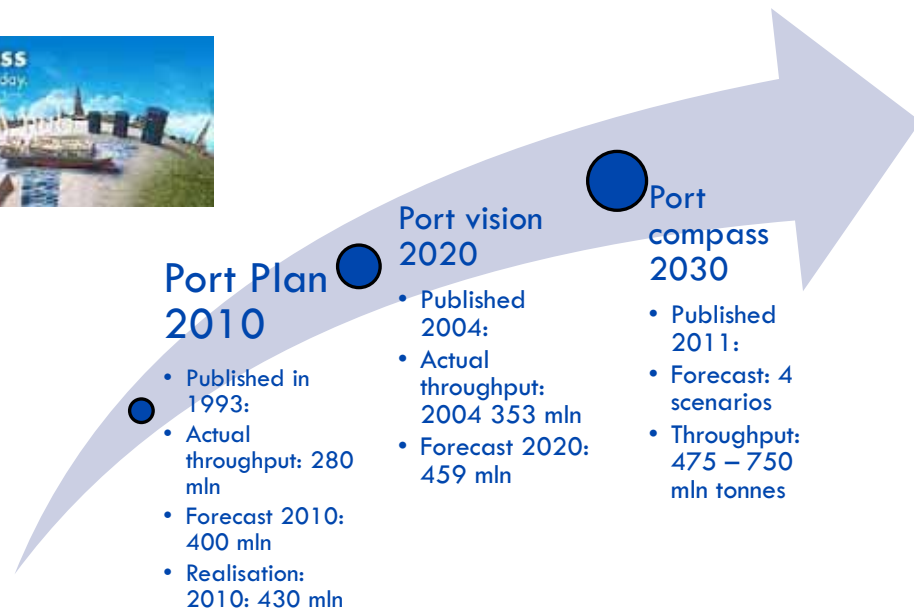
Berlin Wall ?



China GDP ?

The world has changed rapidly, and will continue doing so,

...be prepared and set your directions



History of Port planning



Port Plan 2010

Published in 1993
Plan to develop MV2
Development of Distriparks
Upgrading Port rail connection
Involvement of all stakeholders



Port Plan 2020

Published in 2004
Reclamation, building and exploitation MV2
Redevelopment of City ports
Sustainable port industry cluster management
Improvement highway A15
Port and city development in balance
Rotterdam Climate Initiative



Port Compass 2030

-Realising Global Hub and Europe's Industrial Cluster;
Global hub: Efficiency improvement of logistics chains;
EIC: transition towards bio-based industry, energy port and further integration with Antwerp chemical cluster;
Improving accessibility; Green zones, reduction of nuisance; Innovation & decisiveness

Source: Port of Rotterdam, 2011

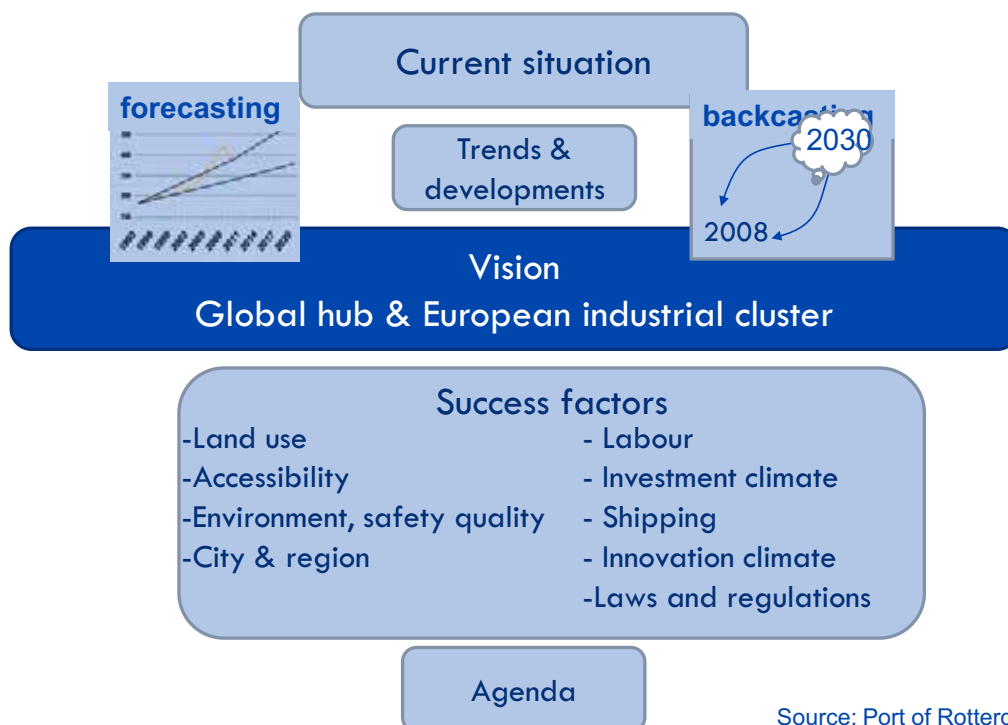
Port planning from a Rotterdam perspective



Part 2:

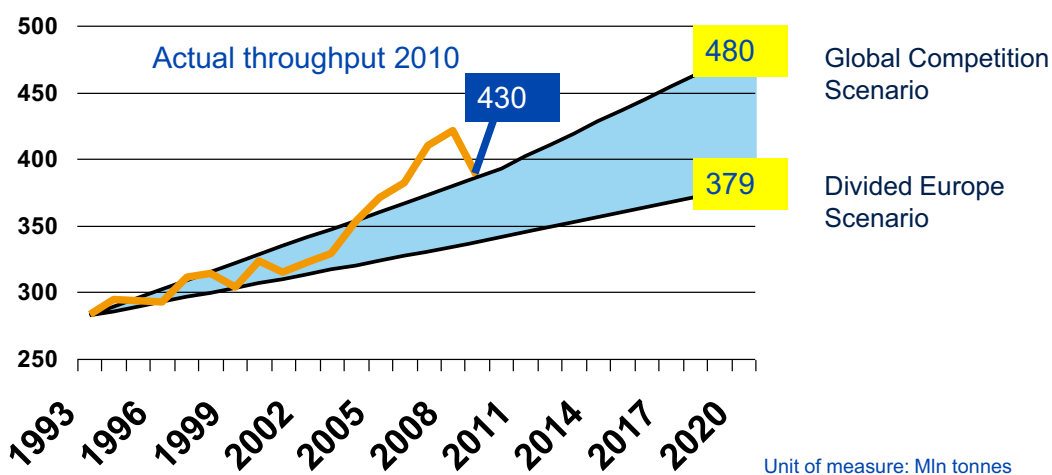
Port Forecasting and scenario thinking

Port planning framework



Source: Port of Rotterdam, 2011

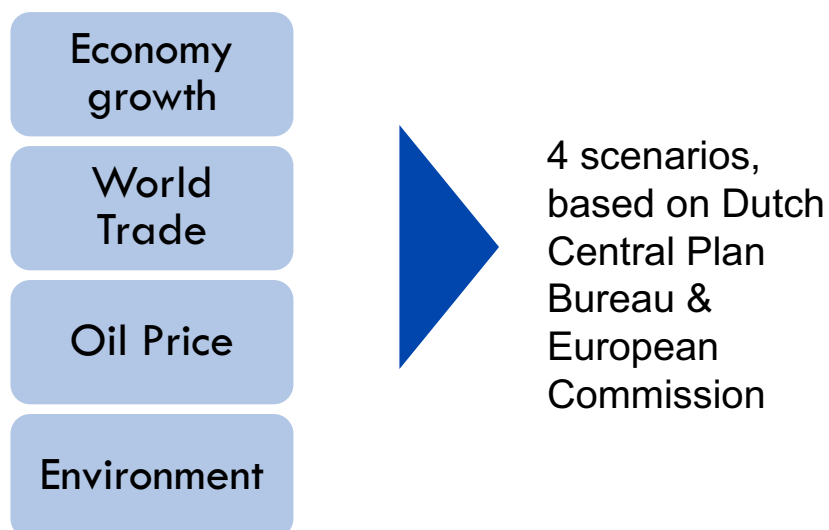
Projections 2020 throughput



Port Forecasting and scenario thinking

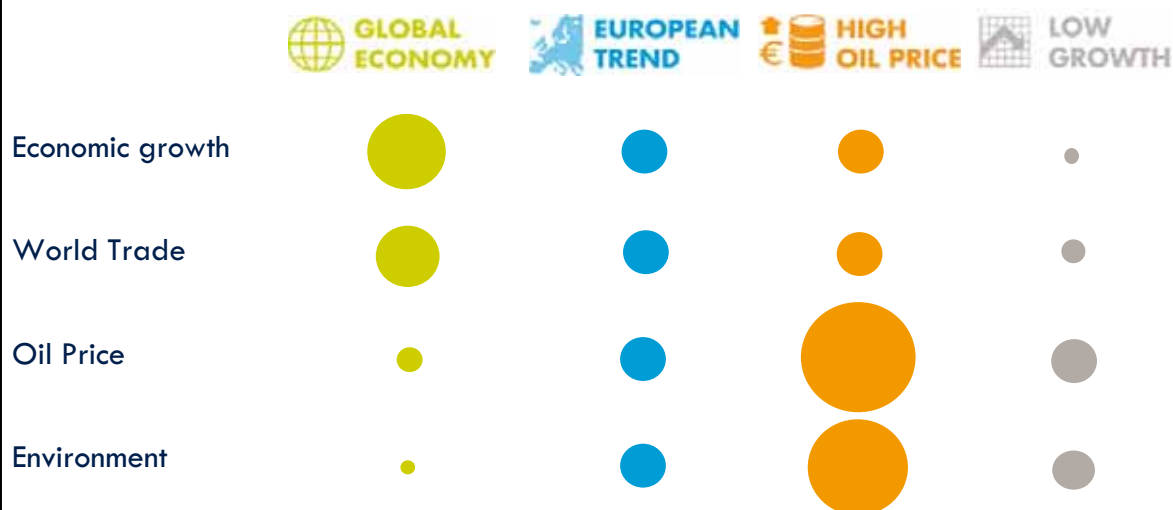
Source: Port of Rotterdam, 2011

Scenario thinking



Port Forecasting and scenario thinking

4 Images of the world



Port Forecasting and scenario thinking

Scenario European Trend



Modest economical growth
 Government policy doesn't change
 Fossil fuels dominant
 No significant trend breakthroughs
 Scenario developed by European Commission



