World Bank Group Report Launch: Financial Protection of Critical Infrastructure Services

Hosted by:
Disaster Risk Finance and Insurance Program,
World Bank Group

Supported by:
The Japan-World Bank Program on Mainstreaming
Disaster Risk Management in Developing Countries Program
financed by the Government of Japan

11 March 2020

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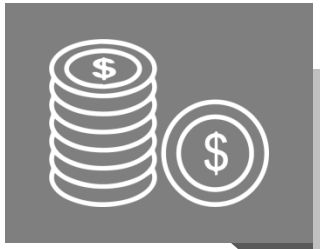
GFDRR
Global Facility for Disaster Reduction and Recovery

World Bank's Focus for supporting APEC DRF WG:

Financial Risk Management of Critical Infrastructure



Reliable and resilient critical infrastructure services enable **investment, growth, jobs and economic transformation.**

- **US$94 trillion** in infrastructure investment needed between now and 2040 to maintain growth and reduce poverty.

Disruption to public infrastructure systems and services can set back progress and economic growth.

- **US$400 billion** + estimated annual cost of disruptions and damages to energy and transport services and infrastructure in low- and middle-income countries globally.

Agenda and Speakers

Topic	Speakers
Welcome	Shoko Takemoto, World Bank Disaster Risk Management Tokyo Hub
Opening Remark	Mr. Naoya Jinda, Director of Research Division, Ministry of Finance, Japan
Framing Presentations	**11.10am SGT**
1) Operational Framework for Financial Protection of Critical Infrastructure Services	Mr. Benedikt Signer, Disaster Risk Finance and Insurance Program, World Bank Group
2) Financial Instruments for Critical Infrastructure Services [Pre-recorded Video Presentation]	Dr. Nicola Ranger, Disaster Risk Finance and Insurance Program, World Bank Group
3) Data and Analytics to Design Risk Financing Programs for Critical Infrastructure Services [Pre-recorded Video Presentation]	Prof. Jim Hall, Climate and Environmental Risks in the University of Oxford and Director of Research in the School of Geography and the Environment
4) Risk Financing Programs for Critical Infrastructure Services – Financier's perspective	Mr. Masaaki Nagamura, General Manager International Initiatives, Tokio Marine & Nichido Fire Insurance Co., Ltd. Sherpa, APFF Disaster Risk Financing & Insurance
5) Risk Financing Programs for Critical Infrastructure Services – Government's perspective	Mr. Roger Fairclough, Chair of New Zealand Lifelines Council

Agenda and Speakers

Topic	Speakers
Ignite Presentations: Case Studies on Actions to Strengthen the Financial Resilience of Critical Infrastructure Services against Shocks – Actions, lessons and next step	**11.50am SGT** **Moderator: Lit Ping Low, Disaster Risk Finance and Insurance Program, World Bank**
Ignite 1: Strengthening the Financial Resilience of Critical Infrastructure Services against Shocks of Vietnam Road Sector	Ms. Jen Jung Eun Oh, Infrastructure Sector Leader – China and Mongolia, World Bank
Ignite 2: Strengthening the Financial Resilience of Critical Infrastructure Services against Shocks through Singapore Disaster REsilience Assessment, Modelling, and INnovation (DREAMIN') project	Ms. Beatrice Cassottana, Postdoctoral Researcher in Control, Detection and Recovery of Resilient Cyber-Physical System, Singapore-ETH Centre
Ignite 3: Strengthening the Financial Resilience of Critical Infrastructure Services against Shocks through the Perspective of a Private Electric Utility	Mr. Hendrik Rosenthal, Director, Group Sustainability, CLP
Ignite 4: Strengthening the Financial Resilience of Critical Infrastructure Services against Shocks in Rural Electrification in the Philippines	Deputy Administrator Artis Nikki Tortola, Philippines National Electrification Administration (NEA)
Q&A and closing	**12.10 pm SGT**
Q&A	Moderator: Ms. Shoko Takemoto, World Bank Disaster Risk Management Tokyo Hub; Respondents: All connected speakers
Closing remarks	Benedikt Signer, Disaster Risk Finance and Insurance Program, World Bank Group

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Financial Protection of Critical Infrastructure Services

Opening Remarks

Mr. Naoya Jinda
Director of Research Division,
Ministry of Finance, Japan

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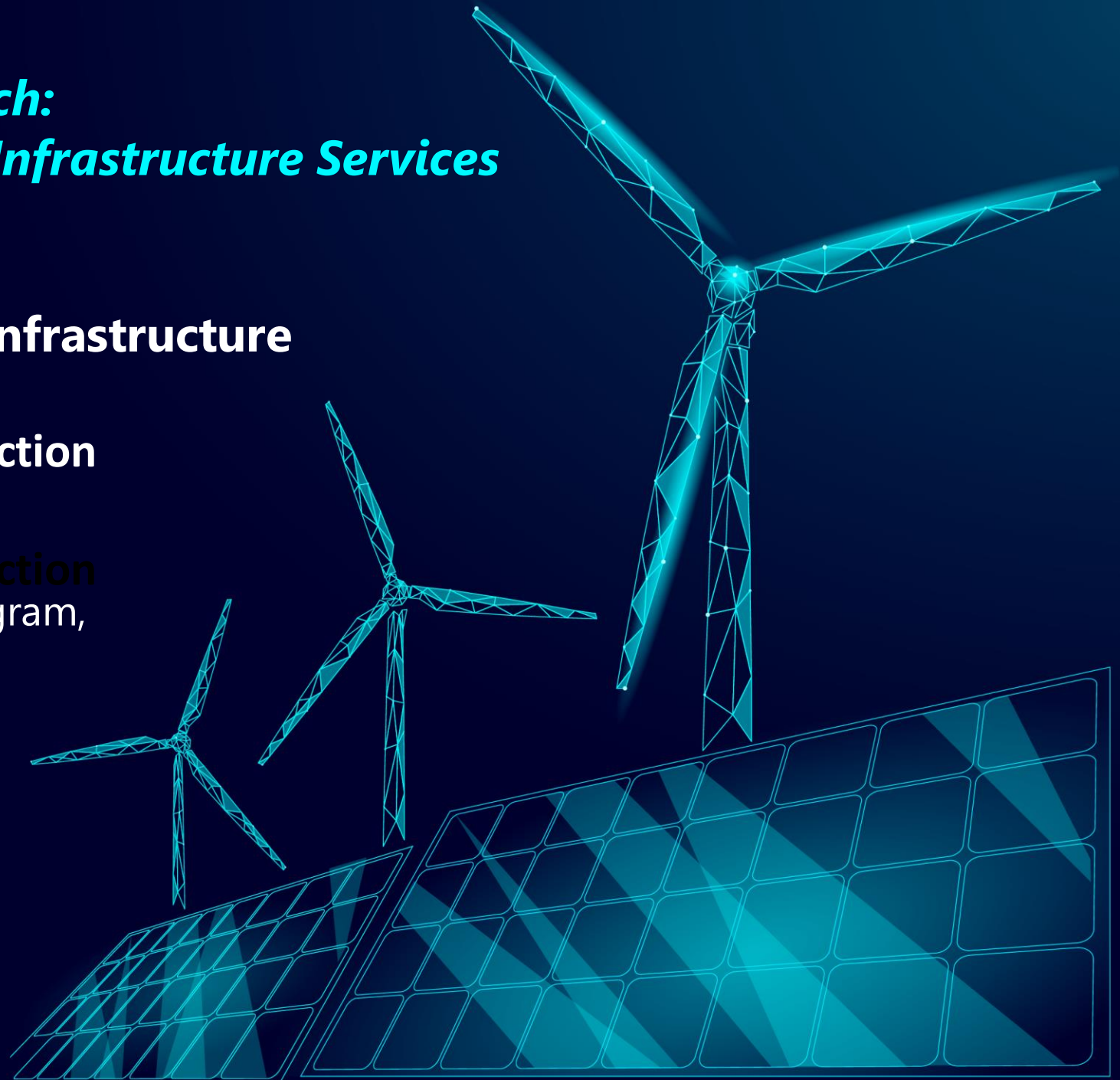
Financial Protection of Critical Infrastructure Services:
Key concepts, findings and call for action

Benedikt Signer
Disaster Risk Finance and Insurance Program,
World Bank Group
bsigner@worldbank.org



