

Ad Hoc Expert Meeting on

**Climate Change Impacts and  
Adaptation: A Challenge for  
Global Ports**

29 – 30 September 2011

**Climate Change Impacts  
– Adaptation Measures in Ports –**

Presentation by

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# **Climate Change Impacts -Adaptation Measures in Ports-**

**UNCTAD Ad Hoc Expert Meeting**

**Susumu Naruse, Secretary General, International Association of Ports and Harbors (IAPH)**

# Overview of the Presentation

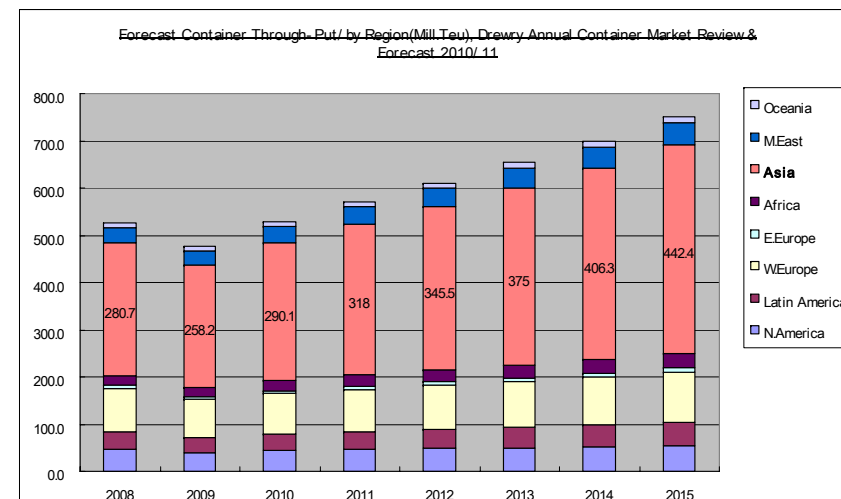
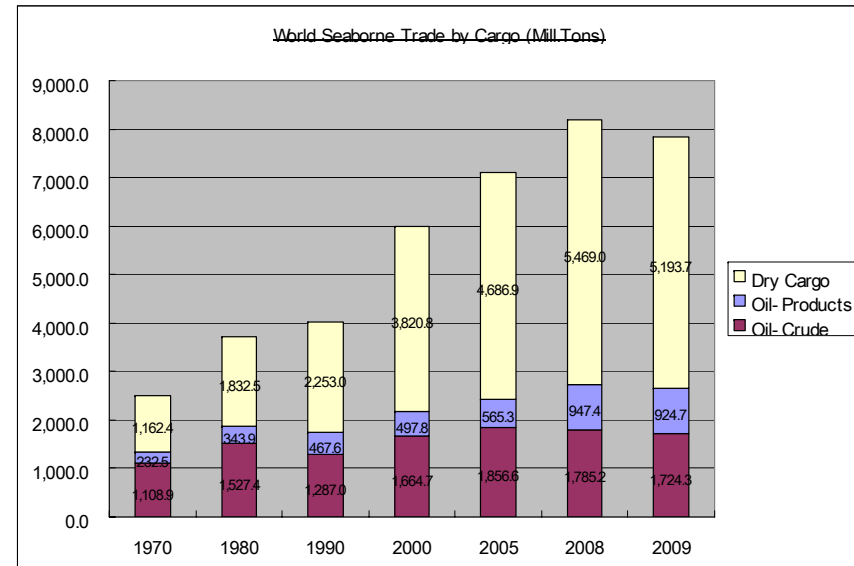
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- ▶ **World Trade and Seaports**
- ▶ **Mitigation against Climate Change**
  - Environmental Ship Index
  - LNG fuelled Vessels and Ports
- ▶ **Adaptation against Climate Change**
  - Climate Change Impacts on International Seaports
  - Seaports and Climate Change- An Analysis of Adaptation Measures-
- ▶ **Climate Change and Coastal Protection in Japan**
  - Sea Level Rise & Intensification of Typhoon
- ▶ **Climate Change and Northern Sea Route**
- ▶ **Offshore Wind Farm and Ports**
- ▶ **Conclusions**



# World Trade and Seaports

- ▶ World trade has increased at a much faster rate than world economy.
- ▶ Ninety percent of world trade is estimated to be transported by maritime transport.
- ▶ Seaports play a vital role in world trade as nodes of maritime transport, thus in economic development of the world.
- ▶ Ports also play an important role in regional and local economies, creating job opportunities, providing space for urban activity and others.
- ▶ Container transport has become the prime means of maritime transport, which is estimated to carry nearly 90% of the total global trade in monetary value.
- ▶ To pursue economies of scale, ocean-going vessels have become larger, which require ports to be more efficient and reliable.
- ▶ Ports are very vulnerable to climate change, e.g. sea level rise and intensification of storms.