Source: Port of Rotterdam, 2011



GLOBAL ECONOMY

High economical growth
Strong increase world trade
Energy consumption soars
No stringent environmental policies
Scenario developed by Central Plan
Bureau



Source: Port of Rotterdam, 2011



HIGH OIL PRICE

Modest economical growth
Dramatic increase of oilprice
High investments in alternative energy
More stringent environmental policies
Scenario developed by European
Commission



Source: Port of Rotterdam, 2011

Scenario Low Growth



LOW GROWTH

Low economical growth
Fossil fuels dominant
Energy consumption and mobility stable
Environmental policies only successful on national level
Scenario developed by CPB



Source: Port of Rotterdam, 2011

Drivers of change



Port Forecasting and scenario thinking



Transport

Bunker fuel transition

Economies of scale transport

Integrated planning of transport operations

IT

Internet LESS
virtual, augmented reality

Robotics and smart technology

Smart IT solutions for smooth and efficient mobility

Port related industry

Focus on quality products, made in Europe;

Increasing prices for iron ore and coal impede growth German economy

Shortage rare earth materials



Port Forecasting and scenario thinking

Source: Port of Rotterdam, 2011



Geo-politics

Dependency on world economy

Crisis in Europe

Scarcity

Supply Chains

Active mngt infrastructure

CO2 footprint supply chains

Closed loop supply chains

Energy

Energy Efficiency

Biobased and green chemicals

Renewable energy and CO2 reduction



Port Forecasting and scenario thinking

Source: Port of Rotterdam, 2011



Global economy

Centre of gravity moves to Asia

Transition sustainable macro-economy

Stability EU / European economy

Localisation / protectionism

Society

Increasing individualism

Increasing shortage of manpower / brains

Environment

Climate change

Water issues (flooding, salination)