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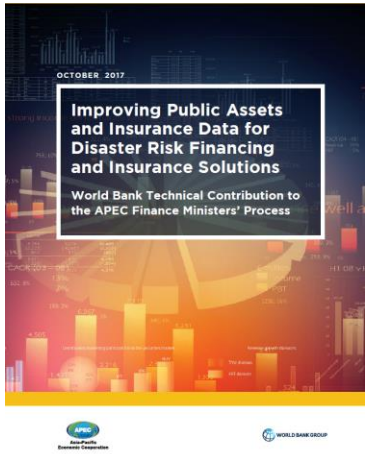
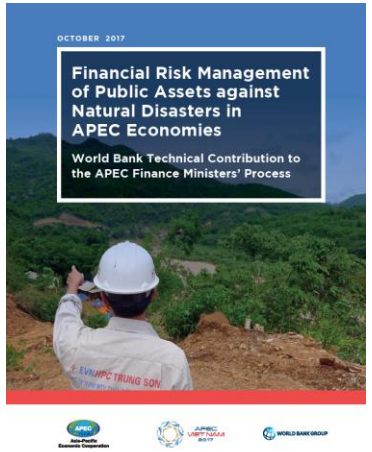
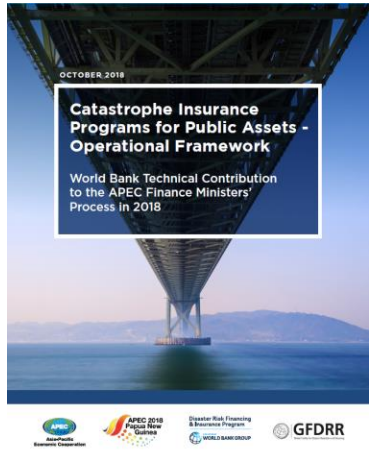
From protecting assets to protecting services





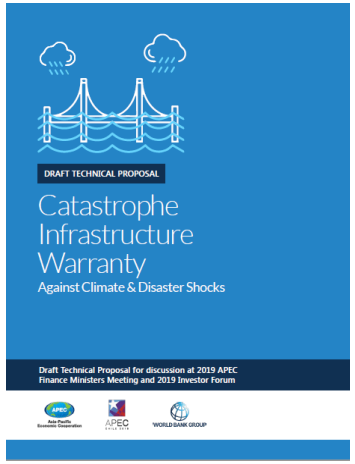
2017

APEC experience and underlying fundamentals



2018

Operational Framework for protecting assets



2019

Proposed financial product to embed resilience and risk finance

2020

Protecting critical infrastructure services

Why focus on critical infrastructure services?

1. **Much larger cost to the economy:** Estimated cost of disruption to services at least 20 times larger than cost of physical damages.

2. **The COVID-19 experience:** Disruption to services can emerge not just from physical damages, but also disruptions to people, inputs, or even shocks to demand.

3. **Unaccounted contingent liability on the government balance sheet:** usually not quantified, cost of temporary actions to maintain critical services, cascading effects.

4. **Unclear risk ownership:** Unlike ownership of physical assets – risk ownership of critical services usually not as established between government and operators. Also can create poor incentives for resilience and delays in service restoration.

Why focus on critical infrastructure services?

Losses to Assets

US $18 bn

Losses from Service Interruption

US $390 bn

Annual losses to energy and transport sector in low and middle income countries globally

Infrastructure systems to deliver services

One or multiple physical assets connected in a network (e.g. roads, hospitals, power plants)

People

Inputs (e.g. raw materials, fuel, electricity)

Shock responsive systems:
Combine Financial and Operational Preparedness

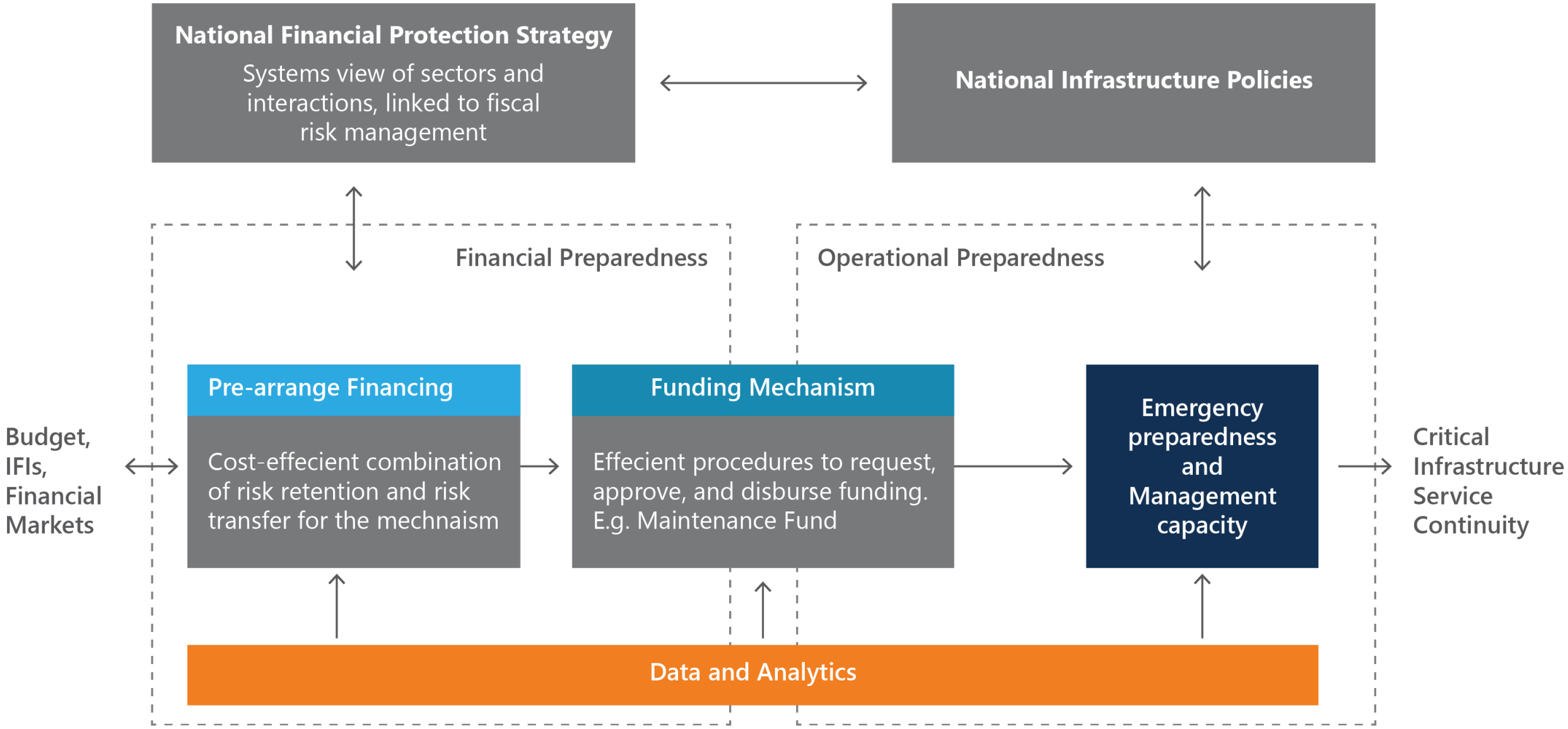
Operational preparedness:

The right plans, standard operating protocols, and capabilities (e.g. people, equipment, resources) in place to quickly restore critical services.

Financial preparedness:

A mechanism to ensure adequate and timely financing is available to implement those plans and that it can be accessed effectively.

(Both availability and disbursement of funding).


National Financial Protection Strategy
Systems view of sectors and interactions, linked to fiscal risk management
National Infrastructure Policies
Financial Preparedness
Operational Preparedness
Budget, IFIs, Financial Markets
Pre-arrange Financing
Cost-effecient combination of risk retention and risk transfer for the mechnaism
Funding Mechanism
Effecient procedures to request, approve, and disburse funding. E.g. Maintenance Fund
Emergency preparedness and Management capacity
Critical Infrastructure Service Continuity
Data and Analytics

Governments and Finance Ministers could promote financial resilience of critical infrastructure services through the following areas

1. Assessing the potential fiscal impact from disruptions to critical services;

2. Strengthening the integration of operational and financial preparedness planning;

3. Integrating the contingent liability from critical service interruptions in risk financing frameworks;

4. Considering ways to promote comprehensive risk management during recovery from the COVID-19 pandemic.

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Financial Protection of Critical Infrastructure Services

IGNITE PRESENTATIONS

Financial Instruments to Strengthen the Financial Resilience of Critical Infrastructure Services against Shocks