# IAPH Projects on Climate Change -Mitigation-

Creating WPCI (World Ports Climate Initiative),

IAPH is tackling the following projects:

- Air Quality and GHG Tool Box
- Carbon Footprinting fro Ports
- On-shore Power Supply
- Intermodal Transport
- Sustainable Lease Agreement Template
- Cargo-handling Equipment
- Environmental Ship Index
- LNG fuelled Vessels and Ports

Mitigation measures are easier to discuss in IAPH since they can be applied to all ports in the world.

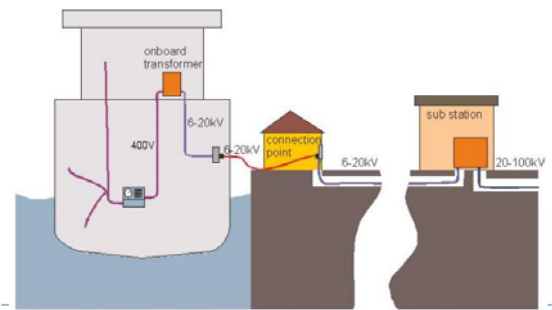
**IAPH TOOL BOX FOR PORT CLEAN AIR PROGRAMS**  
Improving Air Quality While Promoting Business Development  
A Reference Guide provided by the International Association of Ports and Harbors (IAPH)



**CARBON FOOTPRINTING FOR PORTS**  
GUIDANCE DOCUMENT  
DRAFT

Prepared by:  
Carbon Footprint Working Group  
World Ports Climate Initiative  
Port of Los Angeles, Lead Port

Logos of participating ports: WPCI, THE PORT OF AMSTERDAM, Port of Antwerp, PHA, Port of LONG BEACH, THE PORT AUTHORITY OF NY & NJ, PORT OF OAKLAND, Port of Oslo, Port of Seattle.



# Environmental Ship Index

- ▶ ESI is a system in which we identify ships that perform better than usual ships in reducing gases emissions and ports give some incentives to these environmentally friendly ships.
- ▶ As of July 1<sup>st</sup>, 2011, 368 ships and 6 incentive providers (5 ports and Green Award) participate in the system. Participating incentive providers and their incentive schemes are shown in the table below.
- ▶ Seven more ports, Bremen, Los Angeles, Kiel, Groningen Sea Ports, Zeebrugge, Gent, and Wilhelmshaven, are expected to join the system by the end of the year.

Incentive Provider	Minimum Requirements	Incentives
Port of Rotterdam	ESI score 20 or more	6% or more reduction on port dues
Port of Amsterdam	ESI score 30 or more	10% or more reduction on port dues
Port of Oslo	ESI score 20 or more	30% reduction on port dues (tankers only)
Port of Antwerp	ESI score 30 or more, or 25 best ships	10% or more reduction on port dues
Port of Hamburg	ESI score 20 or more	10% or more reduction on port dues
Green Award	Participation in ESI	ESI participations obtain extra points



# LNG fuelled Vessels and Ports

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## 1. Background

- ▶ LNG (liquefied natural gas) is much a cleaner energy source, which can almost eliminate sulphur emissions and particulates, reduce CO<sub>2</sub> and NO<sub>x</sub> by 26% and 80-90% respectively.
- ▶ At the moment some seagoing vessels are already fueled by LNG (22 vessels in North Europe) and new engines are being developed by the manufactures such as Rolls Royce.
- ▶ The challenges are cost associated with LNG as vessel fuel, safety at ports and bunkering facility at ports.