More stringent environmental regulations



Port Forecasting and scenario thinking

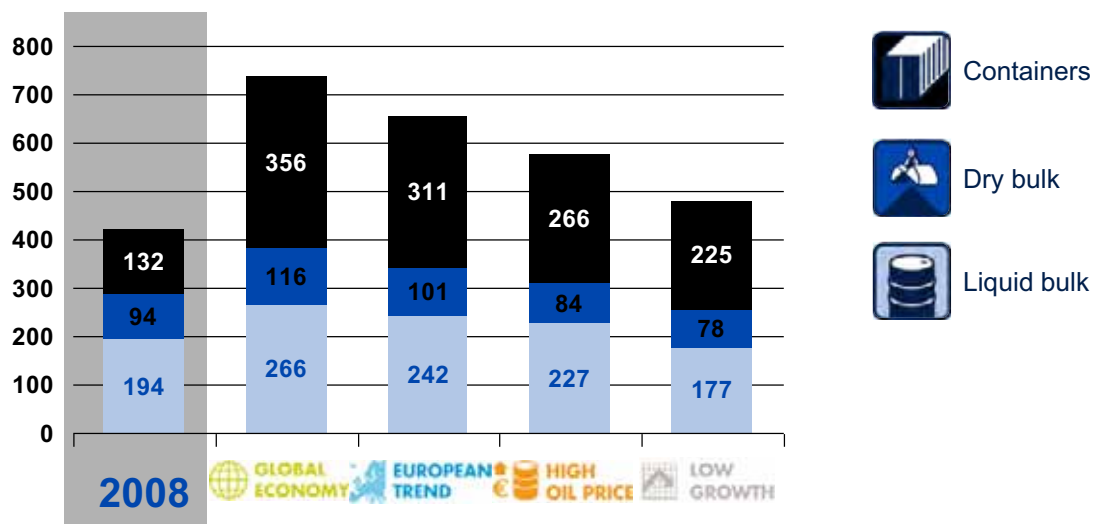
Source: Port of Rotterdam, 2011

Port planning from a Rotterdam perspective



Part 3: World outlook in 2030

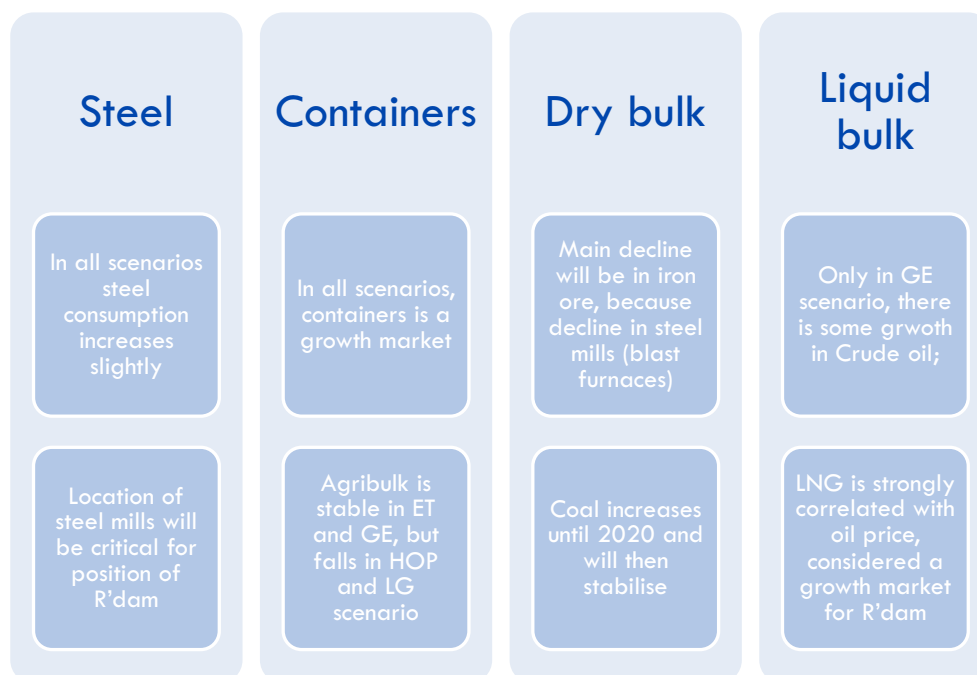
World outlook 2030



Unit of measure: in million tonnes

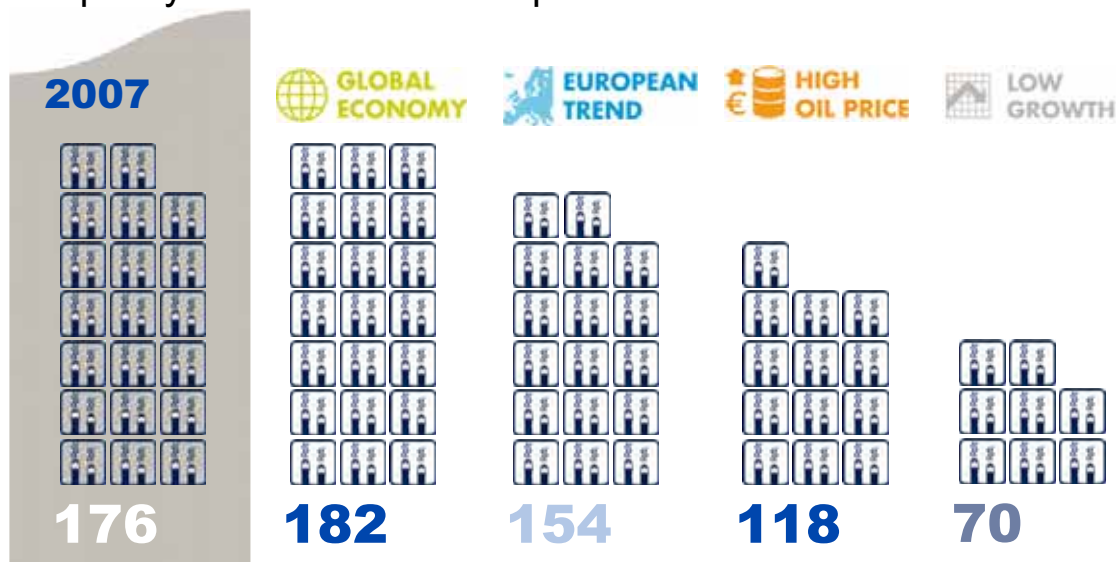
Source: Port of Rotterdam, 2011

World outlook at a glance



Source: Port of Rotterdam, 2011

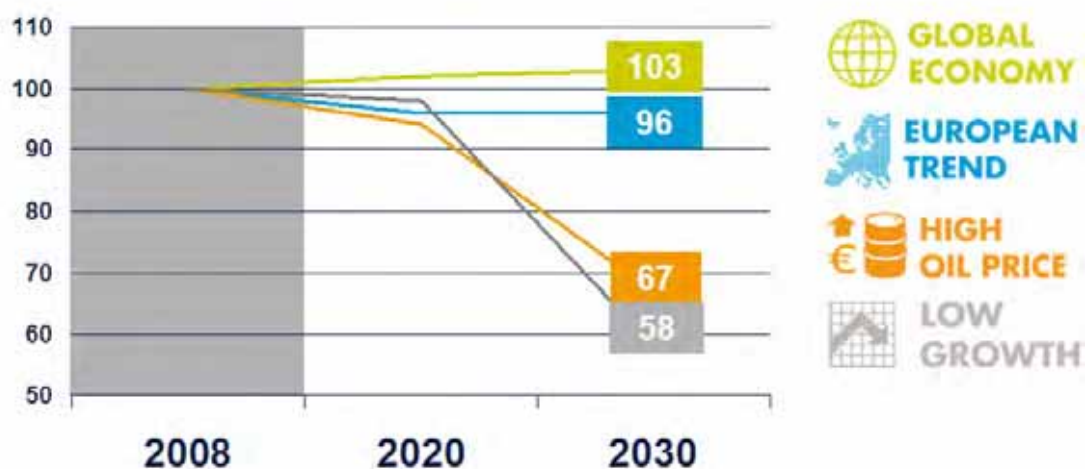
Capacity refineries NW-Europe 2030



Unit of measure, in million tonnes

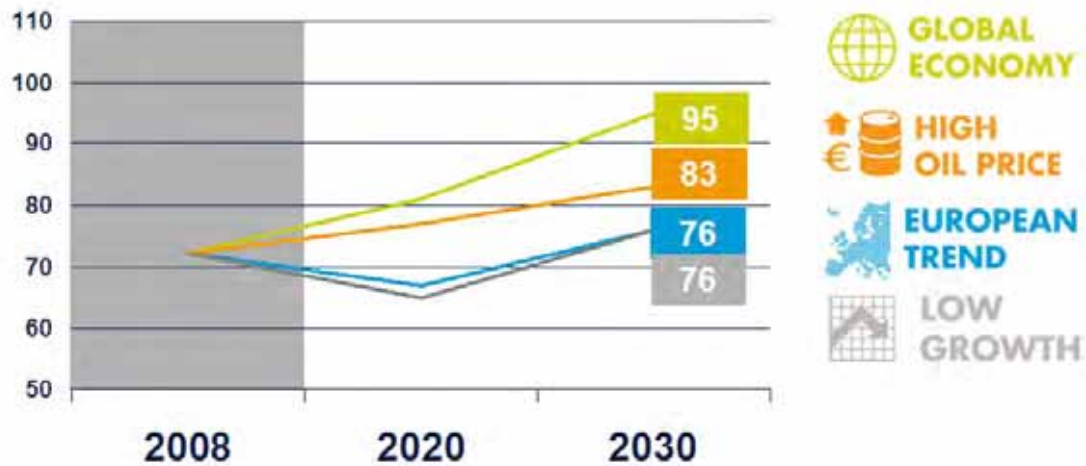
Source: Port of Rotterdam, 2011

Crude oil

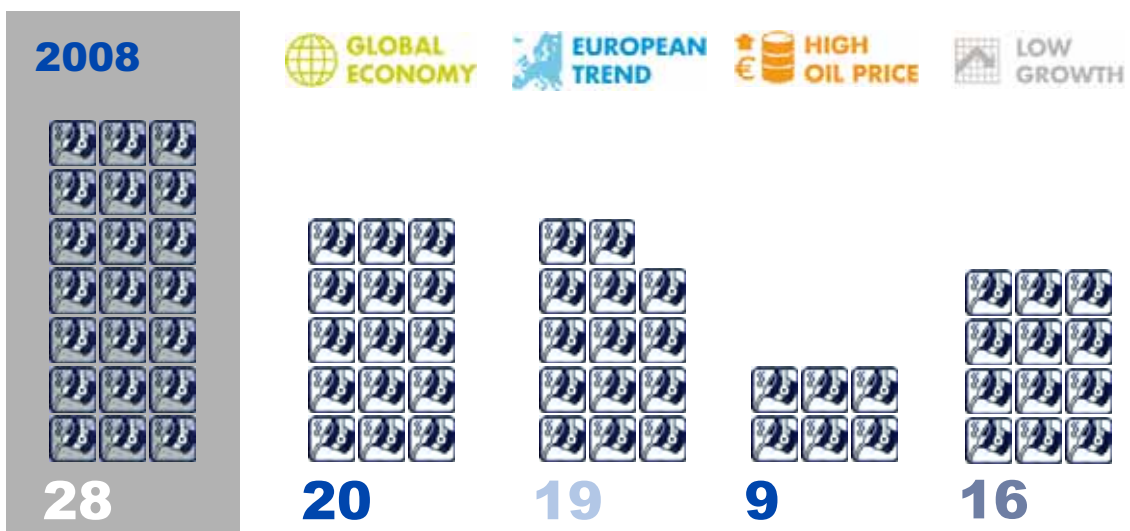


Unit of measure: in million tonnes

Mineral oilproducts

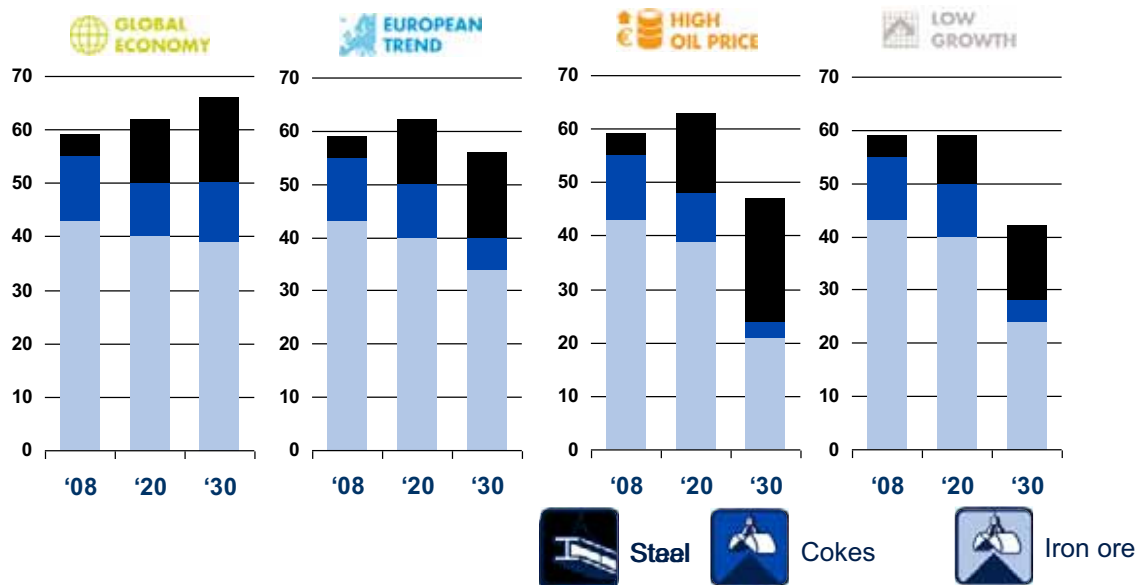


Number of steel mills NW-Europe 2030



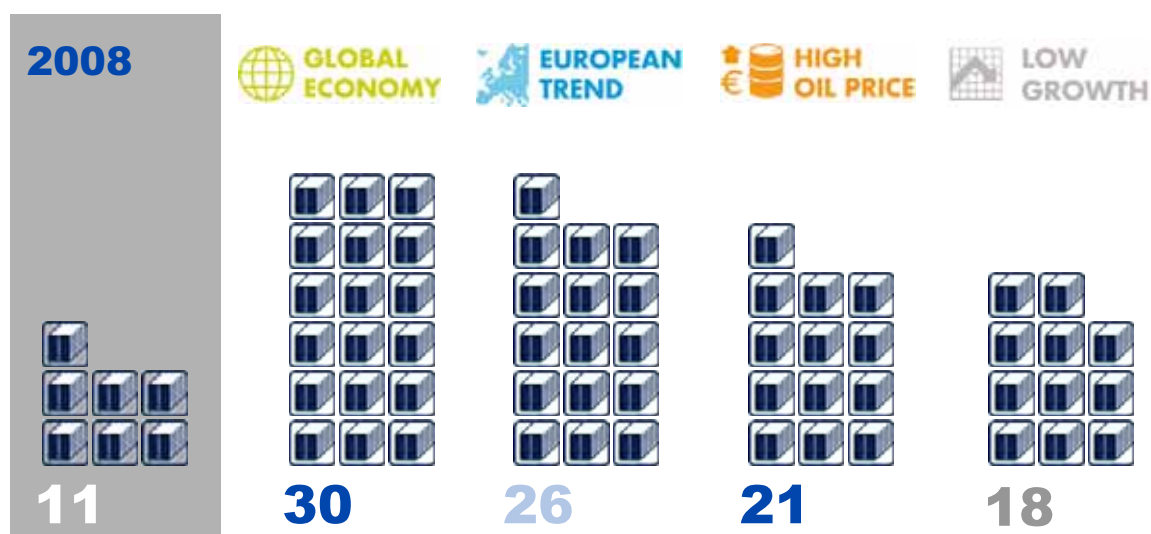
Source: Port of Rotterdam, 2011

Volume Rotterdam



Source: Port of Rotterdam, 2011

Container throughput 2030



Source: Port of Rotterdam, 2011



- Global Hub
- European Industrial Centre



- Global Hub

“In 2030, Rotterdam is Europe’s most important port and industry complex. It is a strong combination of the Global hub and Europe Industrial Complex, both leading in efficiency and sustainability. Rotterdam is closely connected with other NW European Industrial logistics areas. Leading companies invest in modern facilities. Cooperation between companies, government and universities results in a high quality labour market, good quality of life and accessibility. Rotterdam is a major pillar for prosperity in the Rijnmond area, Netherlands and Europe”.

