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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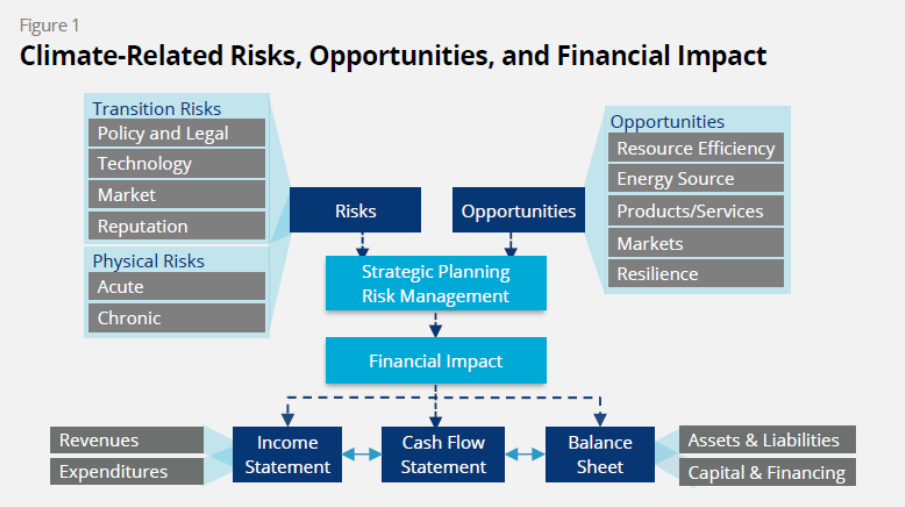
New movement - Demand for climate risk impact analysis

- **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)

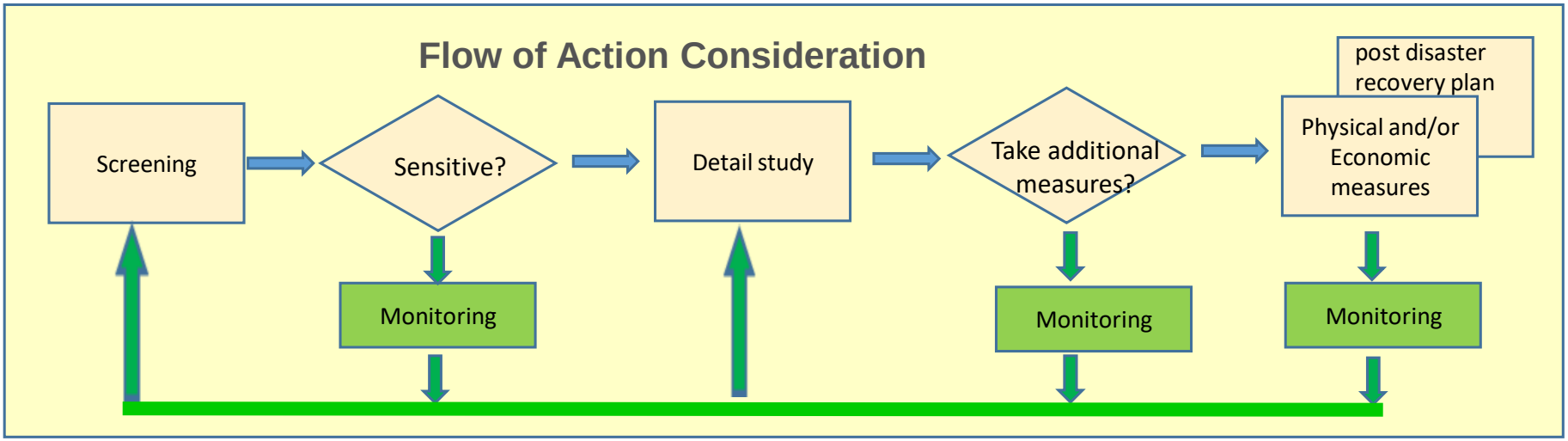


- Risk

Transition risk : mitigation
Physical Risk :adaptation

- Requirements

Disclosure of risk, impacts and countermeasures



Possible Impacts on Business

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

Impacts written in red is emerged by extreme weather. Boarder between extreme weather and climate change is unclear.