## 2. IAPH's Action

- ▶ Goals --- to create international standards/guidelines for port infrastructure, safety and security at ports and legal aspects.
- ▶ Items to be studied:
  - safety distance and allocation of bunkering berths
  - bunkering safety procedures
  - supervision of procedures (worker education and crew awareness)
  - preparation for possible accidents (facilities and equipment, training, procedures)
  - other items including influence on ISPS code



# IAPH Project on Climate Change –Adaptation- 1

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## ► Climate Change Impacts on International Seaports

1. Questionnaire survey to IAPH member ports on how they plan to adapt to climate change

### 2. Results

- they discuss more frequently mitigation than adaptation measures.
- most ports prepare port planning on a 5-10 year horizon.
- design standards of most ports cover 50 year or more historic flood (or storm) events (but not climate change).
- about a half ports do not address the climate change issue at this time.
- Sea Level Rise is the chief concern among ports, which is followed by storm impacts.
- 38% predicts SLR of 0.5-1.0 m by 2100 and 15% 1.0m or more.
- 39% feel that 0.5-1.0 m would be a problem and 58% that 1.0-2.0 m would be a problem.
- ports should be better informed of local SLR and other climate events.





# IAPH Projects on Climate Change –Adaptation- 2

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## ▶ Seaports and Climate Change

### - An Analysis of Adaptation Measures-

-- Possible climate change impacts on different types of port facility are addressed.

-- those types are:

1. access channel, vessel mooring area, breakwaters, shore-protection works and hinterland connections as basic infrastructure;
2. inner channel, revetments, quay walls, mooring buoys as operational infrastructure;
3. stacking yard, warehouses, silos, and offices as port superstructure;
4. ship and cargo handling equipment as port equipment

-- opportunities and risks caused by possible climate change impacts such as sea level rise and weather intensification are addressed for each type of facility.

-- a good guidelines for adaptation measures in ports but lacks best practices.



# Planning of Coastal Protection Facility in Japan

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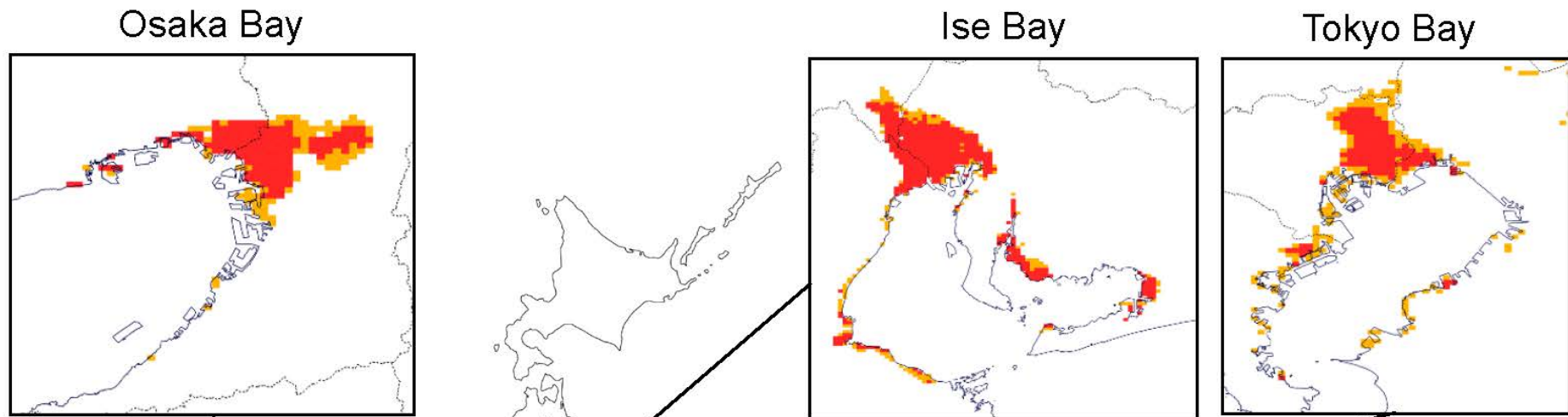
- ▶ Japan has three densely populated bay areas that also have Japan's five largest ports.
- ▶ As shore protection facilities were mainly developed in the 1960's and 1970's, they have become obsolete.
- ▶ It was decided that when they were renewed climate impacts should be taken into consideration though as this involves a lot of investment it needs a lot of time to complete.
- ▶ The following slides are cited from the presentation that Dr. Isobe of Tokyo University delivered at the IAPH Busan Conference this May.