- Europe’s Industrial Cluster

“In 2030 the Rotterdam industries and energy sector functions as an integrated complex with Antwerp. Hence it is the largest most modern and sustainable petrochemical and energy complex of Europe. This complex competes on world scale, through its cluster advantages, integrated supply chains and energy-efficiency. The transition to sustainable energy production and biobased chemicals is in full swing”.

Action agenda

- Realising Global Hub and Europe's Industrial Cluster;
- Global hub: Efficiency improvement of logistics chains;
- EIC: transition towards bio-based industry, energy port and further integration with Antwerp chemical cluster;
- Improving accessibility (all modalities);
- Green zones, reduction of nuisance (noise, traffic jams, pollution) for better living;
- Innovation & decisiveness through better coordination with stakeholders
- Skilled personnel at all levels requires increase of students in technical / logistics education, up-to-date HR policies and strengthening of facilities in the port



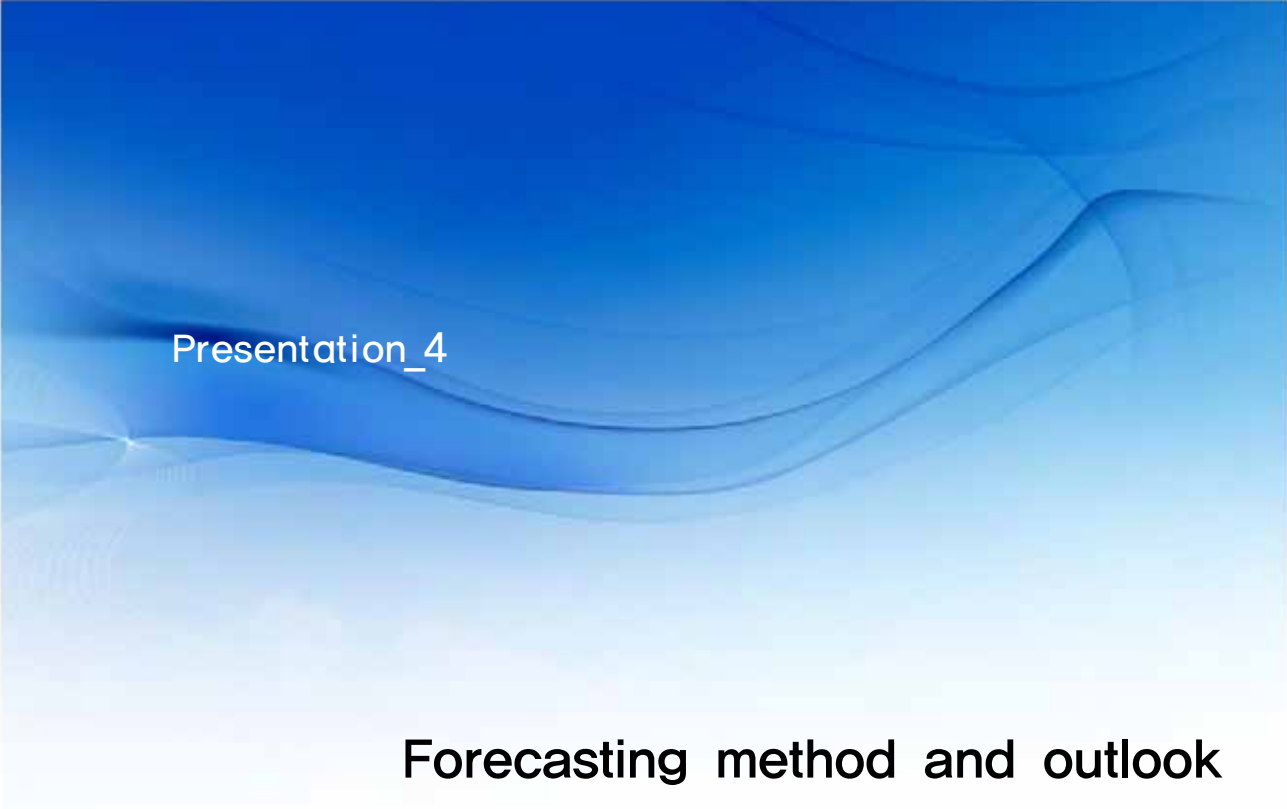
Netherlands in partnership with Korea: STC-Korea
Master Shipping and Transport



full speed ahead... with your career!

**More information:
Maurice Jansen MSc,
Head of Netherlands Maritime University
www.stc-nmu.eu / m.jansen@stc-r.nl / T.+31 10 4486060**

ROTTERDAM WORLDPORT WORLD CITY ROTTERDAM WORLDPORT WORLD CITY ROTTERDAM

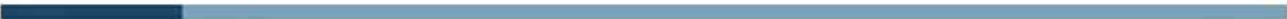


Presentation_4

Forecasting method and outlook of port volumes in Korea

Sim Ki-sup

KMI, PDAC Associate Research Fellow



Forecasting method and outlook of port volumes in Korea

2011. 11.11.



한국해양수산개발원
KOREA MARITIME INSTITUTE

TABLE OF CONTENT

I	Summary of Forecast
II	Forecasting Method by Item
III	Result of port volume forecast by item
IV	How to improve forecast method in the future



I. Summary of Forecast

Forecast item: Grain, cement etc – forecast port volume of 12 dedicated ports) by item

Time range:
-Baseline year : 2011
-Mid-term goal year : 2015
-Final goal year: 2020

Space range: Busan, Gwangyang Port etc 29 trading ports + other ports

Forecast method: Depending on the item, use one of the methods, or a hybrid of the two methods to forecast

1. Bottom-up method : analyze factors that directly affect the volume, then calculate the monetary value **Forecast volume of each port, then calculate the total national volume. (compare and review the Top-Down method and total volume)**
2. Top-down method : analyze the development of total volume by item and analyze the industry trend and factors that influence volume **to estimate the total national volume, and divide the number into each port**



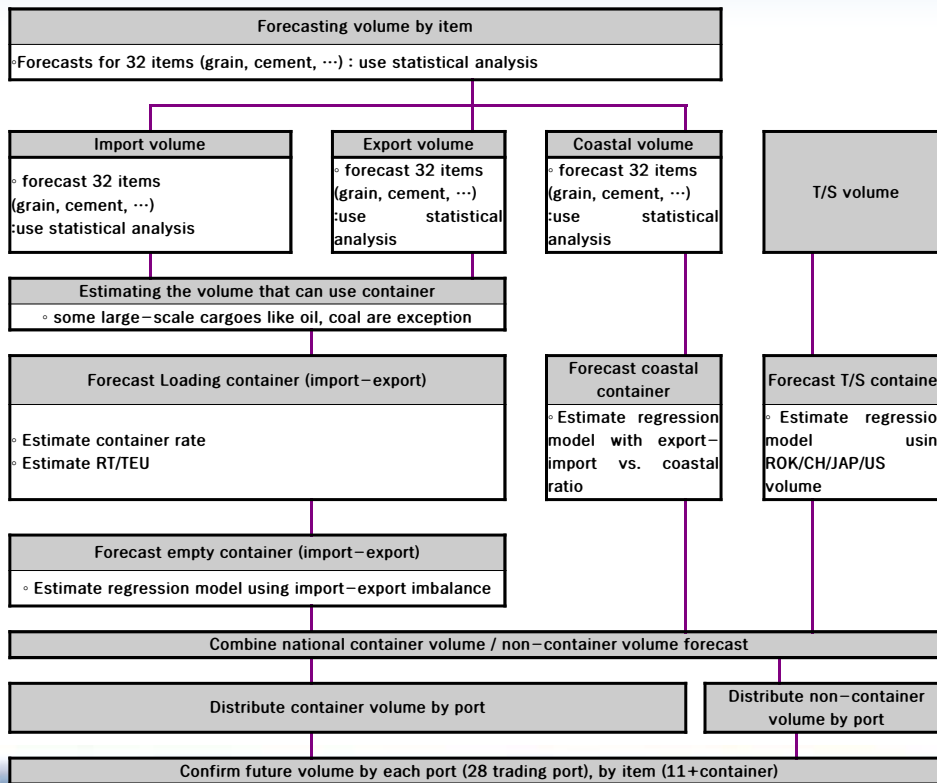
Forecasting method by item

- Existing Method of Forecasting Demand
- Summary of Changes in Forecasting Demand Method
- Forecasting Method by Item



II-1. Existing Method of Forecasting

▷ Process of forecasting volume by port



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II-2. Summary of Changes in Forecasting Demand Volume

Grain

- ▷ Forecast by separating food and feed. For food, consider population and grain consumption per person.