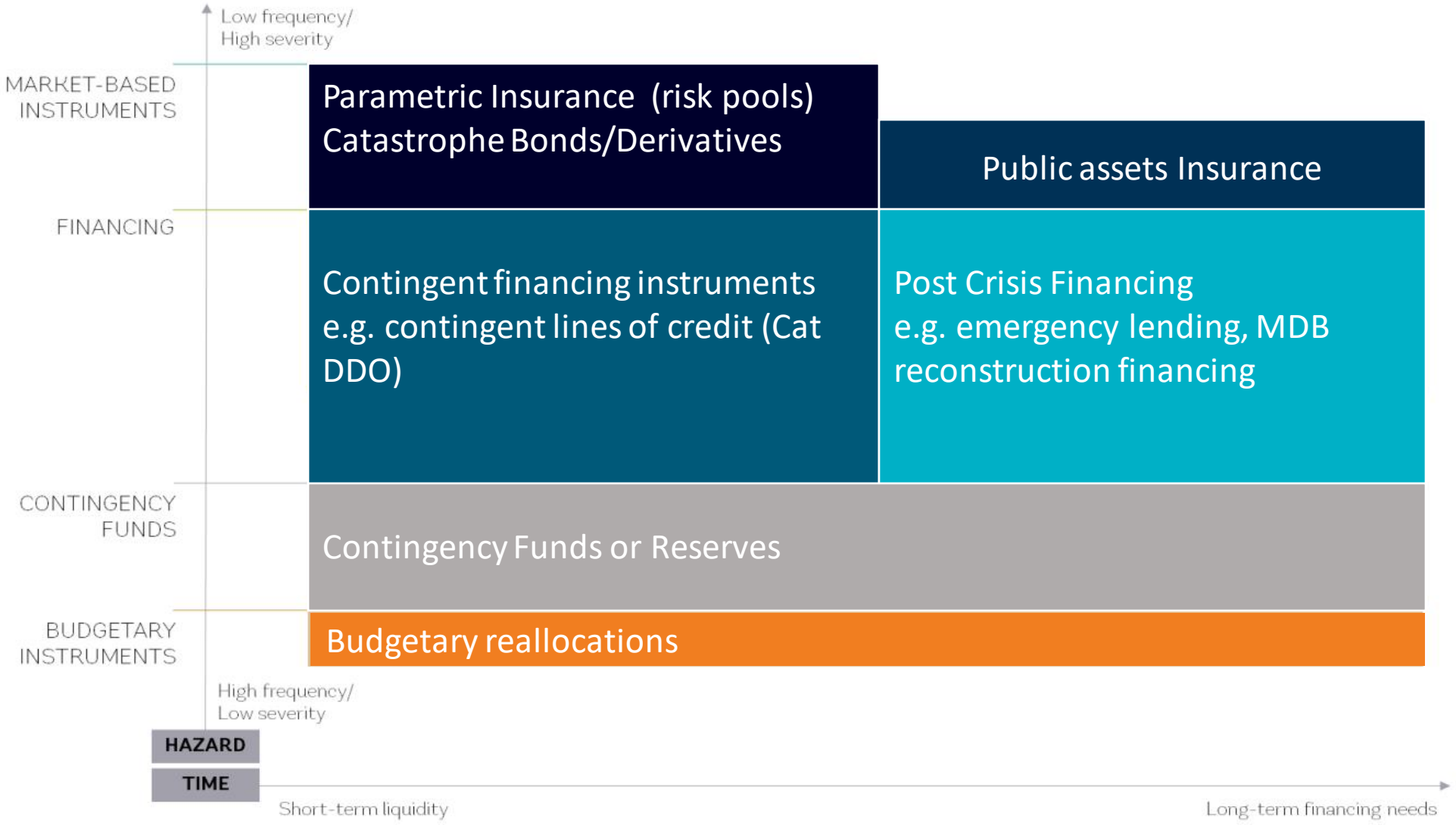
Dr Nicola Ranger
Deputy Director and Head of Climate and Environmental Risk Research, **UK Centre for Greening Finance and Investment**
Senior Consultant, Crisis and Disaster Risk Finance, **World Bank Group**

11 March, 2021

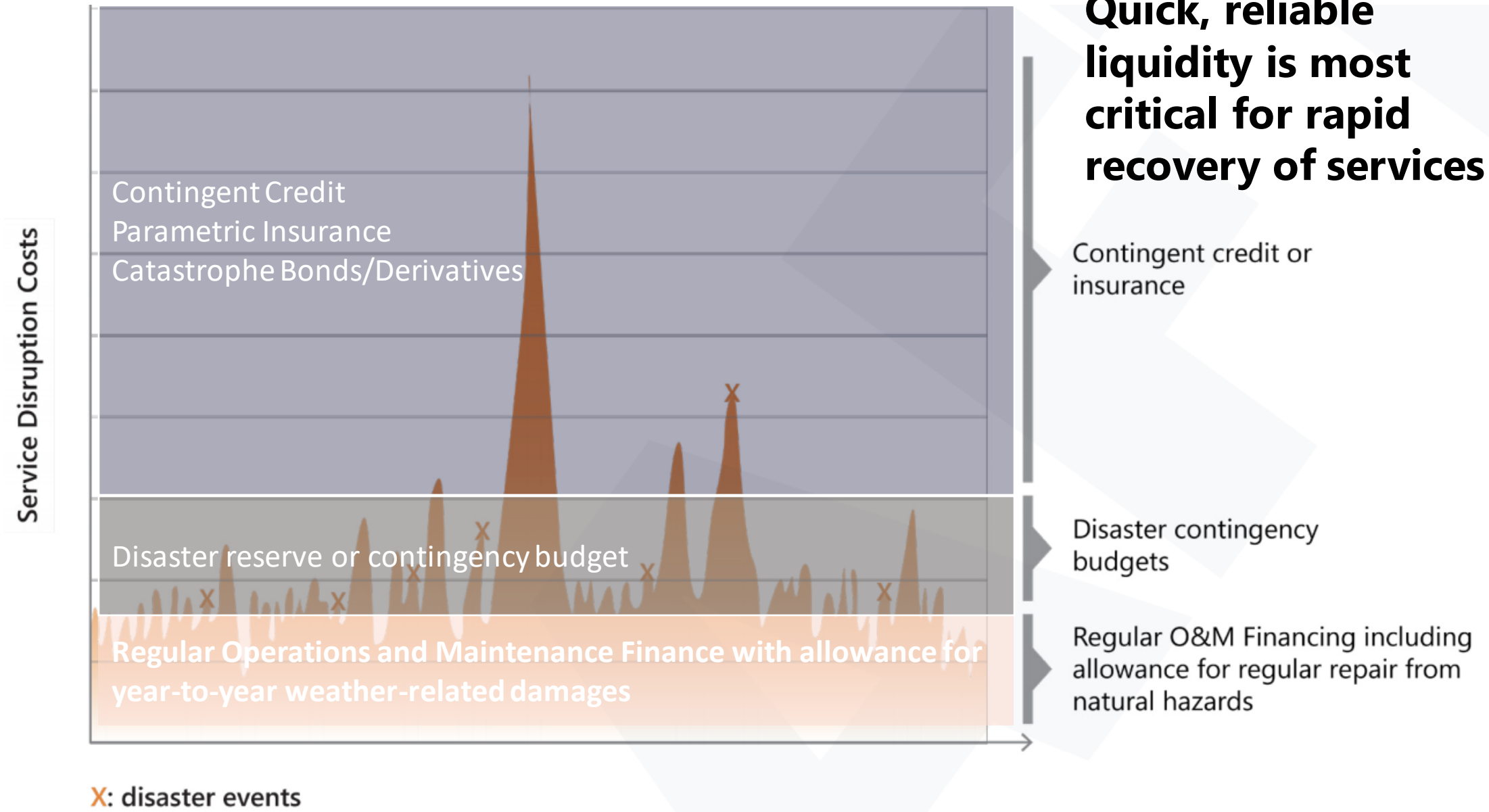
ACTIONS: Role of Financial Instruments

- Governments, infrastructure owners and operators can incur significant costs to restore critical services and reinstate assets and this can have a **big impact on the balance sheet**
- Having a financial plan and appropriate financial instruments in place before a disaster strikes has three benefits:
  - **Reduces the financial impact on the balance sheet** – smooths cost over time and increases financial efficiency so reducing overall costs
  - **Ensures that finance is available quickly after a disaster**, and so can help to reduce the economic impact of a disaster
  - **Gives predictability**– enables better planning and preparedness

