Workshop Japan and the Netherlands
Climate Adaptation and Resilience
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From Science to Project Risk Management
- Resilience of Infrastructure Investment –

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New movement - Demand for climate risk impact analysis

- Increase of weather related disaster events provides damage on business
- Pressure for the further disclosure of climate related risk by finance sector. e.g. TCFD

TCFD (Task Force on Climate-related Financial Disclosures)

- Risk
  Transition risk: mitigation
  Physical Risk: adaptation

- Requirements
  Disclosure of risk, impacts and countermeasures

Flow of Action Consideration

- Screening
- Sensitive?
- Detail study
- Take additional measures?
  - Physical and/or Economic measures
- post disaster recovery plan

Monitoring
## Possible Impacts on Business

<table>
<thead>
<tr>
<th></th>
<th>Chronic</th>
<th>Acute</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature</strong></td>
<td>· Working environment</td>
<td>· Decrease of operation rate of port</td>
</tr>
<tr>
<td><strong>Water</strong></td>
<td>· Water scarcity(mining/washing)</td>
<td>· Working environment</td>
</tr>
<tr>
<td><strong>Wind/Typhoon</strong></td>
<td>· Water scarcity(mining/washing)</td>
<td>· Flood（mine site, transportation and supply chain）</td>
</tr>
<tr>
<td><strong>Energy and resource development</strong></td>
<td>· Decrease of operation rate of port</td>
<td>· Damage on facility and operation rate</td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td>· Change of power generation (Solar power)</td>
<td>· Decrease of operation rate of port</td>
</tr>
<tr>
<td></td>
<td>· Water scarcity(cooling water for thermal power - hydropower)</td>
<td>· Transmission line</td>
</tr>
<tr>
<td><strong>Transportation</strong></td>
<td>· Coastal water</td>
<td>· Flood (power house, pipeline etc)</td>
</tr>
<tr>
<td><strong>Urban infrastructure</strong></td>
<td>· Living environment</td>
<td>· Water scarcity(cooling water for thermal power - hydropower)</td>
</tr>
<tr>
<td></td>
<td>· Infection</td>
<td>· Damage by strong wind on power house, wind turbine transmission</td>
</tr>
<tr>
<td></td>
<td>· Scarcity of municipal water</td>
<td>· Salt damage</td>
</tr>
<tr>
<td><strong>Manufacturing</strong></td>
<td>· Working environment</td>
<td>· Flood (factory, transportation and supply chain)</td>
</tr>
<tr>
<td></td>
<td>· Scarcity of industrial water</td>
<td>· Damage by strong wind</td>
</tr>
<tr>
<td><strong>Agriculture/Fishing</strong></td>
<td>· Change of agricultural products</td>
<td>· Flood, draught</td>
</tr>
<tr>
<td></td>
<td>· Agricultural water scarcity</td>
<td>· Damage on agricultural products and equipment</td>
</tr>
<tr>
<td></td>
<td>· Frequency of flood</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· Acidification</td>
<td></td>
</tr>
<tr>
<td><strong>Forestation</strong></td>
<td>· Change of types of trees</td>
<td>· Wild fire</td>
</tr>
<tr>
<td></td>
<td>· Short precipitation</td>
<td>· Flood, draught</td>
</tr>
<tr>
<td></td>
<td>· fallen tress</td>
<td>· Fallen trees</td>
</tr>
</tbody>
</table>

Impacts written in red is emerged by extreme weather. Boarder between extreme weather and climate change is unclear.
Climate change impact on project design

- Project design is determined considering past year’s weather and counter measure for its operation is prepared as BCP.
- Change of climate should be reflected on the assumption of design, operation and BCP. Information about magnitude and probability of weather change is needed.

Assumption / present condition
- Put 20% margin on the average of past 20 years daily precipitation
- Prepare for the flood one time for 100 years, etc.

Climate change:
- Precipitation pattern will be changed
- One time for 100 years flood may be occurred in every 20 years, etc.