## Planning Process

1. Evaluation of current conditions
2. Trend of sea level rise in Tokyo Bay
3. Flowchart of planning process
4. Sea level rise in the given year
5. Intensified maximum typhoon
6. Required crown height of shore protection facility



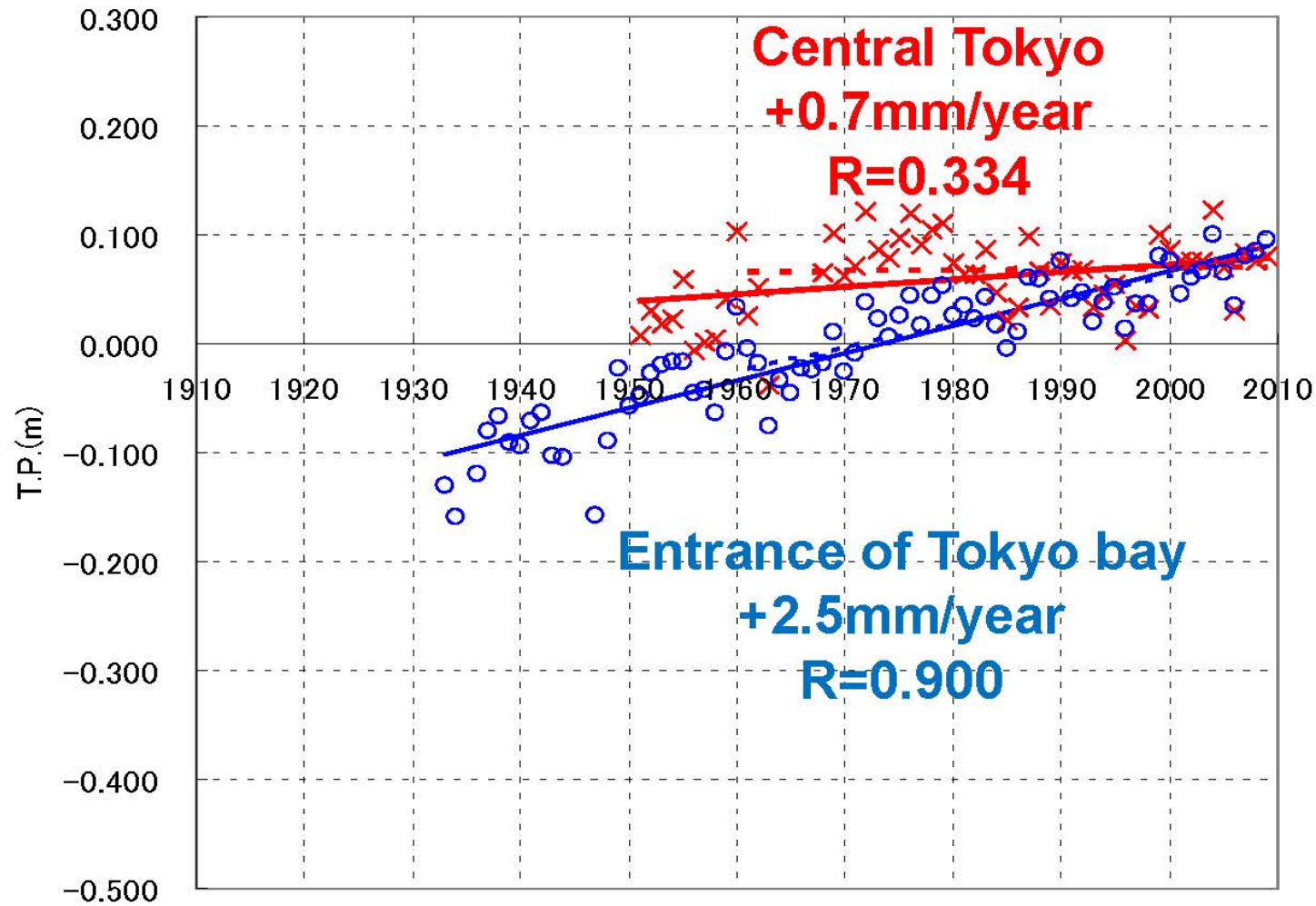
# Impact of sea level rise on the three major bays in the end of the 21 century