LESSONS: The basic principles of risk laying still apply…

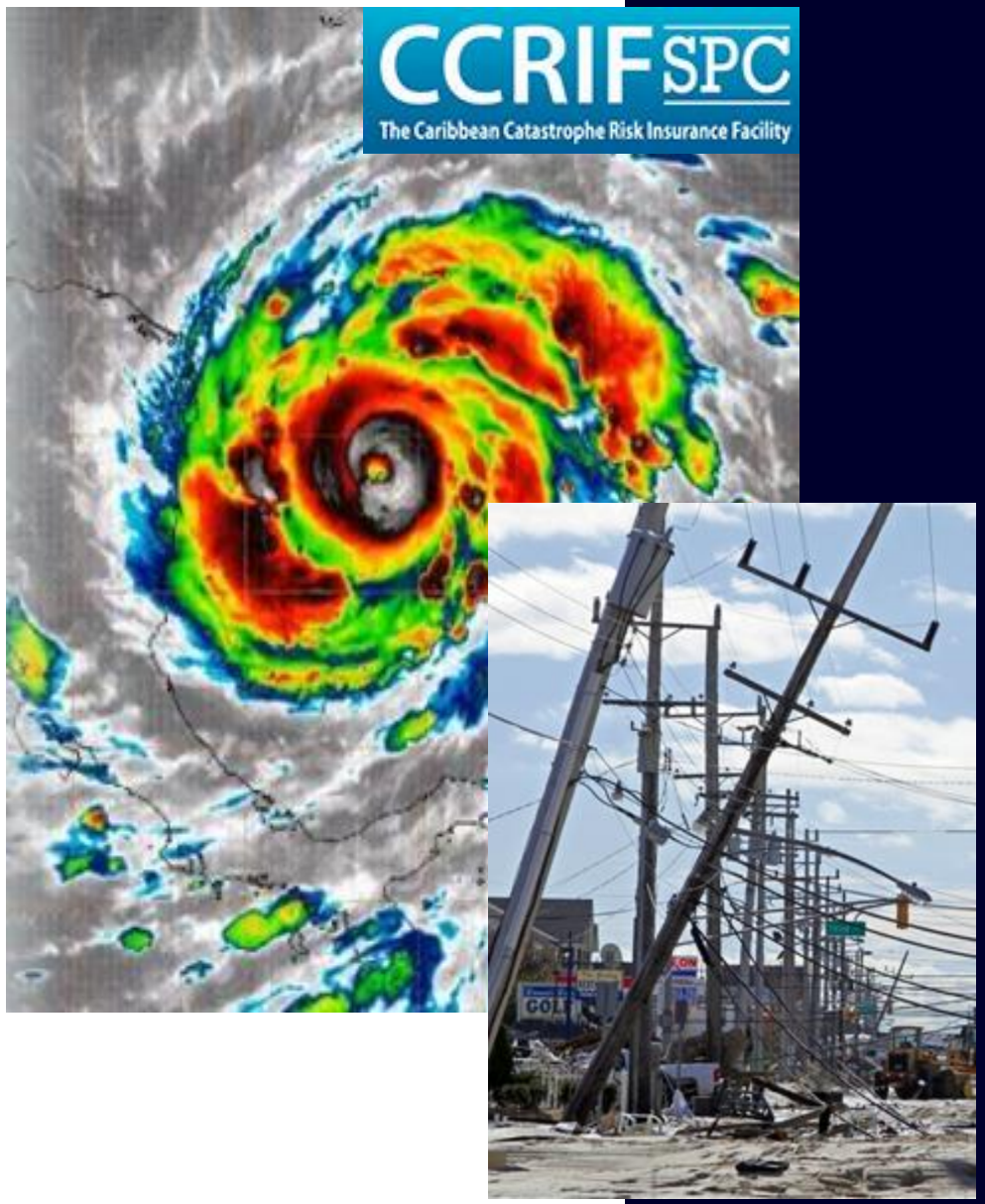


LESSONS: What's different about critical infrastructure services?



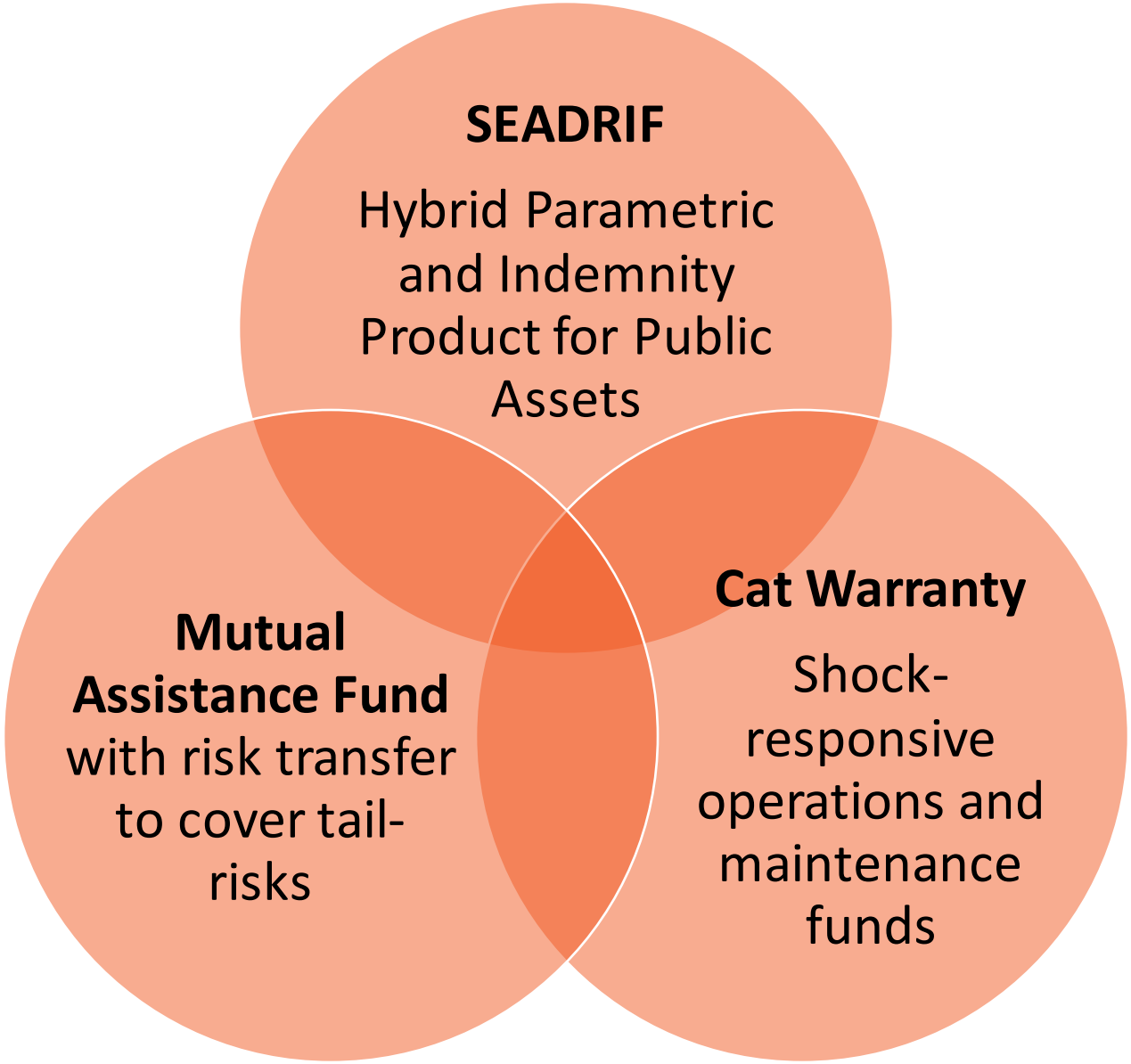
LESSONS: What's different about critical infrastructure services?

- **Quick, reliable liquidity is most critical.** So-called parametric products can play an important role
- **Embed within systems:** finance has to be hard-linked to capacity to respond *(e.g. examples from US and Japan)*
- **O&M bedrock:** how do we design financial instruments that also support operations and maintenance?
- **Role of the private sector**: how to ensure good financial resilience throughout the whole infrastructure system?



NEXT STEPS

- Fundamentals: building systems and capability
- Innovation in financial product design
- Investing in basic data, including asset level data and risk information



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Data and Analytics to Design Risk Financing Programs for Critical Infrastructure Services

Jim Hall,
Professor of Climate and Environmental Risks
Director of Research in the
School of Geography and the Environment
University of Oxford