Cement

- ▷ Regression analysis by separating port of export (Donghae, Samcheok, Okgye) and port of import (others). Forecast for each port considering long-term construction permission area in region.

Coal

- ▷ Separate by usage - steel, power generation, cement production. Use crude steel capacity, power generation capacity of each region to forecast individual port volume

Lumber

- ▷ Reflect the construction investment amount of each hinterland by region to forecast individual port volume

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II-2. Summary of Changes in Forecasting Demand Volume

Cargo

- Use aggregate demand forecast by region to forecast individual port

Iron ore

- Use crude steel production capacity using blast furnace of each region to forecast import individual port volume

Steel

- Use crude steel production capacity of each region that uses blast furnace, electric furnace method to forecast individual port volume

Scrap iron

- Use crude steel production capacity of each region using electric furnace method and past average record to forecast

Automobile

- Use automobile plant production volume of individual port region to forecast individual port volume



II-2. Summary of Changes in Forecasting Demand Volume

Chemical industrial Product

- Use port characteristic (ethylene production capacity), or chemical product production volume to forecast individual port

Other goods

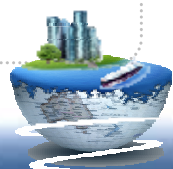
- Factor in steel, cement demand to forecast individual port volume

Manufacturing

- Factor in hinterland GRDP increase rate to forecast individual port volume

Oil

- Categorize into refined oil, gas-type oil, crude oil and factor in oil refinery facility, gas production facility capacity to forecast

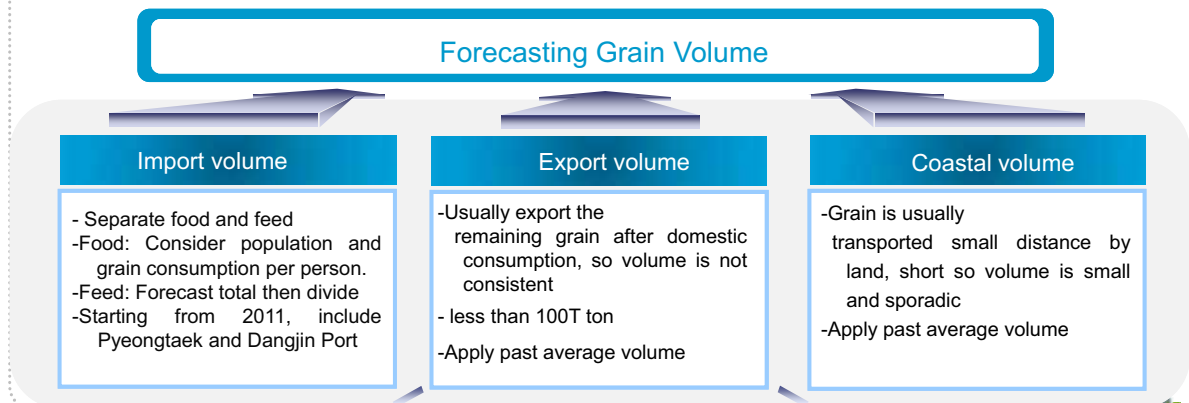


II-3. Method to forecast port volume by item

2-1. Grain

▷ Summary of Forecast

- Most of grain volume is import-dependent
- Export and Coastal volume occurs in small volume only in some ports
- Change in forecasting method: Top-Down→ Bottom-up

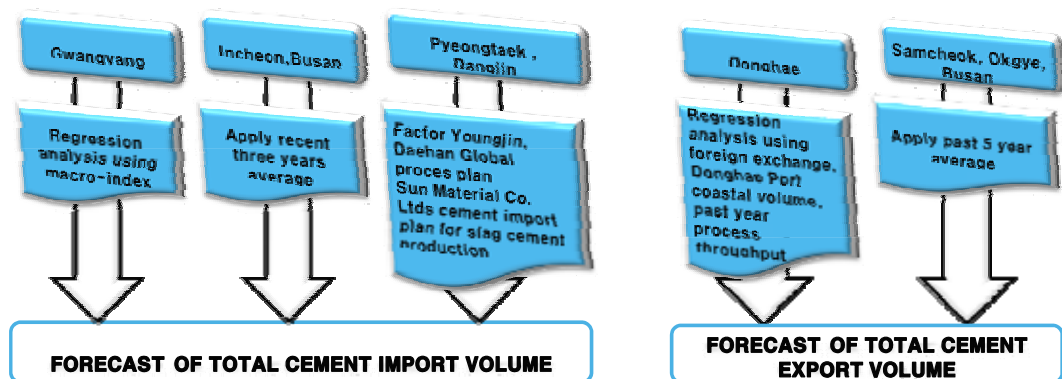


II-3. Method to forecast port volume by item

2-2. Cement

▷ Summary of Forecast: Import, Export

- Import volume : Forecast centered on port where most of cement import occurs for slag cement (Gwangyang, Pyeongtaek·Dangjin Port)
- Busan and Incheon port have small volume
- Export volume: Bigger volume in Donghae Port, other ports have volatile volume

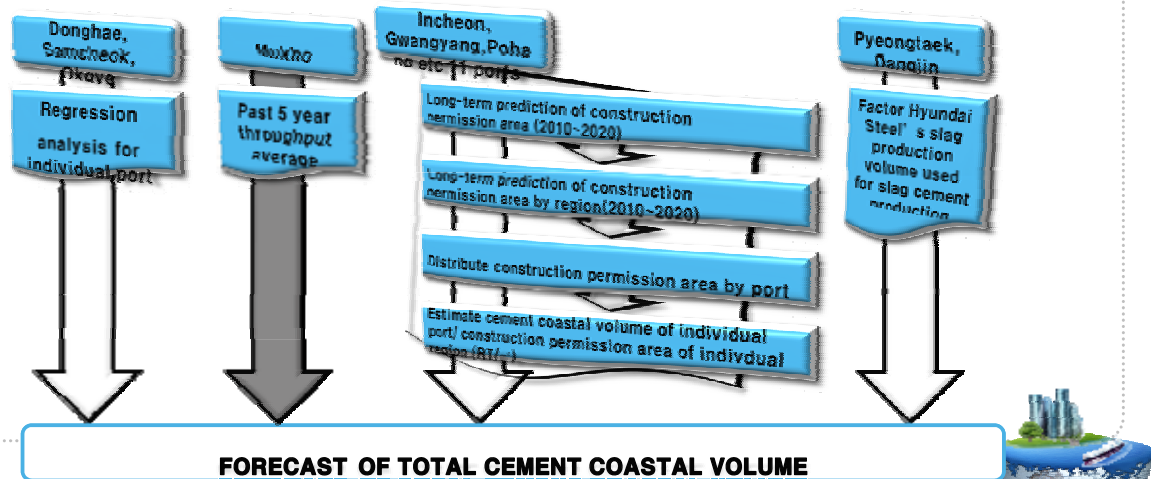


II-3. Method to forecast port volume by item

2-2. Cement

▷ Summary of Forecast : Coastal

- Coastal volume usually occurs in Donghae, Samcheok, Okgye
- Use regression analysis in this area to reflect South Korea's economic change
- Use forecast amount for construction permission area for other ports

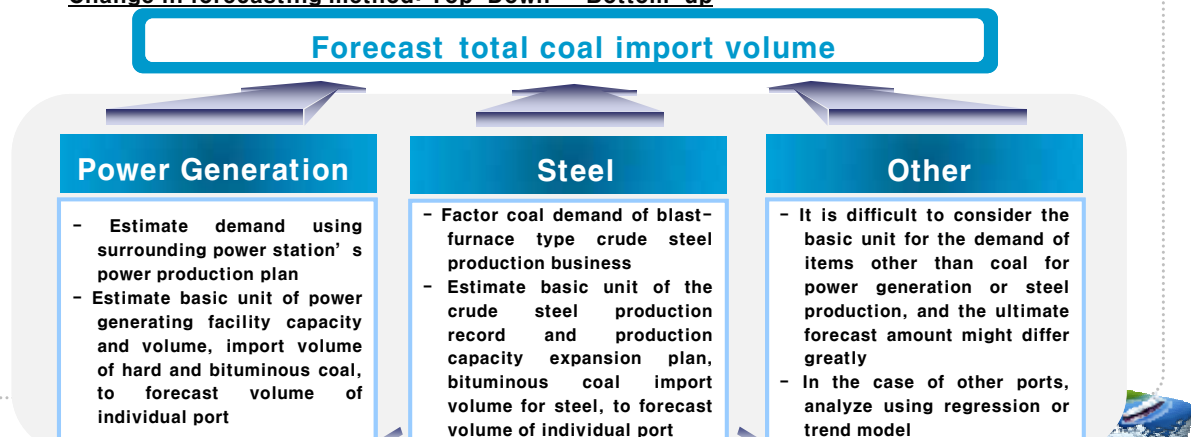


II-3. Method to forecast port volume by item

2-3. Coal

▷ Summary of Forecast

- Coal is composed of hard coal and bituminous coal, and is mostly import-dependent.
- After predicting demand for each usage, gather the total number to predict the total coal volume
- Around 99% of coal volume is import volume, so only import volume is estimated
- Change in forecasting method: Top-Down → Bottom-up