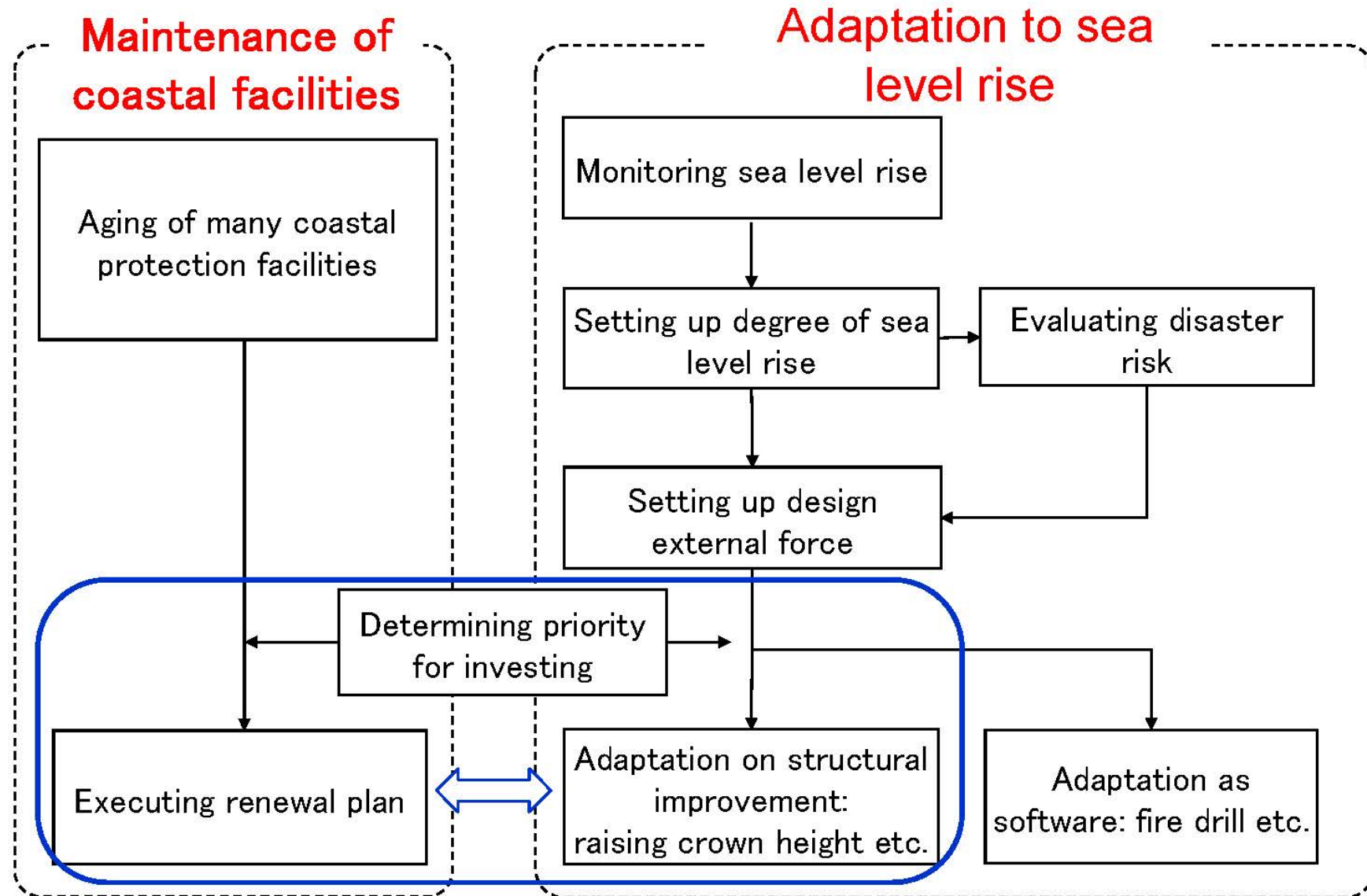
Total Area and Population below mean monthly-highest sea level in the case of 59cm rise

	Present Condition	After 59cm sea level rise	Ratio
Area (km <sup>2</sup> )	577	879	1.5
Population (thousand people)	4,040	5,930	1.5