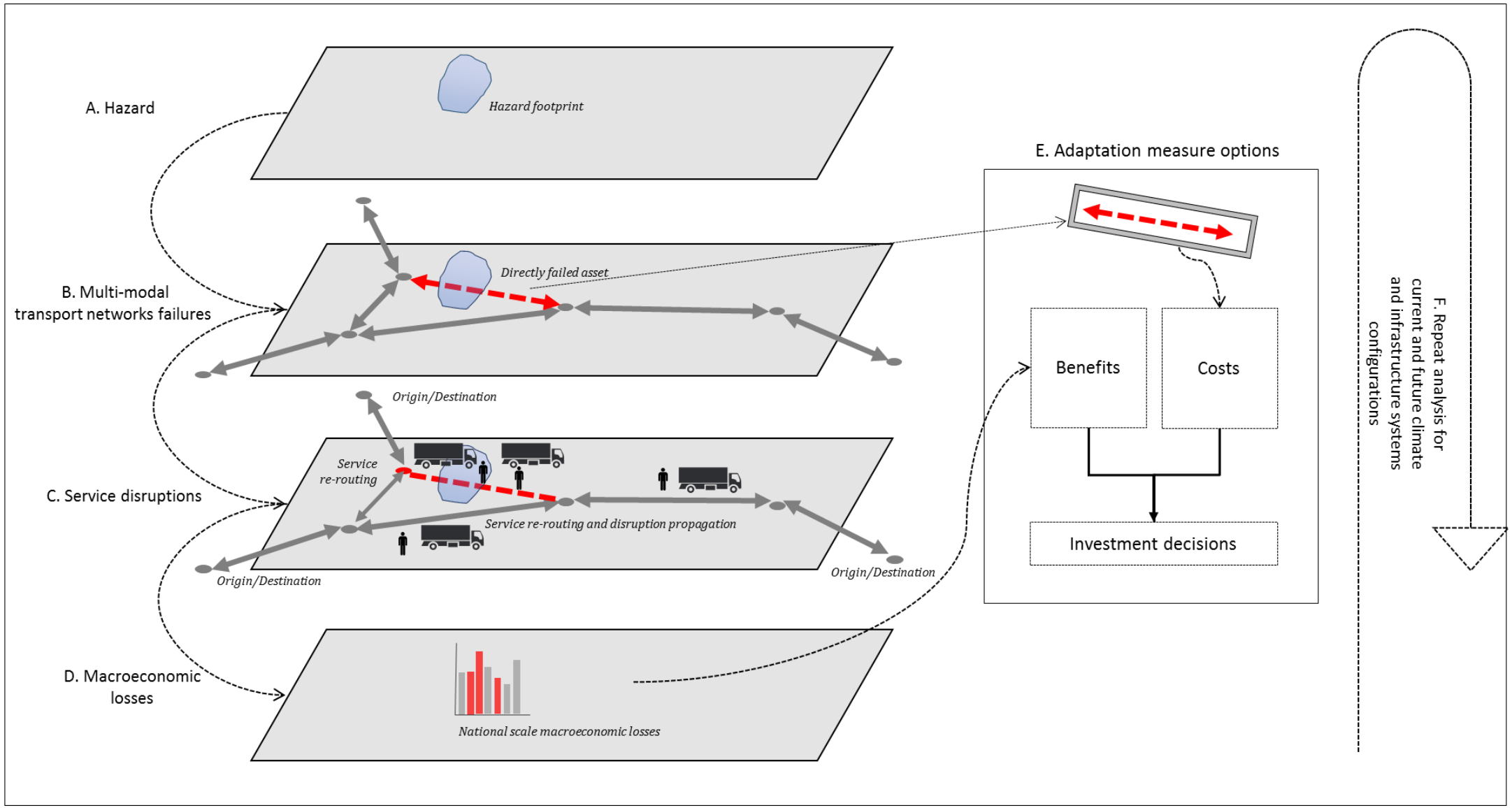
11 March, 2021

Risk analytics to inform decision making

Geospatial analysis of risks to infrastructure systems informs:

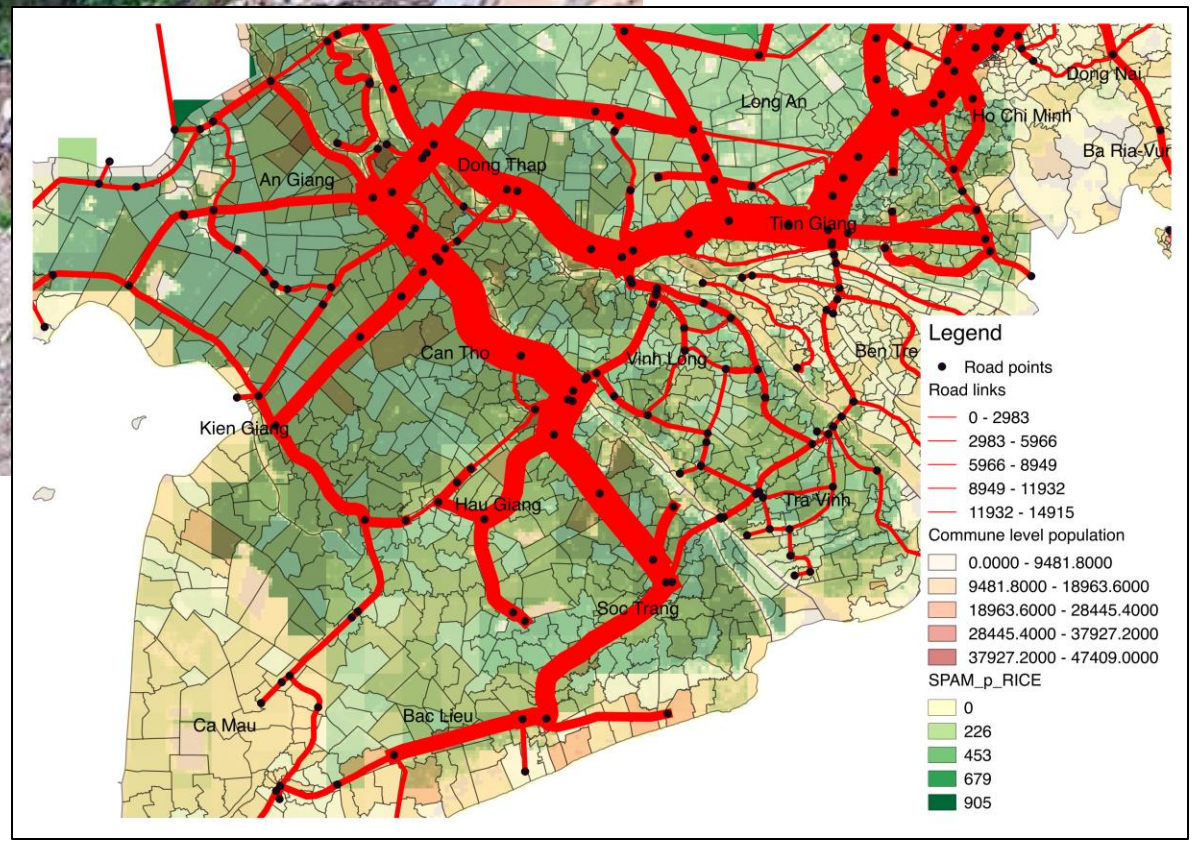
- Targeting and pricing of disaster risk financing and insurance:
  - Indemnity insurance
  - Parametric insurance
  - O&M finance
- Prioritisation of adaptation investments
- Climate risk reporting for infrastructure investments
- Macro-prudential regulation