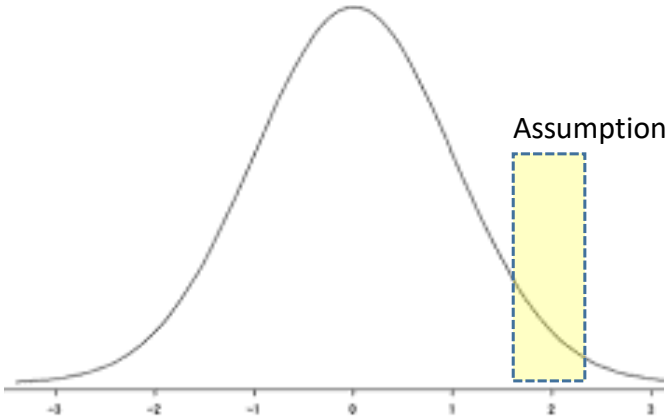
Climate change impact on project design

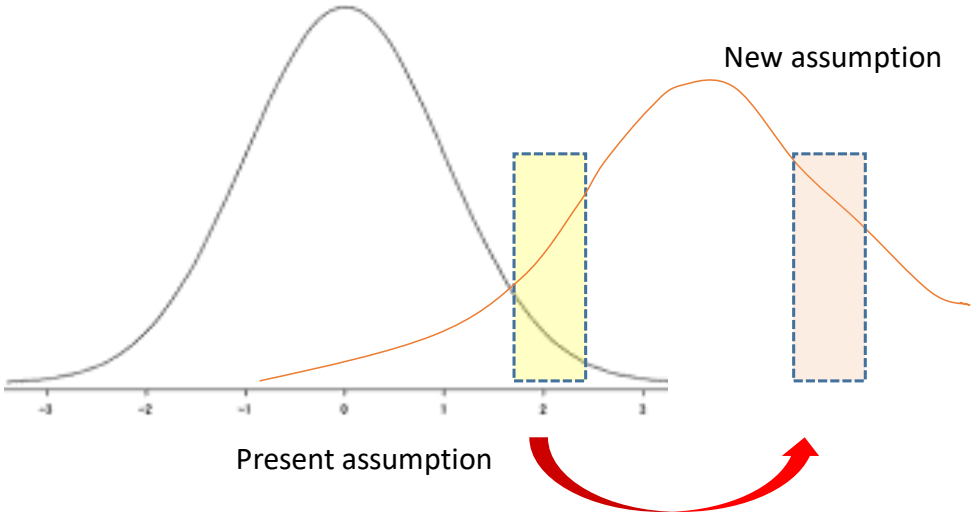
- Project design is determined considering past year's weather and counter measure for its operation is prepared as BCP.
- Change of climate should be reflected on the assumption of design, operation and BCP. Information about magnitude and probability of weather change is needed.

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.





- Project is designed with proper margin for past day's event and risk management (BCP) is prepared. Investment period vary project to project and many of projects are finished before emerging climate change impact obviously.
- Additional measure will be taken considering over all risk for the project.

  Risk = Impact on operation/business X Probability
- When risk is low and economic impacts is manageable, "no additional measures" can be reasonable decision.