Risk = Impact on operation/business X Probability
- When risk is low and economic impacts is manageable, “no additional measures” can be reasonable decision.
Actions for climate impact risk on infrastructure
- Business Continuity Plan -

- Risk management – asset
  ✓ Evacuation plan; ‘safety first’
  ✓ Physical measures; higher specification infrastructure. balance of cost and risk reduction. 100% hedging is not possible.
  ✓ Economic measures; insurance, reserves etc.
  ✓ Post disaster recovery plan
  ✓ Relocation or multiple investment for risk diversification

- Risk management – supply chain
  ✓ Review of supply chain risk; less information about supply chain seems to be a bottle neck.
  ✓ Redundancy; longer allowance of delivery time, more stocks
  ✓ Risk diversification; multiple supply source, multiple logistics
Expected information service by DIAS/d4PDF

Overview of climate change impact – World Map

Source: d4PDF

Upper = average, middle = summer, low = winter
Left = present, middle = 4°C scenario, right = change

● Types of information which is needed
  ✓ Overview of climate change; wind, precipitation and temperature
  ✓ Regional maps for screening and specific area for detail analysis
  ✓ Monthly data, daily data etc.
  ✓ Probability and distribution
Impacts on flooding by typhoon under climate change

- Simulation of impacts on flooding and high tide by typhoon in the coastal area
- Pilot study; Ariake Bay, Saga Prefecture in Japan (SI CAT)

Coastal area at Ariake Bay

- Flood risk is mitigated by multiple dams operation.
- Coastal area is surrounded by dike and river water shall be pumped up to Ariake Bay

What next?

- Optimization of dam’s operation.
- Optimization and capacity increase of pumps
Urban Flood Simulation System

- Simulation of overflow of sewage network by heavy rain
- Pilot project; Tokyo 23 cities
- To be public use through DIAS

- Yellow; sewage network
- Blue; river
- Red dots line; underground river
- Red dot; pump station

Accuracy test

What next (options)?
- Real time monitoring and alert system
- Reflection on hazard map
- Improvement of infrastructure
Pacific Islands High Tide impact model

- Simulation of high tide by cyclone under climate change
- Pilot study; Fiji, Vanuatu, and Samoa

Suva of Fiji

- Red area; high tide (inundation) area
- Blue (red) circle; higher risk of inundation.

⇒ it is planned to develop as a residential area for low-income household but possibly reconsidered (additional measures).

What next?
• Adaptation plan/Revision of city planning
Digital information service for resilient infrastructure
(Future of DIAS – a conceptual model)

Integrated/analyzed

Scientific data

Social & Economic data

Including
✓ past events
✓ real time human behavior

Archive data
Data science
Neutrality and public service
Human network

Application & analysis service
For
Design
Real time monitoring and emergency actions
Post disaster recovery

Resilient infra.

DIAS will be the next phase after 2021. Its role and structure is under consideration. This is just an idea for its future service.
‘Quality Infrastructure Investment Program’

Resilience should be an indispensable element of ‘Quality Infrastructure’

- To achieve inclusive, sustainable, and resilient “quality growth”
- Bridging the infrastructure gap as a bottleneck against global economic growth.

<Elements of Quality Infra>

<table>
<thead>
<tr>
<th>Elements of quality infra.</th>
<th>Category</th>
<th>country</th>
<th>Project/technology</th>
<th>finance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective mobilization of finance (e.g. PPP)</td>
<td>Transport</td>
<td>Thailand</td>
<td>Mass Transit (Purple line)</td>
<td>ODA Loan</td>
</tr>
<tr>
<td>Socio economic development and development strategy</td>
<td></td>
<td>Cambodia</td>
<td>Traffic management</td>
<td>ODA Grant</td>
</tr>
<tr>
<td>High quality standard</td>
<td>Energy</td>
<td>Uzbekistani</td>
<td>Gas fired power</td>
<td>ODA Loan</td>
</tr>
<tr>
<td></td>
<td>Energy</td>
<td>Morocco</td>
<td>High efficient Coal power</td>
<td>JBIC/NEXI</td>
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<td></td>
<td>Energy</td>
<td>Lao</td>
<td>Hydro Power</td>
<td>JBIC/NEXI</td>
</tr>
<tr>
<td></td>
<td>Technology</td>
<td>India</td>
<td>Pump up Hydro</td>
<td>ODA Loan</td>
</tr>
<tr>
<td></td>
<td>Technology</td>
<td>Vietnam</td>
<td>Refinery</td>
<td>JBIC/NEXI</td>
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<tr>
<td></td>
<td>Technology</td>
<td>-</td>
<td>High Speed Train (Shinkansen)</td>
<td>-</td>
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<tr>
<td></td>
<td>Technology</td>
<td>-</td>
<td>Airport management/Port management</td>
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<tr>
<td></td>
<td>Technology</td>
<td>-</td>
<td>High voltage transmission line</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Technology</td>
<td>-</td>
<td>Earth Observation system/Weather Radar</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Japanese government
Conclusion

- Infrastructure under climate change
- Science data and digital innovation
- Combination of Science, Policy and Investment