Infrastructure risk analysis calculations

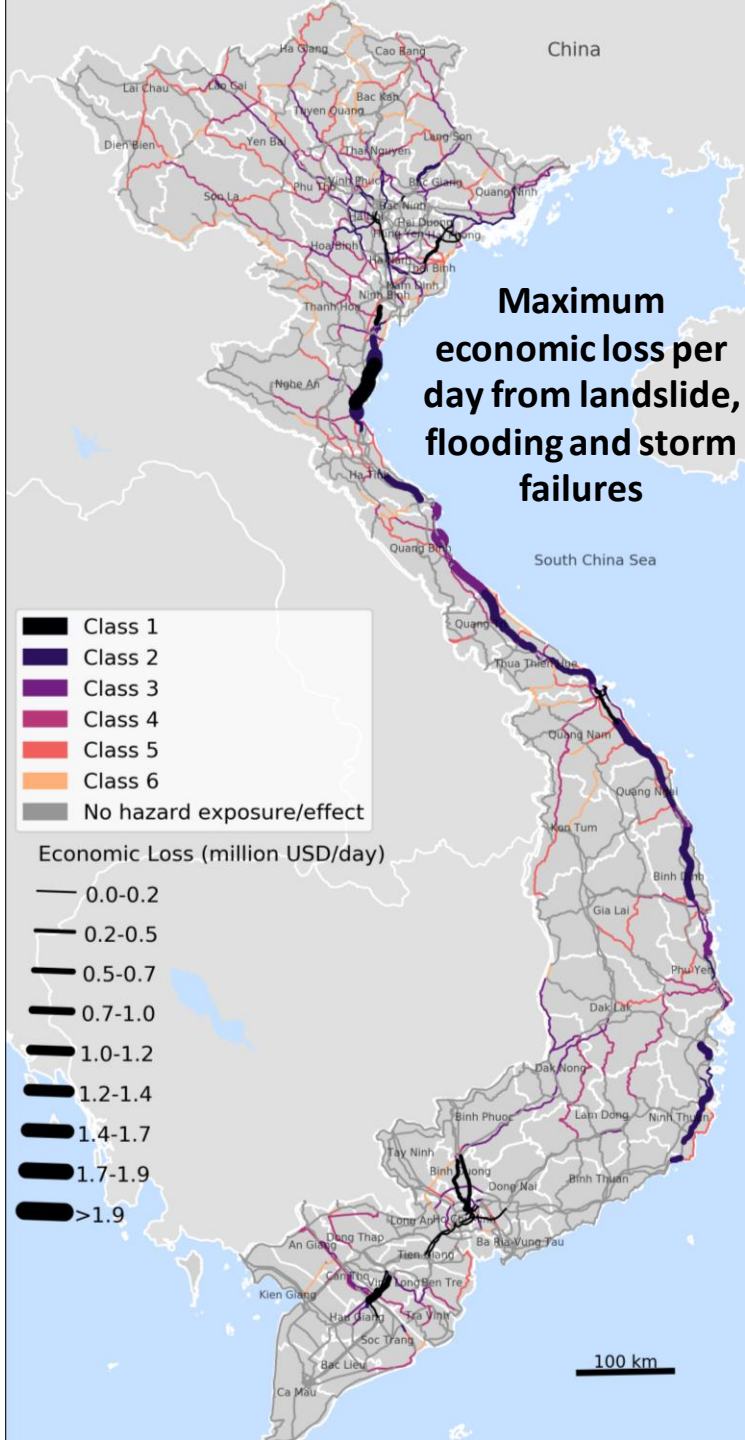


Application in Vietnam

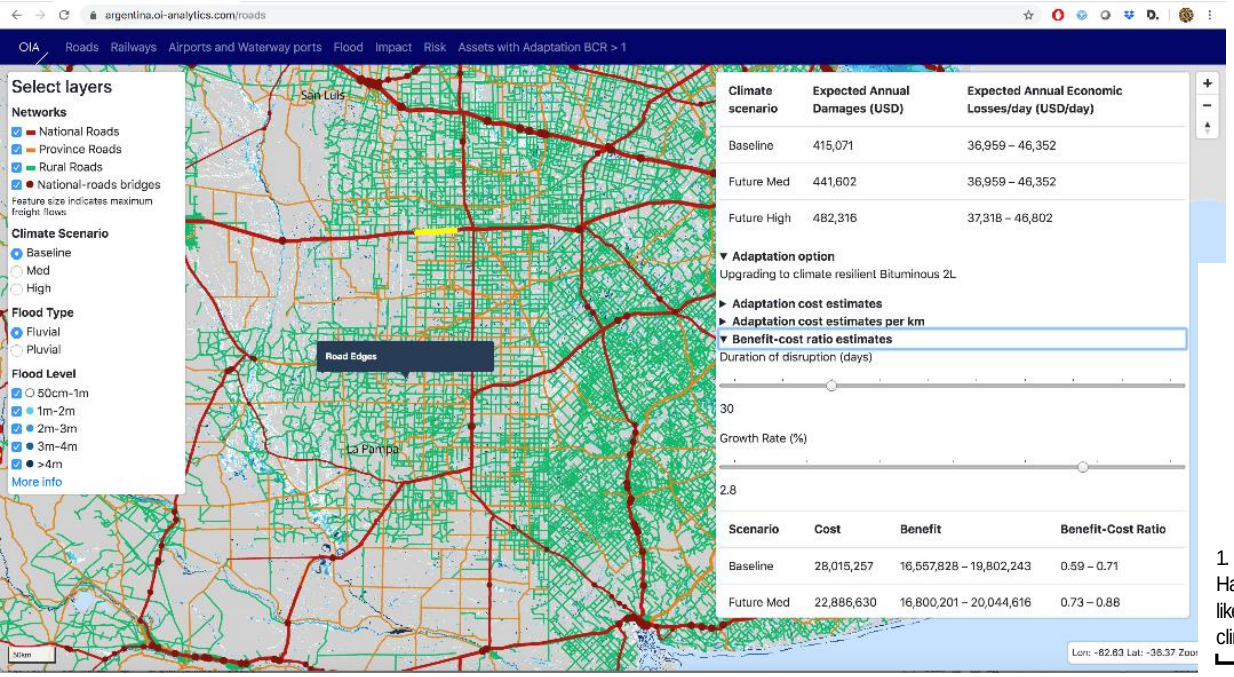
Landslide at National highway 4h in Lai Chau – June 2014



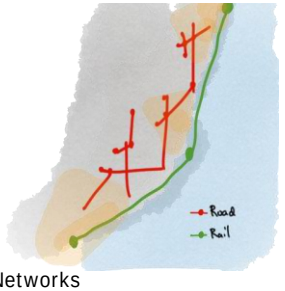
Most important routes for agriculture



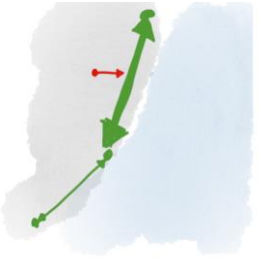
Decision support tools



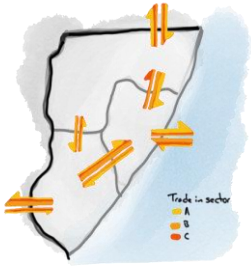
1. Hazard
Hazard maps with intensity and likelihood, under current and future climate scenarios.



2. Networks
Energy, transport, water systems linked to population and economic activity.



3. Services
Network models of service provision give knock-on effects and indirect impacts of individual asset failure.

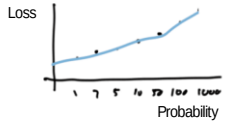


4. Socio-economics
Population and firm locations provide demand for infrastructure services. Regional supply-use tables.

5. Fragility ⨯ Exposure = Vulnerability
Networks exposed to hazards of varying intensity may lead to direct damages and service disruption.

6. Δ Service Provision = Criticality
Calculate impact of the failure of any single asset on overall service provision in the networked system.

7. Macroeconomic
Calculate wider impacts on the macro-economy through input-output modelling.

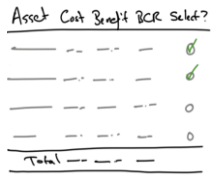


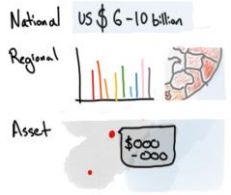
8. Probability × Impact = Risk
Calculate risk of direct damage and risk of indirect losses due to service disruption.

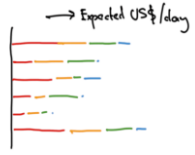
9. Adaption options
Introduce changes to the network or response to hazard events.

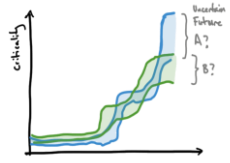
Calculate expected benefits as avoiding potential losses.

Summarise and prioritise options.