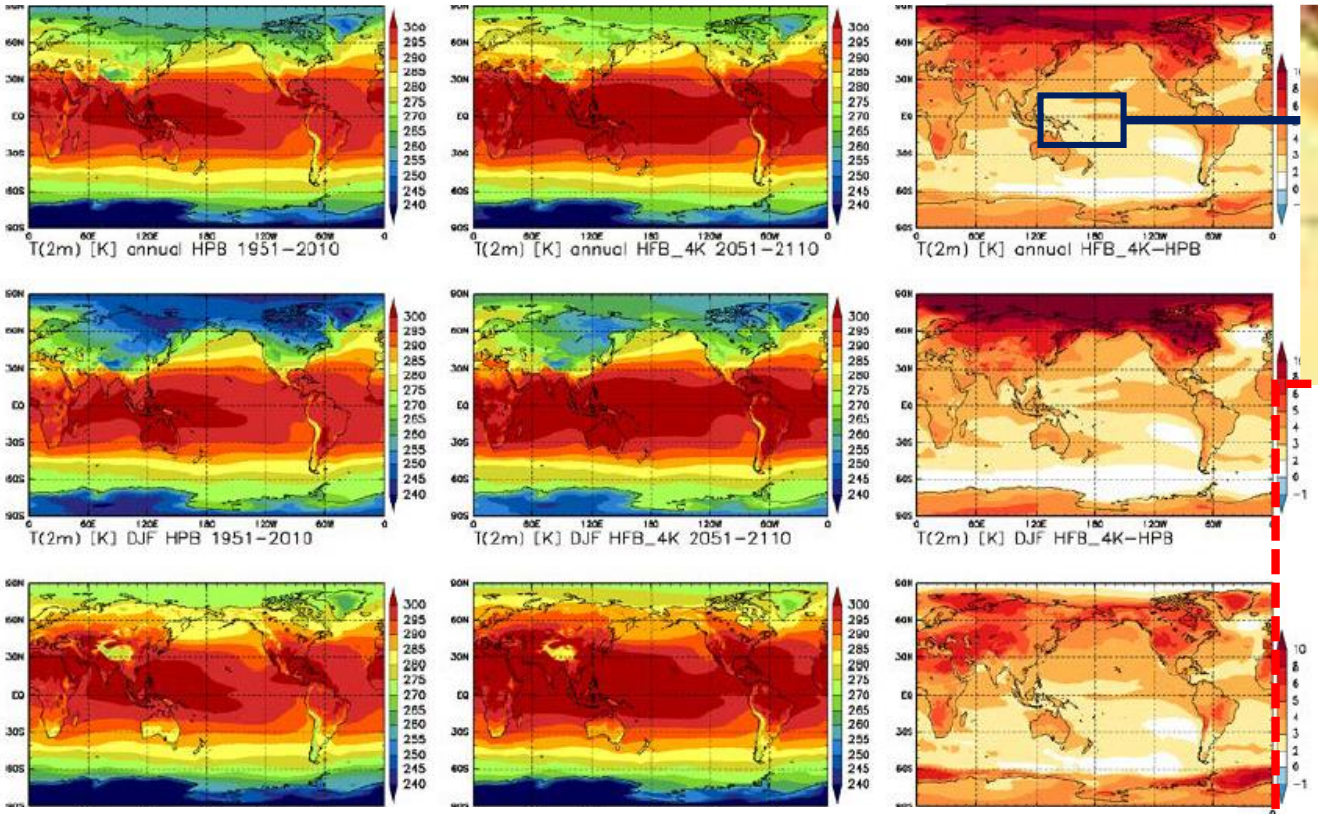
Actions for climate impact risk on infrastructure
- Business Continuity Plan -

- ➢ 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



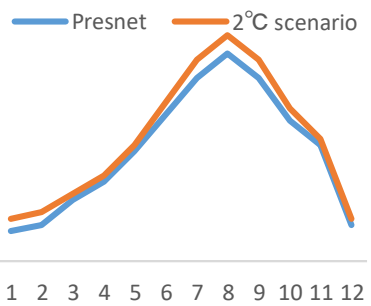
Source: d4PDF

Upper=average, middle=summer, low=winter

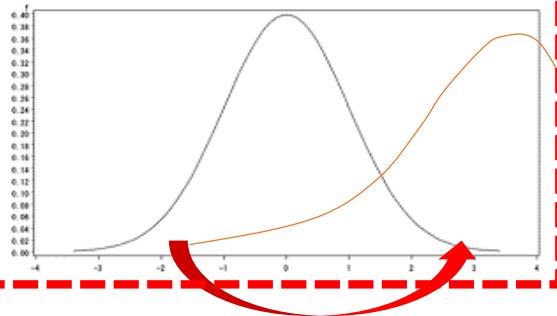
Left=present, middle=4℃ scenario, right=change

Region map

Change of monthly averaga



051-2110) Distribution of daily precipitation



●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 are 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