# Long-term change of annual mean sea level in Tokyo bay

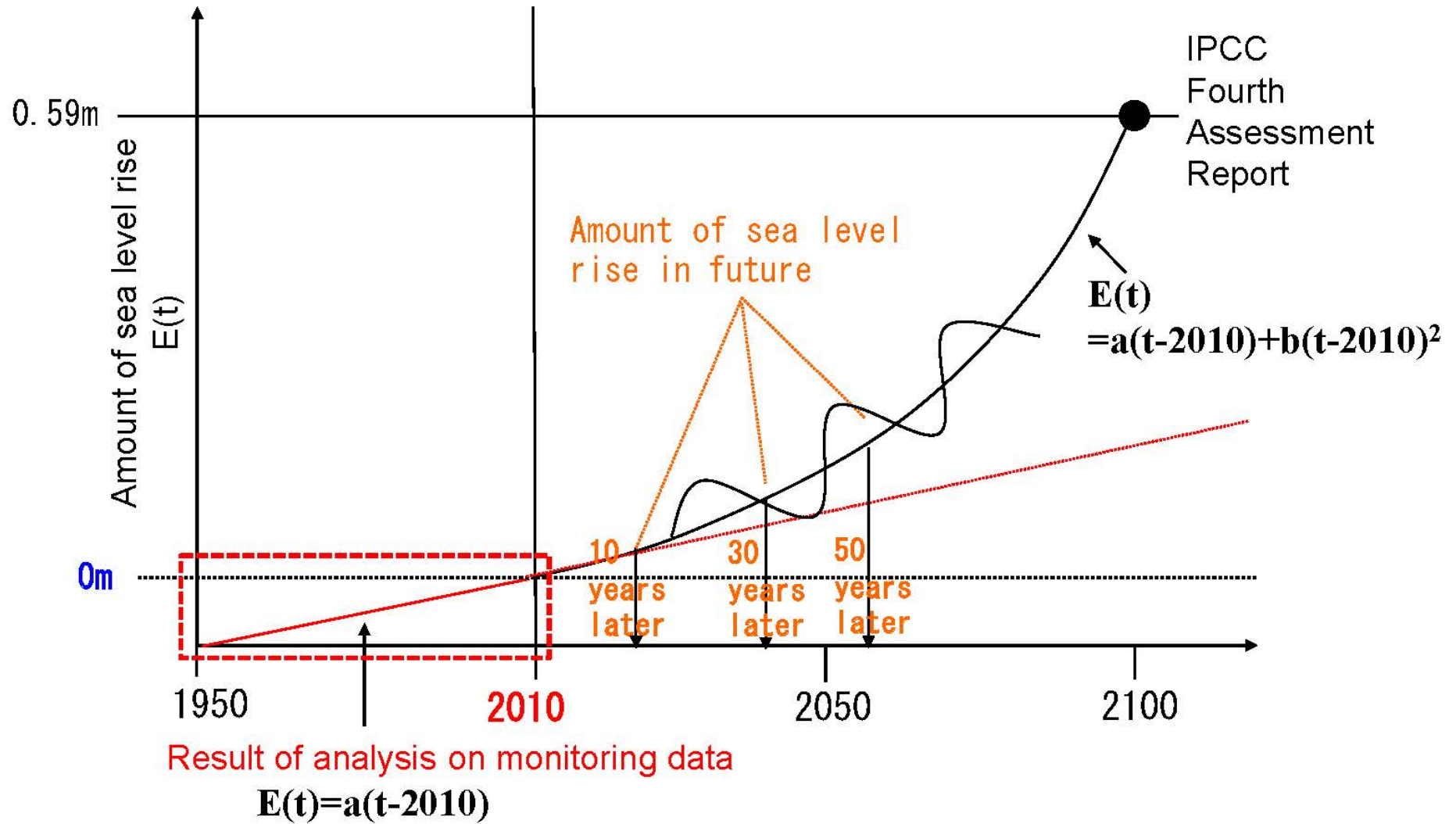


# Process towards adaptation strategy to global warning



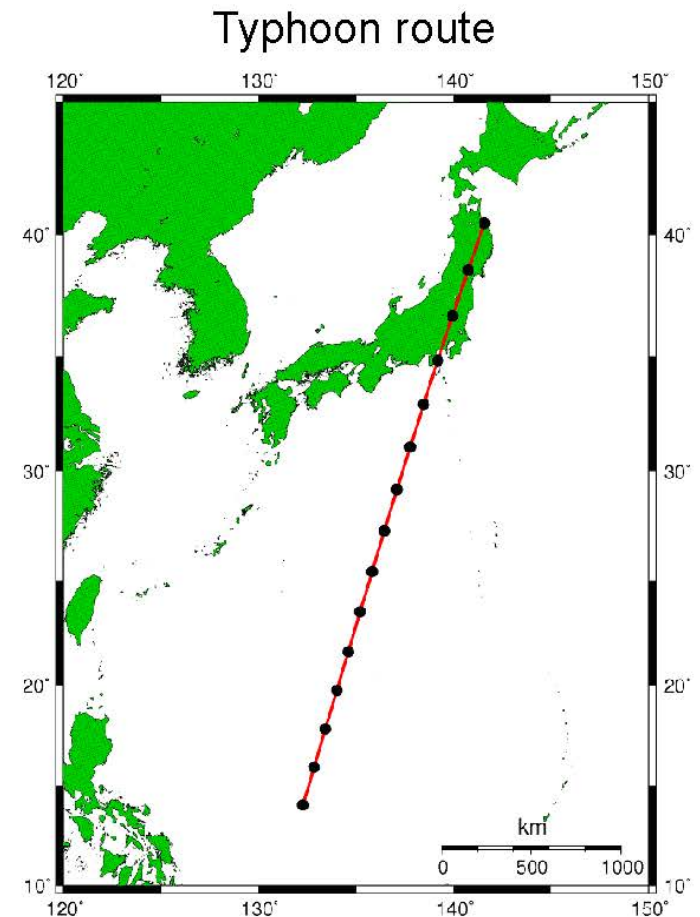
# Setting up amount of sea level rise until 2100