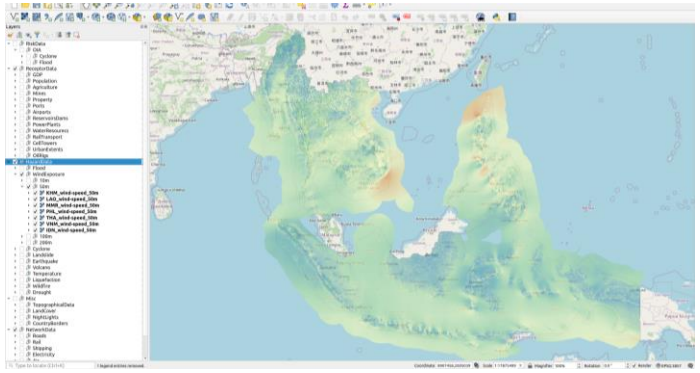


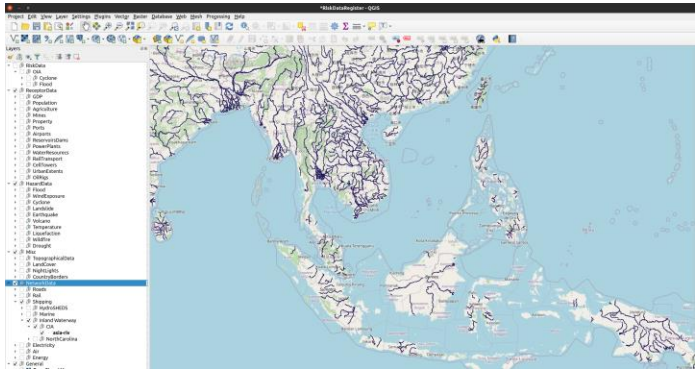


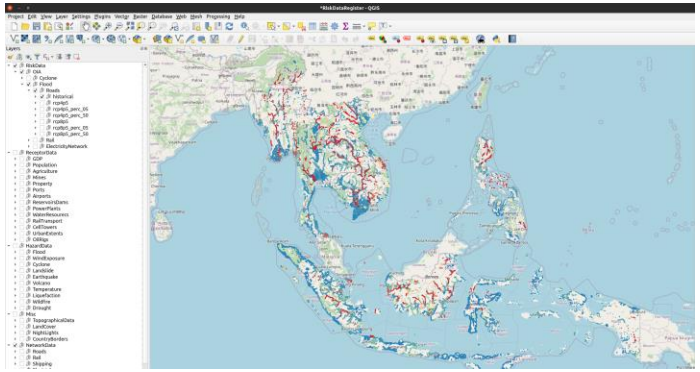


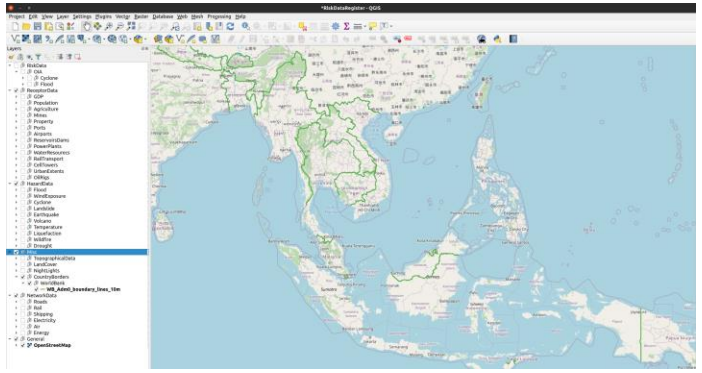


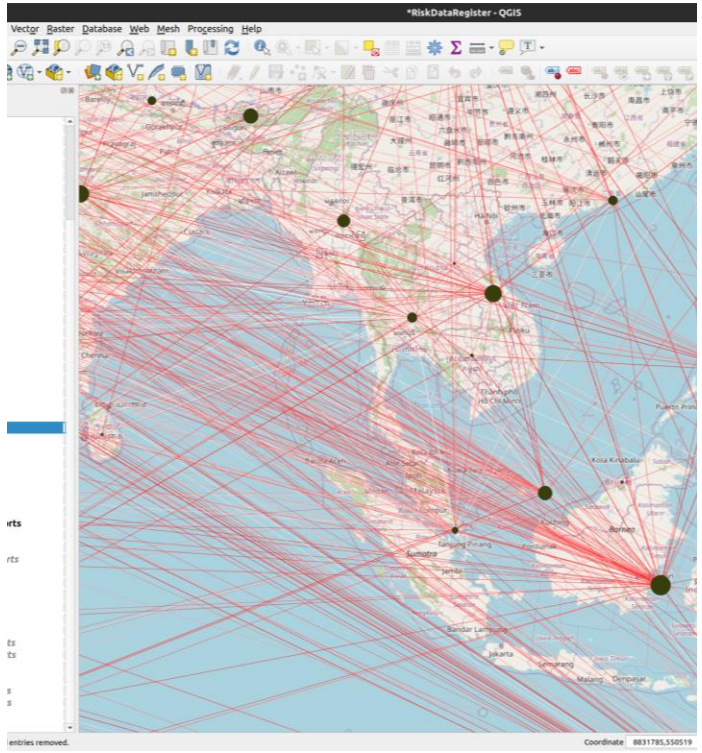
Analytics for Financial Risk Management of Critical Infrastructure in South East Asia











- Demonstrate ***how criticality analyses and vulnerability assessments for critical infrastructure systems can be used to inform financial risk management by governments***, including potential financial products, and present a prototype analytical platform for SE Asian countries
- Apply a criticality framework to a financial risk assessment of critical infrastructure systems to assess ***whether and how the analysis can be scaled*** both geographically and intensity of work.

Conclusion

Challenges and Opportunities for Analytics for Financial Risk Management of Critical Infrastructure

Challenges:

- Asset data: condition, design standards, recovery capacity
- Business interruption, supply chains and economic impacts
- Costs and benefits of maintenance and upgrade

Opportunities:

- Growing demand for quantification of infrastructure risks for a variety of purposes
- Earth Observation and crowd source datasets
- Multi-purpose open source risk analysis software and tools

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Risk Financing Programs for Critical Infrastructure Services – Financier's perspective

Masaaki Nagamura,
Fellow & General Manager International Initiatives
Tokio Marine & Nichido Fire Insurance Co., Ltd.
Sherpa, APFF Disaster Risk Financing & Insurance

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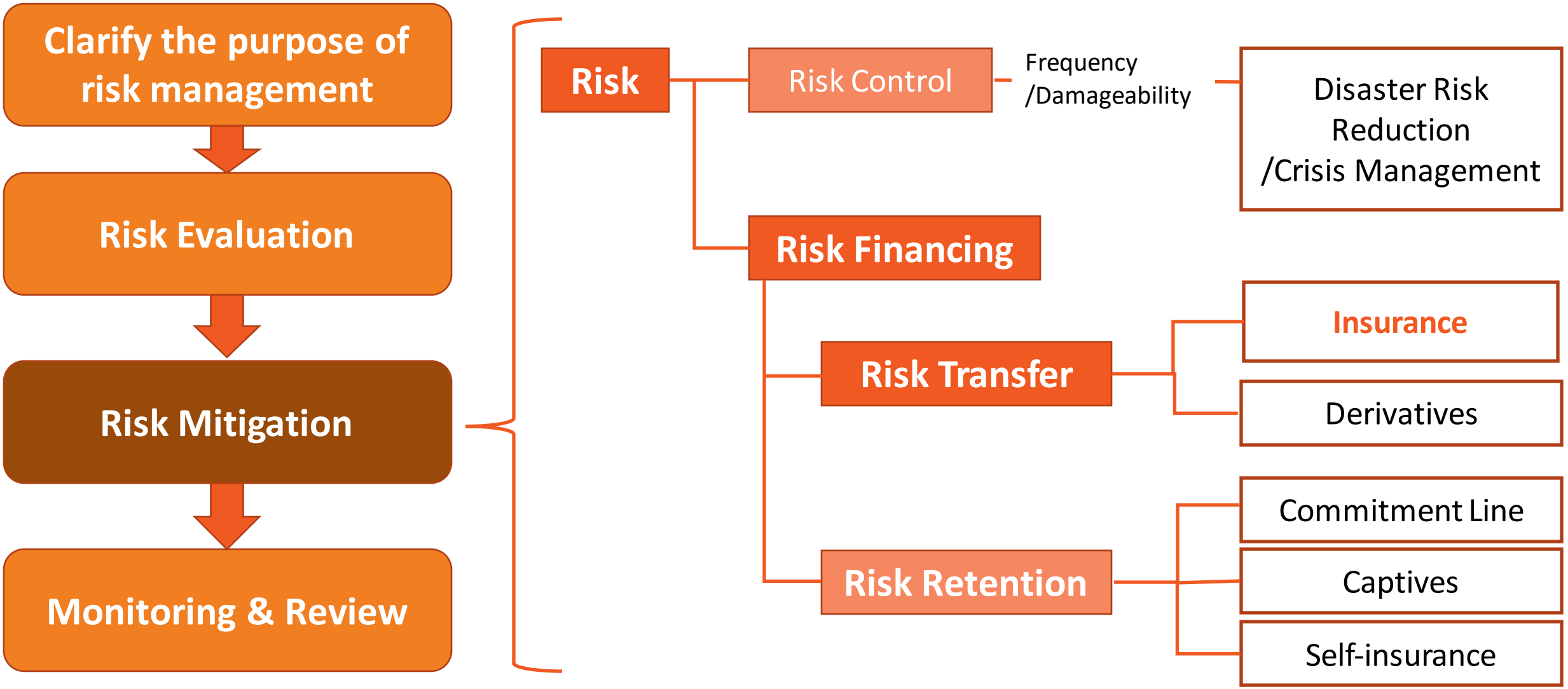
Risk Financing as a Component of Holistic Risk Management

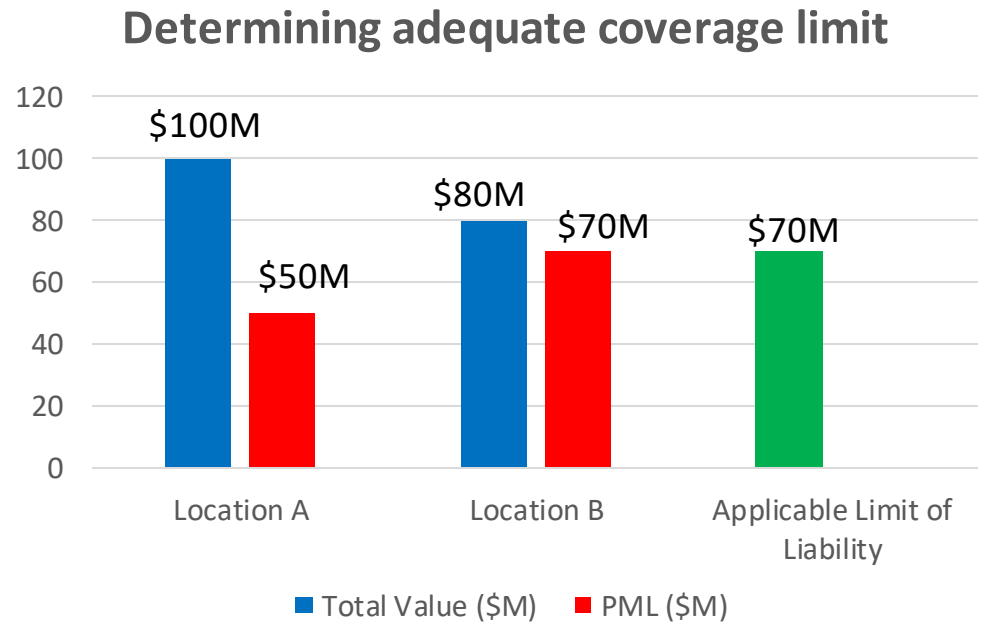


Probable Maximum Loss Analysis for Physical Damage

- Clarify the purpose of risk management
- **Risk Evaluation**
- Risk Mitigation
- Monitoring & Review

Benefits of PML Evaluation

1. Per location PML helps the insured structure a cost-effective risk financing program.
2. It also helps the insured identify which location needs to be prioritized in terms of risk mitigation.
3. Enables benchmarking against industry peers or other municipalities.