II-3. Method to forecast port volume by item

2-3. Coal

▷ Identify import volume according to the coal demand

Hard Coal					Bituminous coal					
Major throughput harbor	Major Demand Source	PG	S	O	Major throughput harbor	Major Demand Source	PG	S	C	O
Gwangyang	POSCO				Gwangyang	POSCO/ Honam Thermal Plant				
					Daesan	Dangjin Plan				
Donghae	Yeongdong Thermal Plant/ Donghae Plant				Donghae	Cement				
Mukho	Yeongdong Thermal Plant				Mukho	Cement				
					Mokpo	Cement /Power Generation/other				
					Boryung	Boryung Thermal Plant				
Samcheok	Statistical error (add to bituminous coal)				Samcheok	Samcheonpo Thermal Plant/ Hadong Thermal Plant				
					Okgye	Cement				
Ulsan	Private etc				Ulsan	Daegu Combined Heat and Power Plant				
Incheon	Seocheon Thermal Plant				Incheon	Yeonghung Power Plant				
					Taeahn	Taeahn Thermal Plant				
Pyeongtaek, Dangjin	Hyundai Steel				Pyongtaek, Dangjin	Hyundai Steel				
Pohang	Seocheon Thermal Plant / POSCO				Pohang	POSCO				
					Samcheok, Hosan	Samcheok Thermal Plant				

Note : PG : power generation, S : Steel, C : cement industry, O : other

II-3. Method to forecast port volume by item

2-4. Wood and lumber

▷ Forecast of import volume

- Use construction investment on hinterland of individual port: GRDP estimate by KDI
- Investigate mid-long term change trend of domestic construction investment : Construction Economy Research Institute of Korea (CERIK)
- However, Ulsan Port only handles lumber for pulp, so factor the related industry to forecast

Forecasting import volume of wood and lumber

Construction investment of individual of each hinterland & import volume throughput