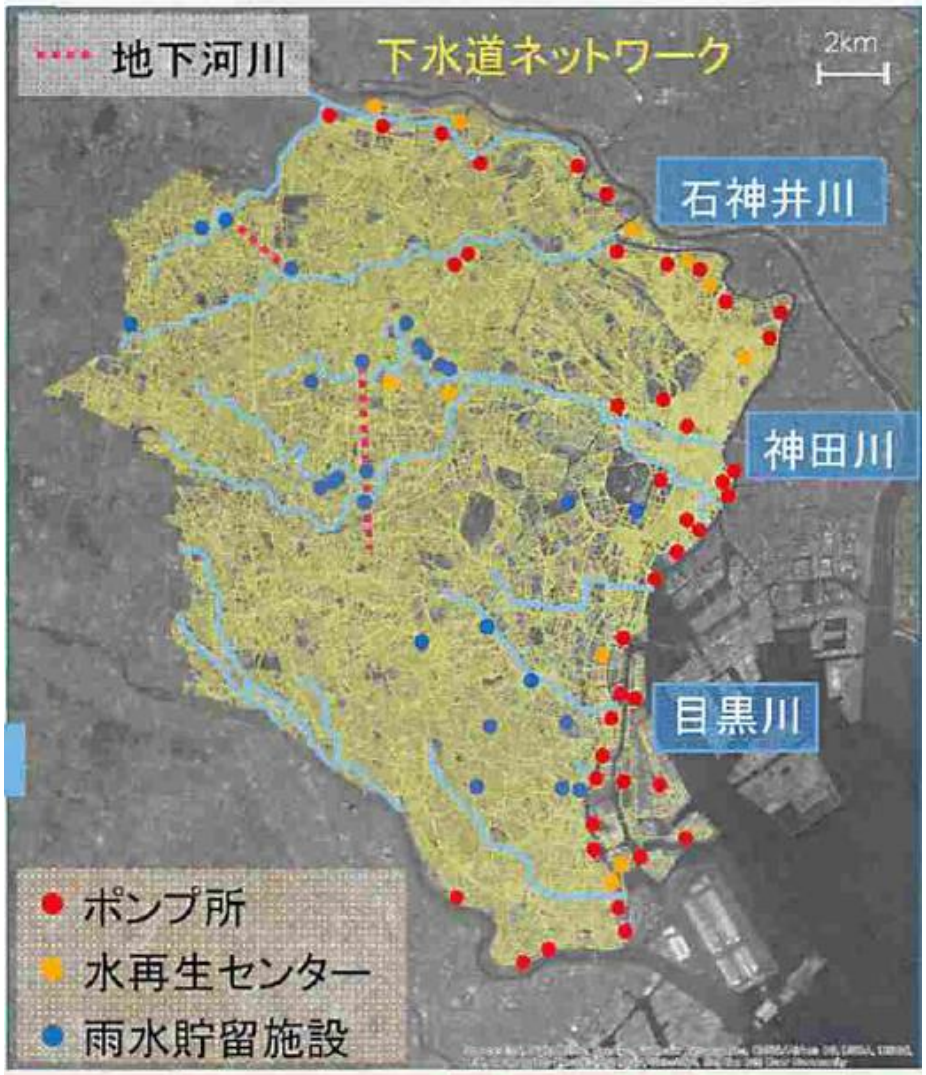
- ✓ Red circle; dams
- ✓ Blue line; river

What next ?