NRC-I model by US Army Corp of Engineers

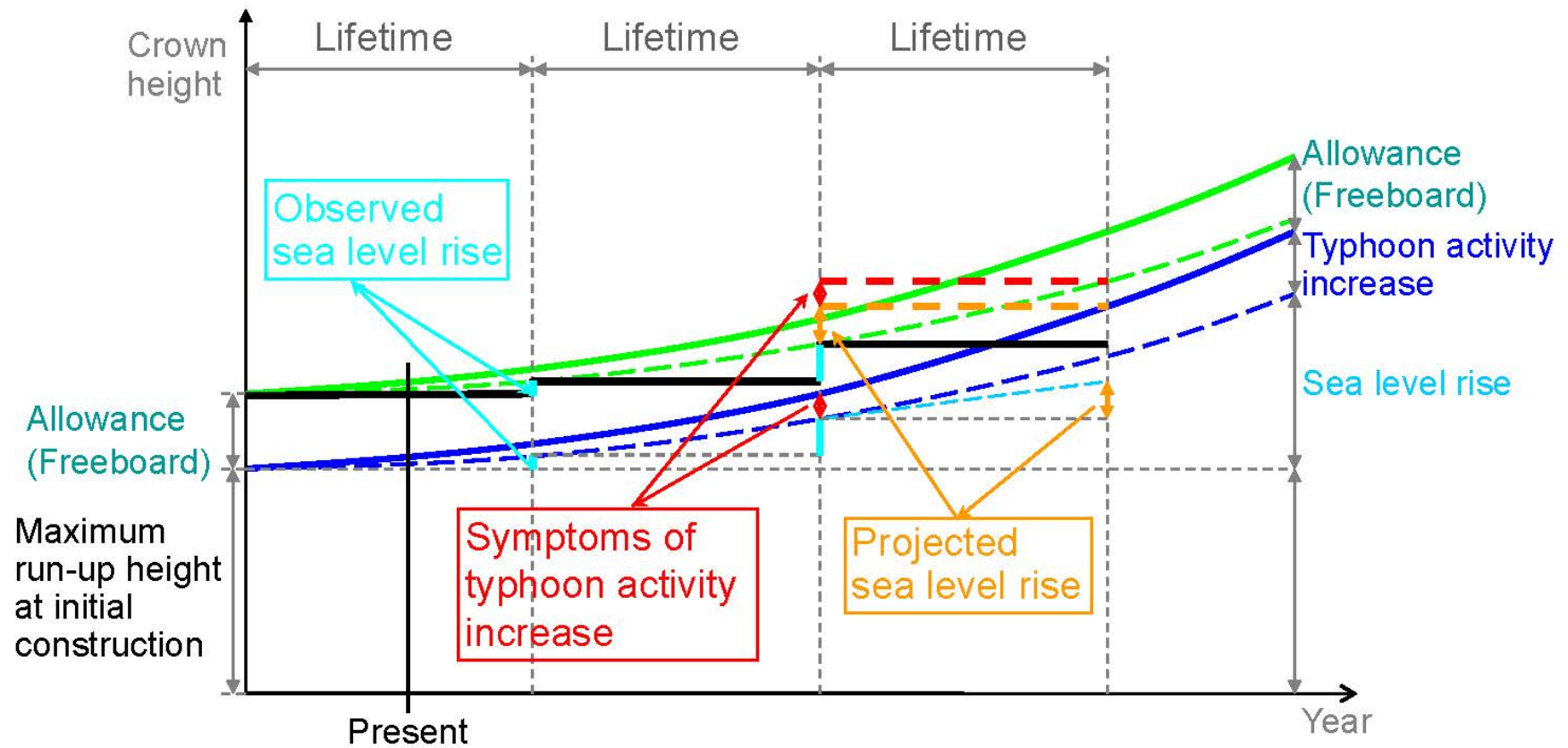


## Disaster scenario in 2100 in Tokyo bay

Strength of typhoon	• Muroto typhoon level: 911hPa of central pressure on landing
Astronomical tide level at the time of storm surge deviation	• Mean monthly-highest sea level: T.P.(Tokyo peil)+0.97m
Sea level rise due to climate change	• IPCC A1FI scenario: +0.6m



# Design of coastal structure adapting to global warming





# IAPH's Position on Adaptation Measures in Ports

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1. Adaptation measures are more difficult to discuss in an organization such as IAPH because all ports have quite different natural, social and historical backgrounds. On top of that, future threats such as sea level rise and intensification of storms are not defined locally in a numerical manner.
2. Few member ports of IAPH have involved physical adaptation measures in their planning considerations so far although port infrastructure usually has a life span of 50 years or more.
3. IAPH needs to gather existing best practices and information on adaptation measures even in other fields.
4. IAPH is ready to work together with member ports in order to carry out case studies at the ports but at the moment the project cannot be materialized due to a shortage of resources and manpower.



# Northern Sea Route (1)

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1. Research organizations such as UCLA predicted that global warming has the potential to significantly alter transportation routes in the Arctic. As sea ice continues to melt, new maritime transportation routes will open up in the Arctic as established ice roads disappear.
2. The potential benefits of a Northern Sea Route are significant: ship routes between North Europe and Far East (Japan, Korea and Northern China) would be 2,500 miles (about 30%) shorter.
3. Sea routes between North America (Canada) and Far East would also become shorter.
4. This would result in a lot of cost and time savings.
5. Ports in the regions need to prepare strategies for the new routes



# Northern Sea Route (2)

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1. The route is predicted to be fully accessible from July to September by 2050.
2. Ships should be ice-resistant and need to be escorted by icebreakers at the moment.