Estimate basic unit

5 year average of estimated basic unit

Apply to construction industry production

PDAC 第25回年會
2017 25th ANNUAL MEETING

Summary of Forecast

- ## Forecast lumber and wood export volume

- ## Forecast lumber and wood coastal volume

- 15

y item
한수요해독센터
 HAN SUYOHAEDEUK CENTER

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graph TD
    A[Single (plural) region's single port] --> D[Use forecast of aggregate demand by region (m³) (2009~2013)]
    B[Plural port of single region] --> D
    C[Incheon, Pyeongtaek, Gangjin Port] --> D
    D --> E[Forecast of long-term aggregate demand by region (m³) (2014~2020)]
    E --> F[Analyze weight of port volume (aggregate demand ton(RT) unit conversion)]
    F --> G[Distribute aggregate demand by individual port in each region]
    G --> H[FORECAST TOTAL SAND COASTAL VOLUME]
  
```

Single (plural) region's single port

Busan Port(Busan)
Ulsan Port(Ulsan)
Donghae
Port(Kangwondo)
Gunsan Port(North Jeolla)
Janghang Port (South Chungcheong, Daejeon)
Pohang Port(Daegu, North Gyeongsang)

Plural port of single region

Masan,
Samcheonpo,
Jinhae, Gohyeon
(South Gyeongsang)
Jeju, Seogwipo
(Jeju)

Incheon, Pyeongtaek, Gangjin Port

Use forecast of aggregate demand by region (m³) (2009~2013)

Forecast of long-term aggregate demand by region (m³) (2014~2020)

Analyze weight of port volume (aggregate demand ton(RT) unit conversion)

Distribute aggregate demand by individual port in each region

Analyze weight of Seoul, Incheon, Gyeonggi Region destination

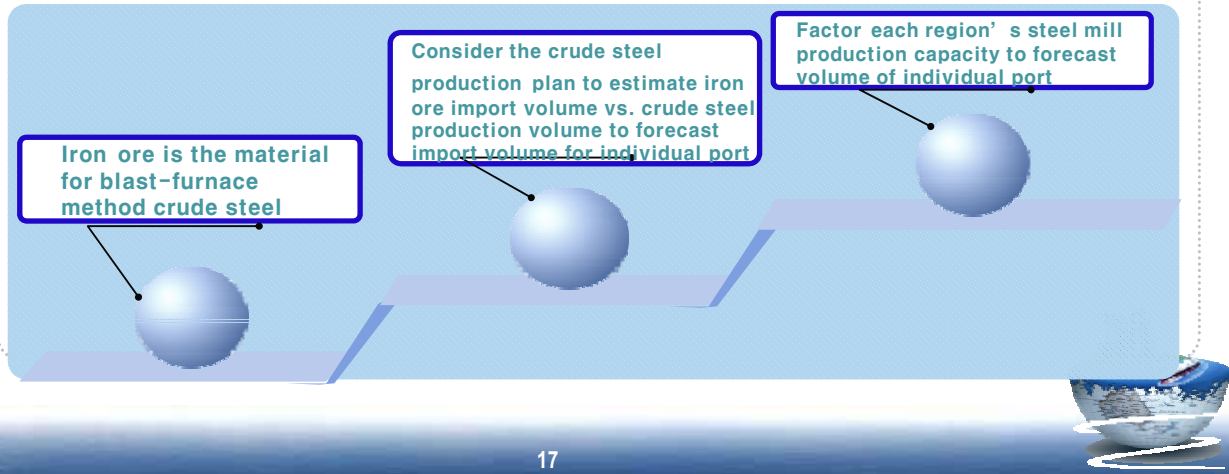
FORECAST TOTAL SAND COASTAL VOLUME

II-3. Method to forecast port volume by item

2-6. Iron ore

▷ Summary of Forecast

- Main import source of iron ore : volume occurs in Pohang and Gwangyang, where POSCO is located. POSCO uses blast-furnace method to produce crude steel.
- Hyundai Steel began producing crude steel since 2010. Since then, Pyeongtaek, Dangjin Port have handled iron ore (iron ore volume expected to continually increase when additional blast-furnace is operated from 2015 on)
- Change in forecasting method : Top-Down → Bottom-Up



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II-3. Method to forecast port volume by item

2-7. Steel

▷ Summary of Forecast : Import/Export

- Separate ports with major steel business and other ports for forecast

Pohang, Gwangyang, Busan, Incheon, Pyeongtaek - Dangjin



Ports with major steel making business. They have a relatively clear correlation with volume, so factor the business' crude steel production capacity, and do a regression analysis to forecast volume

Other ports



Because it is difficult to investigate the reason for volume, monitor the respective port and use past record average to forecast volume

▷ Summary of Forecast : Coastal

- In the case of ports where there are shipyards or other steel making business, volume occurs due to material transportation related to steel.

Gunsan, Gohyeon, Masan, Mokpo, Busan, Okpo, Ulsan, Jinhae, Tongyeong



In the case of ports that handle shipbuilding material, coastal volume has sharply increased in recent 2-3 years (shipbuilding increase)
It is difficult to gather information on the long-term shipbuilding outlook or related business' facility plan.
In the case of 9 ports, used the average of record of the past two years, then drafted the weight of individual port out of the total amount
Predicted volume of individual port by uniformly applying the drafted weight out of the total which factored in GDP growth rate.

Other ports



Apply past average record factoring decreased volume due to business' s using land transportation and flat growth outlook

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II-3. Method to forecast port volume by item

2-8. Scrap Iron

▷ Summary of Forecast

- Scrap iron volume forecast method is Bottom-up
- The past record of scrap iron volume changed greatly by port and there is irregular trend
- In particular, various factors such as global scrap iron price and domestic competition over scrap iron, crude steel capacity combined affect the volume, making it difficult to forecast

▷ Change in forecasting method : Top-down → Bottom-up

▷ Forecast method : Import

- Separate ports with major steel business and remaining ports for forecast

Pyeongtaek · Dangjin Port, Pohang Port



For ports with steel business that have a clear past trend, forecast with regression analysis

Other ports



Other ports, if the past record is very small or the change range is too big, apply the past average record

▷ Forecast method: Export/Coastal

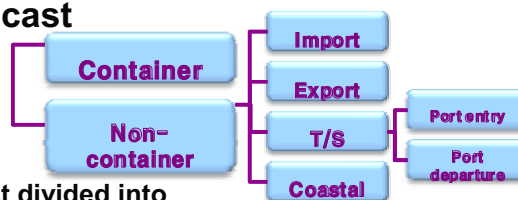
- Uniformly apply past average record of individual ports



II-3. Method to forecast port volume by item

2-9. Automobile

▷ Summary of Forecast



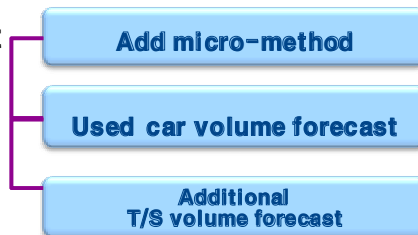
- Automobile forecast divided into non-container (assembled cars) and container(CKD)
- Non-container automobiles (assembled cars), or cars, are to be forecast according to import/export/TS(port entry, port departure)/costal.
- Over 80% of automobiles (as of 2009) are exported. Forecast is possible using world automobile production forecasts and domestic production and export data according to maker/model/port.
- Non-container automobiles forecast can be made by putting together forecasts of individual ports



II-3. Method to forecast port volume by item

2-9. Automobile

▷ Summary of Forecast



[Bird's-eye-view of Pyeongtaek
- Dangjin Port Automobile dedicated port]

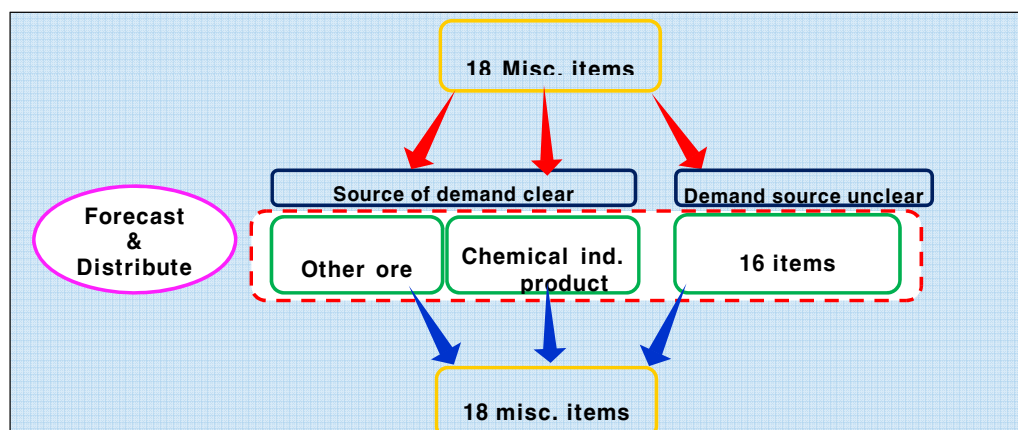
- Supplementary application of micro-method
 - Compound of macro and micro methods : Automobile forecasts by individual ports
 - Unlike the previous method of automobile export forecast, use overseas professional services
 - Detailed automobile forecasts of individual ports based on past date according to maker/model
- Forecast cars and used cars separately, then forecast by adding them
- Additional forecast of automobile transshipment
 - Non-container transshipment of automobiles occur
 - Additional forecast of automobile transshipment (port entry, port departure)

II-3. Method to forecast port volume by item

2-10. Miscellaneous Items

▷ Summary of Forecast

- Other miscellaneous items will be forecast using a bottom-up method
- Forecast on 18 miscellaneous items divided into items with determined demand (other minerals, chemical industrial products) and the 16 remaining items



II-3. Method to forecast port volume by item

2-10. Miscellaneous Items

▷ Summary of Forecasting

- Other minerals
 - Analyze in detail the HS code products that pertain to the category of other minerals using Korea Customs Service data.
 - Pohang, Gwangyang : Demand for steelmaking (factor steel production capability)
 - Pyeongtaek-Dangjin : Demand from hinterland(factor GRDP) + Demand for steelmaking (factor steel production capacity)
 - Donghae, Okgye, Samcheok : Demand for cement (factor GRDP)
 - Other ports : Demand from surrounding area (factor GRDP)
- Chemical industrial products
 - Ulsan, Gwangyang, Daesan : Forecast per unit using ethylene production capacity (Korea Petrochemical Industry Association data)
 - Other ports : Apply per unit chemical industry production of cities by using the city/industry data of Korea Customs Service's Mining·Manufacturing Survey(2008)
- Remaining 16 items
 - Due to the diversity of items included, difficult to reflect traits of each items in forecasting.
 - GRDP of surrounding area of port to estimate volume



II-3. Method to forecast port volume by item

2-10. Miscellaneous Items

▷ Summary of Forecast

- Specific items
 - Animal-vegetable fat and oils, fertilizers, drinks-liquor-delicatessen, fishes and shells-crustacean, sugars, nonferrous metals, machinery, electric appliances, airplane-ship parts, meat, baked goods, other animal-vegetable products, plastic-rubber products, leather goods, textile fiber, other miscellaneous items
- Forecasting method
 - Korea Development Institute's 「Research on Standard Guidelines for Preliminary Feasibility Study on Port Sector Industry,」 (2001) recommends that among the basic socio-economic indicators, GRDP of the zone is factored in when forecasting the volume of goods transported through a port.
 - Apply the GRDP from 2010 to 2030 using the GRDP growth projections per region given by KDI
- Quantity of goods transported through Boryeong New Port
 - Reflecting the additional quantity of goods transported through the port that occurs with the development of Boryeong and the hinterland industrial areas of South Chungcheong province
 - Reflecting the forecasted quantity of goods transported through the port according to the feasibility report on the early development of Boryeong New Port given by the Port Demand Analysis Center on the September 2009

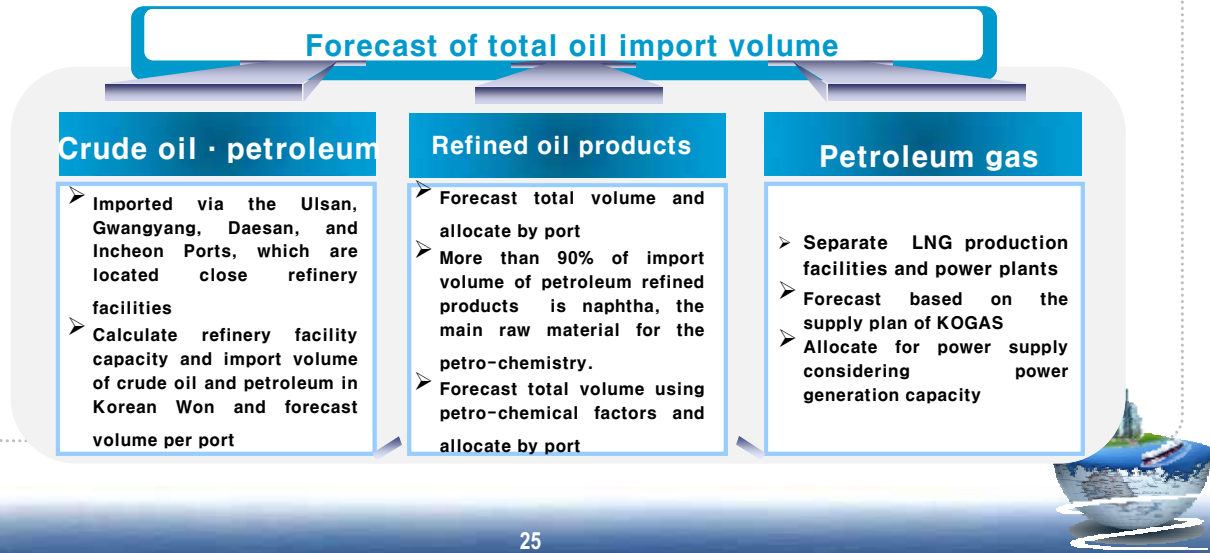


II-3. Method to forecast port volume by item

2-11. Oils

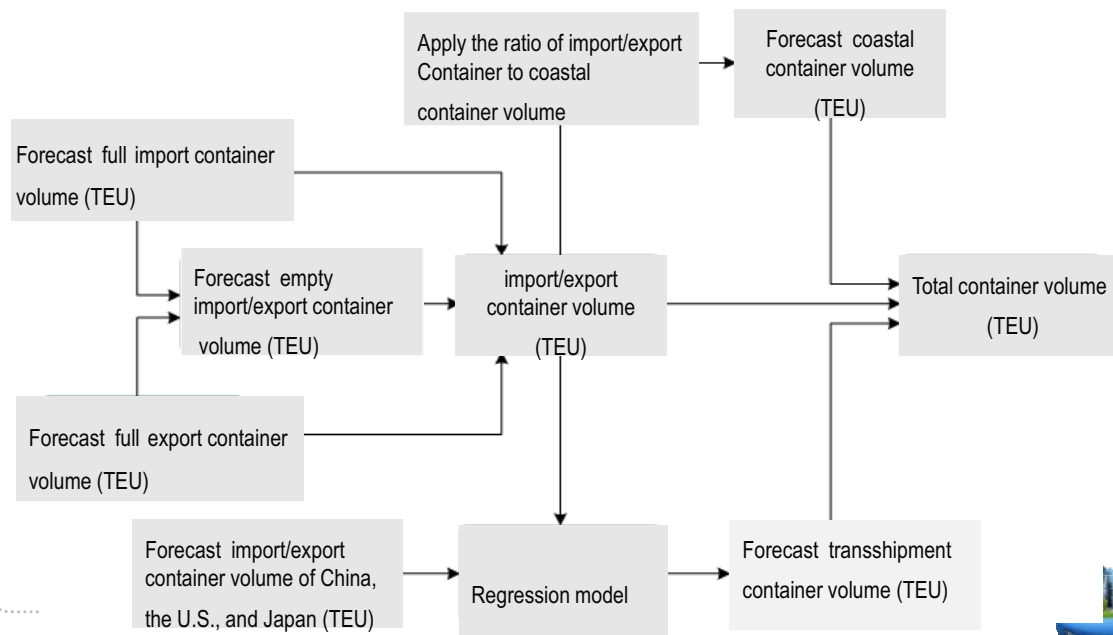
▷ Overview of import volume forecast