- Optimization of dam's operation.
- Optimization and capacity increase of pumps

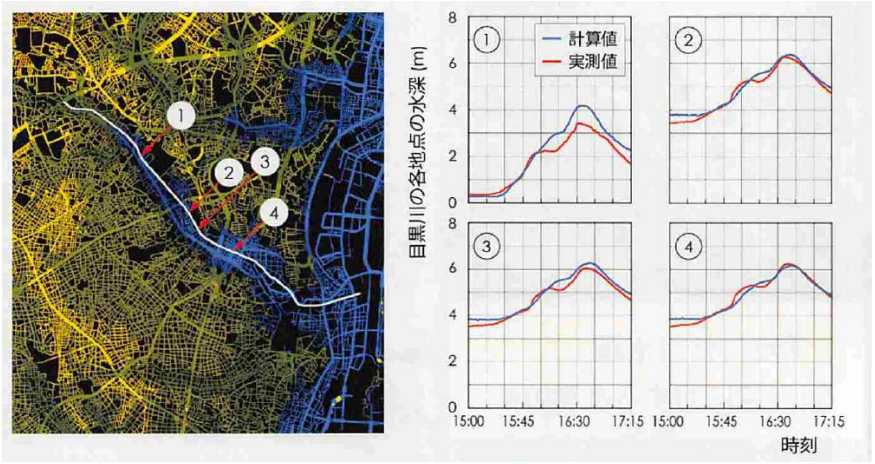
Urban Flood Simulation System

- 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



Blue; simulation, Red; measured

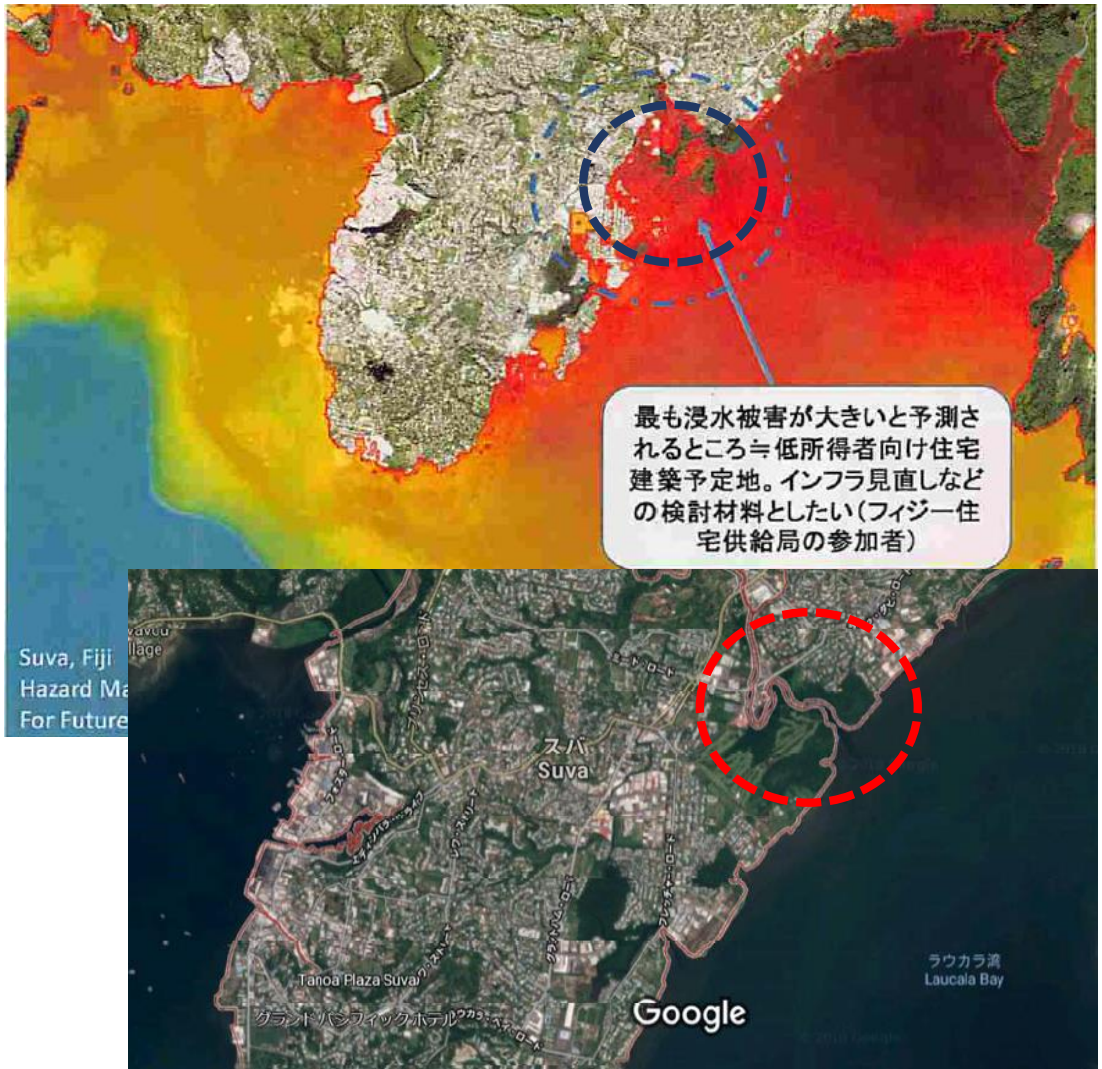
What next (options)?