3. As the majority of Northern Sea Route is Russian waters, Russia may charge ships a “fair” fee to cross the Arctic.
4. A study has shown that the use of the route by a liner service operating between Yokohama and Rotterdam is not profitable until there is a 50% reduction in ice-breaking fees.
5. Formation of a specific international law with respect to the passage of vessels is required.
6. One of the IAPH technical committees took up this as one of their projects, in which they will examine feasibility of this route.



# Offshore Wind Farms and Ports

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- ▶ As of 2010, there are 39 offshore wind farms in waters in Europe, UK, Denmark and other countries with a combined operating capacity of 2,396 MW.
- ▶ As one of sustainable energy sources, a number of new projects are in the pipeline.
- ▶ Ports play a vital role in construction and operation of offshore wind farms: to provide transportation means of various machines and equipment and to be the operating base for maintaining and servicing wind farms.
- ▶ One of the IAPH technical committees is now studying a project on “Ports and Offshore Wind Farms”.



# Conclusions

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## ▶ **Facts**

Seaports play a vital role in the development of world trade and economy, however they are very vulnerable to climate change due to their location.

## ▶ **Mitigation and Adaptation**

IAPH has put a lot of energy on climate change issues. We have quite a few projects about mitigation measures but few projects about adaptation measures since adaptation is more related to natural conditions of ports and thus difficult to discuss in a generalized manner.

## ▶ **Best Practices**

More best practices in ports and/or case studies are needed to formulate complete guidelines on adaptation measures in ports.

## ▶ **Proposition - case study –**

Each case study port will work together with a consultant hired by a possible donor.

1. to select ports for case study (at least 5 case studies are necessary)
  2. to assess climate change threats in each port in numerical terms (sea level rise and external forces)
  3. to assess vulnerability of port facilities
  4. to carry out physical planning of infrastructure and superstructure
  5. to summarize case studies and prepare guidelines
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