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Tackling “Slowness & Uncertainty” for Effective Port Adaptation

Presentation by

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Tackling “slowness & uncertainty” for effective port adaptation

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Intensified hurricanes hitting ports

New Orleans hit by Catrina, 2005
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Port of New York & New Jersey hit by Sandy, 2012
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Concerns and problems of port managers

- IAPH survey on port adaptation shows:
  - Most of port managers are concerned about climate change risks to their ports.
  - However, only a few ports have placed clear policy of adaptation.
  - Most of ports felt not well informed of climate risks, nor much discussed adaptation issues.
  - They felt the serious lack of reliable information, in particular predictions of localized climate change.

Source: IAPH Journal Ports & Harbors, 2010
Adaptation: fundamental differences from traditional port planning & development

- Long time span for planning
  - Port planning & implementation --- 10~20 years
  - Climate change impacts and adaptation planning --- decades or 100 years
  - Cost-benefit analysis doesn’t work for climate adaptation.
  - Minor adjustment approach with master planning doesn’t work for climate adaptation.

- Slow and uncertain speed of changes
  - Change speed of economic factors --- months ~ years
  - Climate change impacts --- 1~3 mm/year (global sea level rise)
  - Too gradual to be effectively accommodated unless a fixed goal is given.
  - Longer periods of mismatch between design load and actual load.

- Changes of “unchanged” conditions
  - For port engineering, natural conditions (wave, sea-level, wind, tide, etc.) are assumed unchanged, though with daily & seasonal changes.
  - Thus, they are treated as statistically estimable for master planning.
  - Yet, too much uncertainty in climate change predictions for any localized coastal area at given point of time.
  - Even if predicted, future changes in natural conditions need to be estimated based on analysis of the complex coastal system around a port.
Climate proofing a port

- **Uncertainty in localized predictions of changes**
  - Incremental planning rather than master planning
  - Scenario-based vulnerability assessment and programming

- Slow, gradual and endless process of changes
  - Inevitably prolonged period of mismatch
  - Importance of "temporary measures" for adaptation

- Adaptation projects of no immediate returns
  - Cost–benefit analysis doesn’t work
  - Incorporate adaptation measures in port projects of immediate needs

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Scenario & Vulnerability Assessment

- Scenarios of Climate Induced Changes (sea level rise, storms, etc.)
  - Impacts to Coastal morphology
    - Wave regime (wave, current, littoral drifts, etc.)
  - Impacts to Port Infrastructure (breakwaters, channels, wharfs, etc.)
  - Impacts to Port Operations (navigation, mooring, crane/yard operations, etc.)
Climate proofing a port

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Prolonged period of mismatch
Case: adaptation measures for sea level rise

- long mismatch
- temporary measures

Sea Level Rise
- High
- Low

Over-design

Under-design

Climate proofing a port

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Opportunities for port adaptation

- Ports are aging, physically or functionally.
  - Design life (yrs.): breakwaters (60–100), berth facilities (30–45), cranes (15–20)
  - Re-construction takes a longer time due to working without disrupting port operations.

  ![Ohi Terminal, Tokyo, opened in 1970s, was reconstructed to deepen its water-depth alongside from 13m to 15m.](image1)
  ![Bayonne Bridge, NYNJ, 80 years old, is now planned to raise by 64ft to allow 7,000 teu or larger container ships to pass under.](image2)

- Ports are growing.
  - Ports are developed to handle ever-increasing cargo volume as well as larger ships.
  - Terminals are expanding their capacity and productivity with innovative operations systems.

  ![Jade Weser, Wilhelmshaven, opened in 2012 as the 1st deep-water container terminal in Germany, which has a natural depth of 18m.](image3)
  ![Yangshan deep-water port, Shanghai, is developed with 30 container berths for main trunk lines calling Shanghai Port.](image4)
Opportunities for port adaptation

- Ports are always under the threats of natural disasters
  - Earthquakes, tsunamis, hurricanes, high waves, …..

Be ready for port adaptation

- Identify critical vulnerabilities and develop action program
  - Cyclic process of vulnerability assessment, adaptation planning & action program
- Intensify monitoring of coastal conditions
  - Urgent need for cost-effective monitoring system of local coastal areas (e.g. remote sensing system via satellite)
  - International/regional sharing of coastal observation data and estimated changes
- Develop effective temporary measures for adaptation
  - Testing and improving temporary facilities/equipment to cope with longer periods of “over-design” and “under-design”
  - Design allowance for retro-fitting and/or flexible facility use
Joint efforts for port adaptation

- Increase **awareness** of critical need for port adaptation
- Set up an **international forum** to share experiences of port adaptation.
- Conduct **case studies** worldwide to gain practical know-how and provide showcases.
- Promote development of **new technologies and systems** for port adaptation.
- Press multi/bilateral financing agencies to build in **adaptation as part of port projects**.

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Thank you for your attention