- Oils include crude oil, petroleum, petroleum gas, refined petroleum products.
- Forecast is made using both bottom-up and top-down approaches according to product.



II-3. Method to forecast port volume by item

2-12. Overview of container volume forecast



II-3. Method to forecast port volume by item

2-12. Forecast import/export container volume

▷ Forecast method

- Based on actual volume in 2010
 - To reflect high growth rate from January through May in 2010
- Unlike in the past, forecast container volume directly
 - Forecast full container import/export volume using GDP
 - Use the difference between import and export full container volume to forecast empty container volume and then add up to calculate import/export container volume

	New method	Old method (to be revised)
Method	- Directly forecast container volume (TEU) using GDP - Forecast non-container volume separately for volume per item (RT)	- Forecast volume of 32 items(RT) - Calculate container cargo volume (RT) by applying container shipping percentage by item - Convert into TEU using RT per TEU
Merits	- Easy to understand/explain the model - Simple forecast model	- Take into account features of each item - Calculate total volume per item
Demerits	As factors are limited, the result is very sensitive to factor changes.	- Difficult to understand the complex model - Require lots of work and time

II-3. Method to forecast port volume by item

2-12. Forecast import/export container volume

▷ Forecast model

Category	Model	Adj R ²
Full import	$\text{Ln}(\text{Import_Con}) = -5.207 + 1.484 \text{ Ln}(\text{GDP})$	0.987
Full export	$\text{Ln}(\text{Export_Con}) = -5.043 + 1.498 \text{ Ln}(\text{GDP})$	0.990
Empty import/export	$\text{Emp_Con}_t = -160,336 + 0.187 \text{ Full_Con} + 0.197 \text{ Gap} + 0.536 \text{ Emp_Con}_{t-1}$	0.984

Note : 1) Import_Con : import container(Unit: TEU)

2) Export_Con : export full container(Unit: TEU)

3) Emp_Con : import/export empty container(Unit: TEU)

4) Full_Con : import/export full container(Unit: TEU)

5) Gap : absolute gap between import full container and export full container (Unit: TEU)

6) GDP : gross domestic product (Unit: billion won)

▷ Result of forecast import/export container volume

(Unit: 1,000TEU, %)

Year	2010	2015	2020	2010~2015	2015~2020
Estimated result	12,349	16,590	21,942	6.1	5.8

II-3. Method to forecast port volume by item

2-12. Forecast transshipment container volume

▷ Forecast overview

- Transshipment container volume significantly increased since the late 1990s due to port facility expansion, transshipment increase caused by maritime transport system changes, and lack of port facilities in China, but slows down currently.
- The ratio of transshipment volume to import/export volume is stagnated around 55%.
- High growth rate will not be shown as China builds massive port facilities.
- But, transshipment might increase with more large vessels calling at Korean ports and improvement of port fee and services.

(Unit: 1,000 TEU, %)

Category	2001	2002	2003	2004	2005	2006	2007	2008	2009
Import/exp ort (A)	6,591	7,356	8,182	9,025	9,412	10,123	11,254	11,605	10,369
Transshipm ent (B)	3,111	4,205	4,598	5,158	5,532	5,673	6,155	6,186	5,719
Ratio (B/A)	47.2	57.2	56.2	57.2	58.8	56.0	54.7	53.3	55.2

II-3. Method to forecast port volume by item

2-12. Forecast transshipment container volume

▷ Forecast method

- Forecast actual volume in 2010, like import/export volume forecast
- Forecast by comparing import/export container volume of China, the U.S., and Japan and import/export container volume of Korea
 - Transshipment is usually for other countries' cargo. Korea mostly transships cargo for China, the U.S., and Japan.
 - As of 2009, China: 28.3%, U.S.: 18.8%, Japan: 15.2%, Three countries' combined rate: 62.4%
 - Korea's import/export volume is to reflect Korea's cargo density.

Model	Formula	R ²
Model 1	$\nabla \text{TSKOR} = 28.692 + 0.484 \nabla \text{KorExIm} + 0.00739 \nabla \text{Cn}$	0.507
Model 2	$\nabla \text{TSKOR} = 26.679 + 0.451 \nabla \text{KorExIm} + 0.00800 \nabla \text{USACn}$	0.592
Model 3	$\nabla \text{TSKOR} = 40.202 + 0.487 \nabla \text{KorExIm} + 0.00505 \nabla \text{JapCn}$	0.499
Model 4	$\nabla \text{TSKOR} = 35,368 + 0.476 \nabla \text{KorExIm} + 0.00547 \nabla \text{USAJapCn}$	0.500

Note : 1) ∇TSKOR : Korea's transshipment difference (Unit: 1,000 TEU)

2) ∇Cn : China's volume difference (Unit: 1,000 TEU)

USACn: China-US volume difference (Unit: 1,000 TEU)

4) ∇JapCn : China-Japan volume difference (Unit: 1,000 TEU)

5) $\nabla \text{USAJapCn}$: China-US-Japan volume difference (Unit: 1,000 TEU)

6) $\nabla \text{KorExIm}$: Korea's import/export volume difference (Unit: 1,000 TEU)

II-3. Method to forecast port volume by item

2-12. Forecast transshipment container volume

▷ Forecast result

- Models 1 to 4 present similar results.
- Model 2 is selected based on stat comparison of MAPE, MAE, and RMSE.

Model	2010	2015	2020	2010~2015	2015~2020
Model 1	6,641	9,793	13,043	9.4	5.9
Model 2	6,641	9,423	12,633	6.9	6.1
Model 3	6,641	9,683	12,842	9.2	5.8
Model 4	6,641	9,672	12,827	9.2	5.8



II-3. Method to forecast port volume by item

2-12. Forecast coastal container volume

▷ Forecast method

- Volume caused by feeder transport of import/export cargo
 - Forecast based on estimated share of coastal container volume out of import/export container volume
 - Reflect government policy to set the share of coastal container volume out of import/export container volume
 - Ratio of coastal container volume to import/export container volume: **4.3% by 2015, 5.6% by 2020**
- Convert some of road transport for the Seoul metropolitan area- southern areas to maritime transport
 - Assumed the conversion rate at **5% by 2015 and 7% by 2010.**





Result of port volume forecast by item



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III. Result of port volume forecast by item

3-1. Result of volume forecast by item

▷ Result

(Unit: 1,000 RT, %)

Item	2010	Forecast		Average annual growth rate	
		2015	2020	'10~'15	'15~'20
Grain	13,024	11,752	11,296	-2.0	-0.8
Cement	38,009	53,726	58,040	7.2	1.6
Coal	119,121	131,849	158,857	2.1	3.8
Wood	6,392	8,803	10,500	6.6	3.6
Sand	56,475	59,327	65,093	1.0	1.9
Iron ore	59,721	92,685	107,492	9.2	3.0
Steel	76,643	95,381	106,763	4.5	2.3
Scrap metal	6,631	6,139	6,384	1.9	1.6
Automobile	39,332	43,360	48,612	2.0	2.3
Other ores	46,839	59,019	68,107	4.7	2.9
Petrochemical products	39,406	43,811	54,083	2.1	4.3
miscellaneous items	50,625	61,448	69,896	4.0	2.6
Oils	343,858	438,638	463,250	5.0	1.1
Container(1,000 RT)	313,714	433,603	579,809	6.7	6.0
Total	1,209,790	1,539,540	1,808,181	4.9	3.3



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III. Result of port volume forecast by item

3-2. Result of container volume forecast

▷ Forecast result

- Result of port volume forecast is significantly influenced by economic conditions at the time of forecast.
- Container volume is expected to grow at the average annual rate of 6% by 2020.

(Unit: 1,000 TEU, %)

Category	2010	Forecast		Average annual growth rate	
		2015	2020	'10~'15	'15~'20
Import/export	12,349	16,590	21,942	6.1	5.8
Transshipment	6,641	9,423	12,633	7.2	6.0
Coastal	378	1,027	1,751	22.1	11.3
Total	19,369	27,040	36,236	6.9	6.1



IV

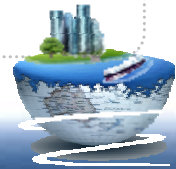
How to improve forecast method in the future



IV. How to improve forecast method in the future

▷ Forecast method

- With the government's green growth policy, coastal volume is expected to increase, in particular, on major import/export ports.
 - However, the current research has not estimated demand based on port policy of major trading countries and not developed a model reflecting maritime demand (business strategy of maritime companies).
- In the future, port volume should be estimated based on port policy and port facility development plans of major countries and shipping patterns of major maritime companies.
- The conversion of road transport for the Seoul metropolitan area- southern areas to maritime transport is expected to focus on Incheon, Pyungtak, Dangjin, Busan, and Gwangyang Ports.
 - However, additional research should be conducted on volume allocation among ports.

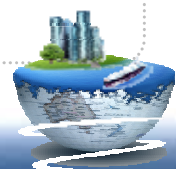


IV. How to improve forecast method in the future

▷ A famous saying on forecast

□ Steve Jobs

- “We cannot exactly forecast what will happen in the future. But, we know in which direction we are going. That is all you can do. If you step back and look, the situation becomes live and gets moving.”



IV. How to improve forecast method in the future

▷ A famous saying on forecast

□ Steve Jobs

- “you can’t really predict exactly what will happen, but you can feel the direction that we’re going. And that’s about as close as you can get. Then you just stand back and get out of the way, and these things take on a life of their own.”



자료: 애플 홈페이지

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Thank you