- Real time monitoring and alert system
- Reflection on hazard map
- Improvement of infrastructure

Pacific Islands High Tide impact model

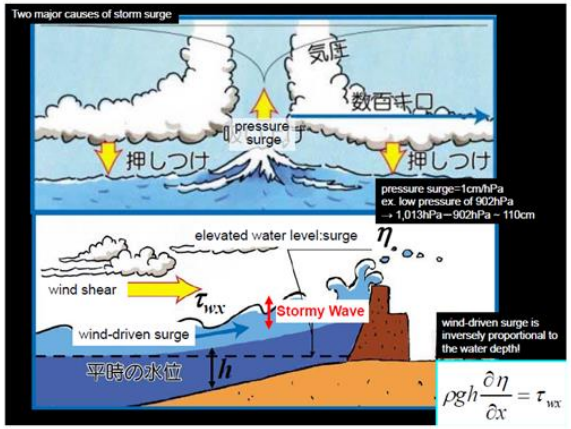
- Simulation of high tide by cyclone under climate change
- Pilot study; Fiji, Vanuatu, and Samoa

Suva of Fiji



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

⇒ it is planed to developed as residential area for low income household but possibly reconsidered (additional measures).



Model

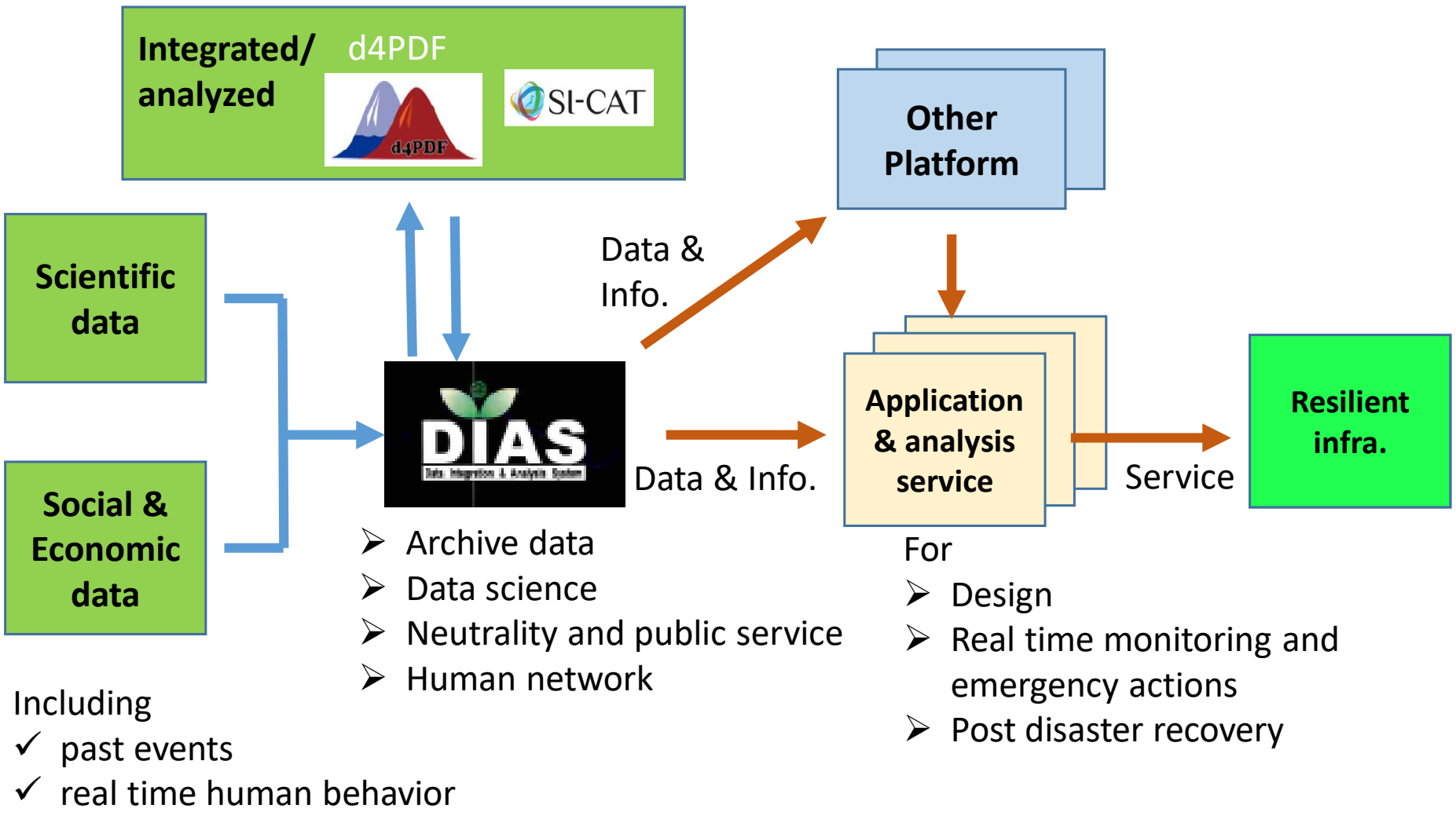
- ✓ Combination of climate model, cyclone model and inundation model
- ✓ Inundation model was applied to Hurricane Haiyan in Philippine for testing its accuracy

What next ?

- Adaptation plan/Revision of city planning

Digital information service for resilient infrastructure

(Future of DIAS – a conceptual model)



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>

Elements of quality infra.
Effective mobilization of finance (e.g. PPP)
Socio economic development and development strategy
High quality standard
Economic Efficiency (life cycle)
Inclusiveness
Safety and resilient
Sustainable
Convenience and amenities
Contribution to local economy

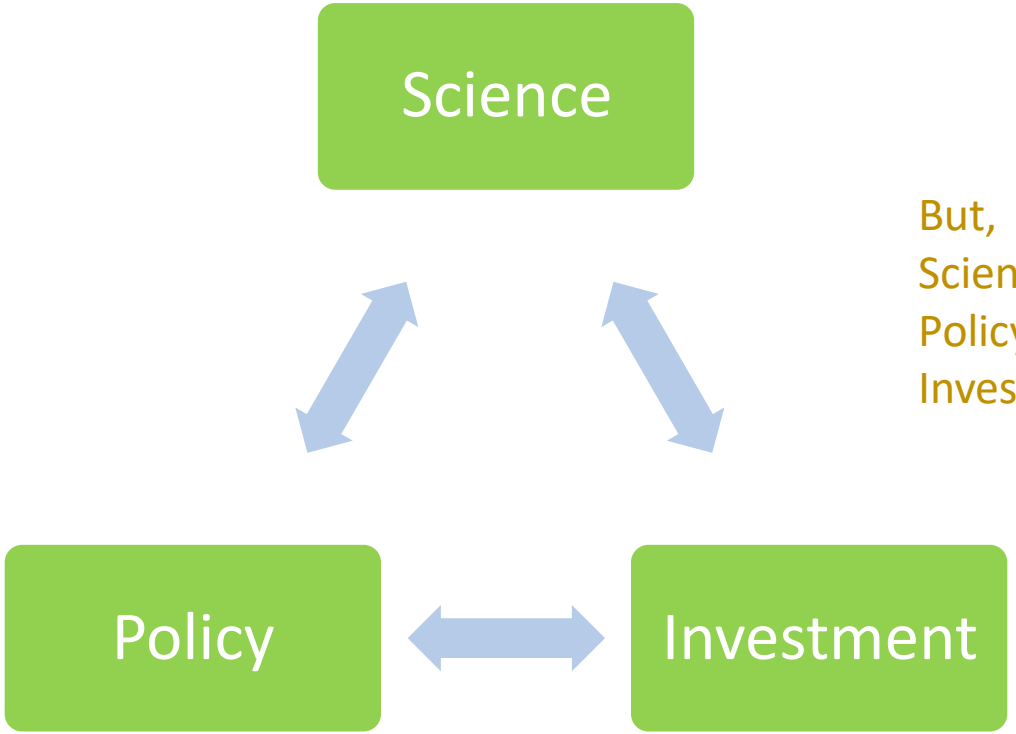
Source : Japanese government

<Case of Quality Infra>

Category	country	Project/technology	finance
Transport	Thailand	Mass Transit (Purple line)	ODA Loan
	Cambodia	Traffic management	ODA Grant
Energy	Uzbekistani	Gas fired power	ODA Loan
	Morocco	High efficient Coal power	JBIC/NEXI
	Lao	Hydro Power	JBIC/NEXI
	India	Pump up Hydro	ODA Loan
	Vietnam	Refinery	JBIC/NEXI
Technology	-	High Speed Train(Shinkansen)	-
	-	Airport management/Port management	
	-	High voltage transmission line	-
	-	Earth Observation system/ Weather Radar	

Conclusion

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



But,
Science for whom?
Policy for whom?
Investment for whom?