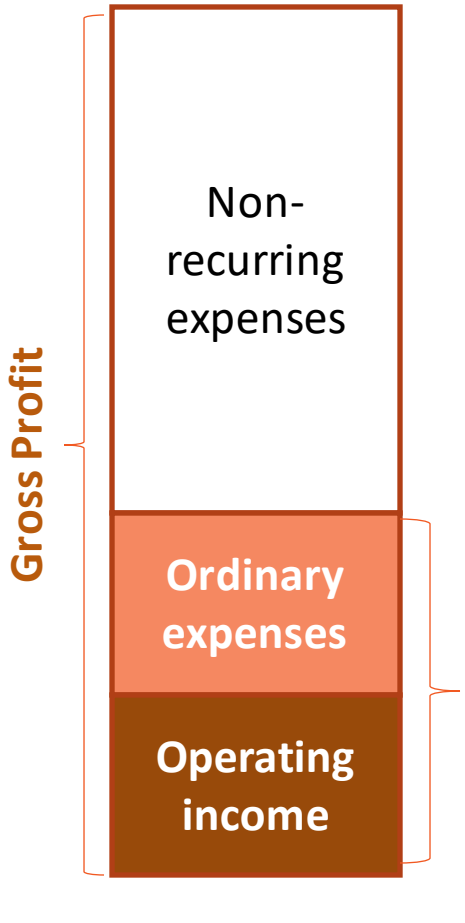


Probable Maximum Loss Analysis for Business Interruption

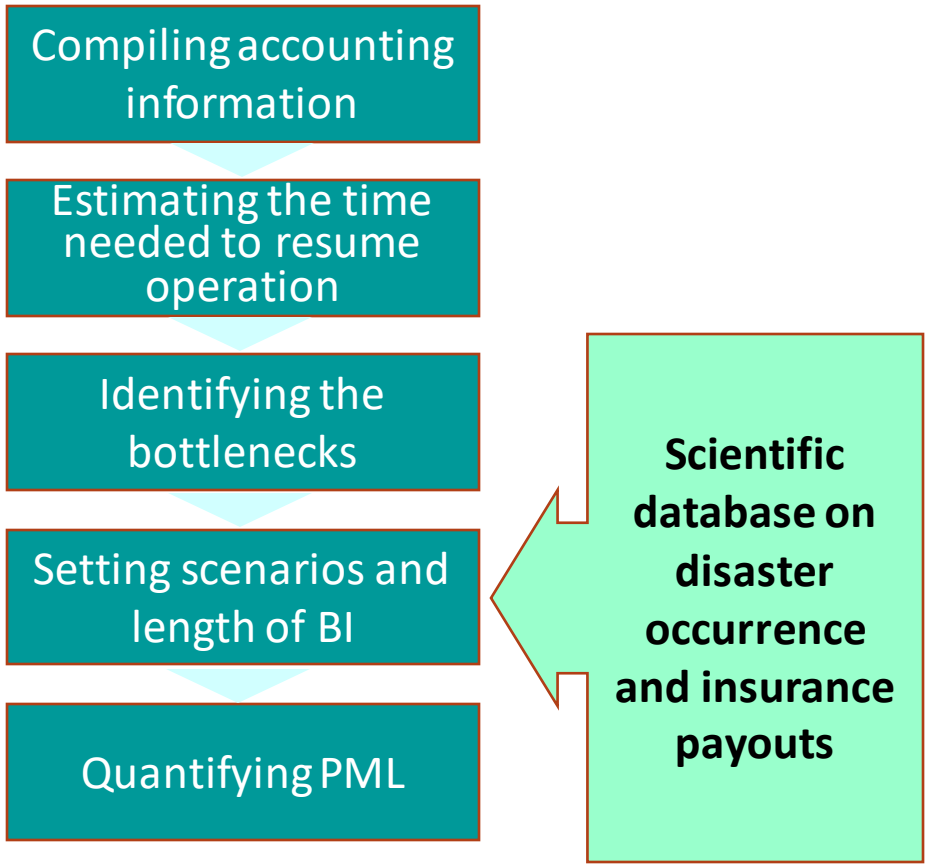
- Clarify the purpose of risk management
- Risk Evaluation
- Risk Mitigation
- Monitoring & Review

How PML for business interruption is evaluated

How business interruption impacts the financials



Flowchart of evaluation



Case Study 1: Airport Facility Services

Typhoon Jebi (No.21) affecting Kansai International Airport (September, 2018)

- Wind-driven high tide flooded the runways.
- Power outage in the terminal building.
- A tanker cast adrift by strong winds collided with the bridge connecting with the mainland, causing gas supply disruption and stranding travelers.

(MLIT)

Case Study 1: Airport Facility Services

An Earthquake PML analysis for an airport facility

Selected Earthquake Scenarios	Seismic Intensity	PML ($M)
An EQ with an excess probability 10% for the next 50 years	7	300
Epicenter A: M 8.1	6+	50
Epicenter B: M 8.6	7	700

- The above PML estimates led the airport management to hedge its earthquake risk with an earthquake derivative contract tailored for the account.

Case Study 2: Power Generation Facility Services

Typhoon Faxai (No.15) (September, 2019)

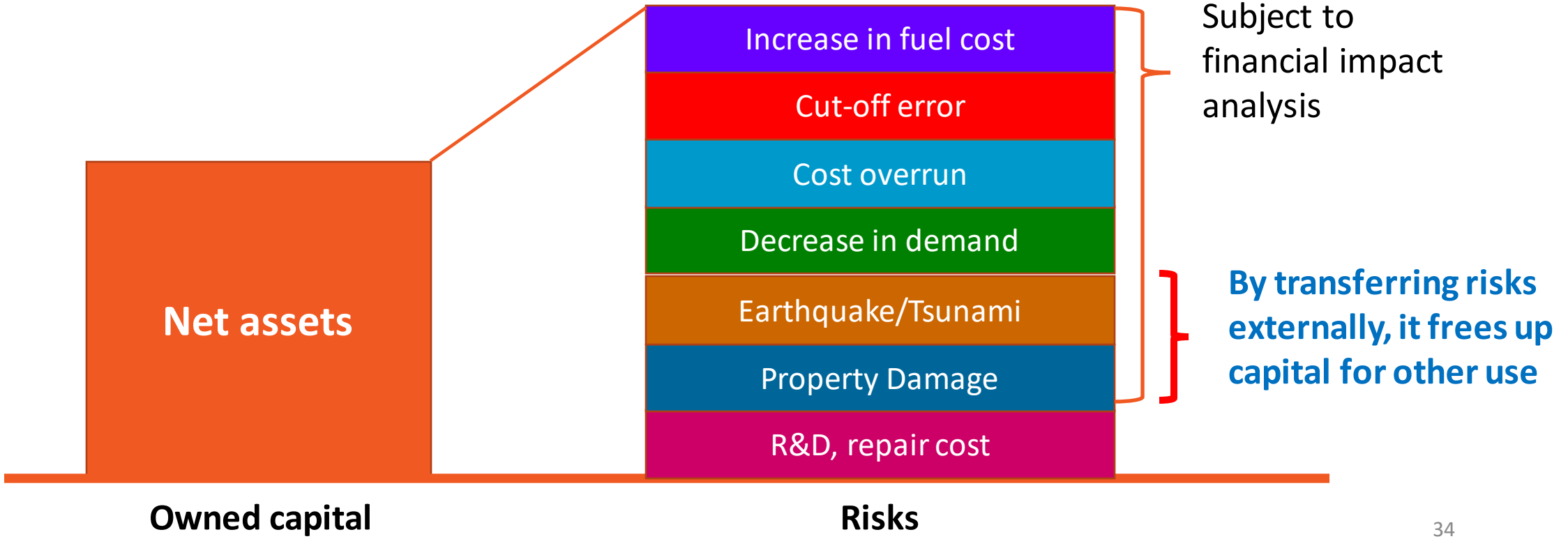
- Typhoon Faxai seriously impacted the power grid system and caused massive power outage.
- The case prompted the discussion on energy resiliency.

(TEPCO Power Grid)

Case Study 2: Power Generation Facility Services

What risk financing means for power producers

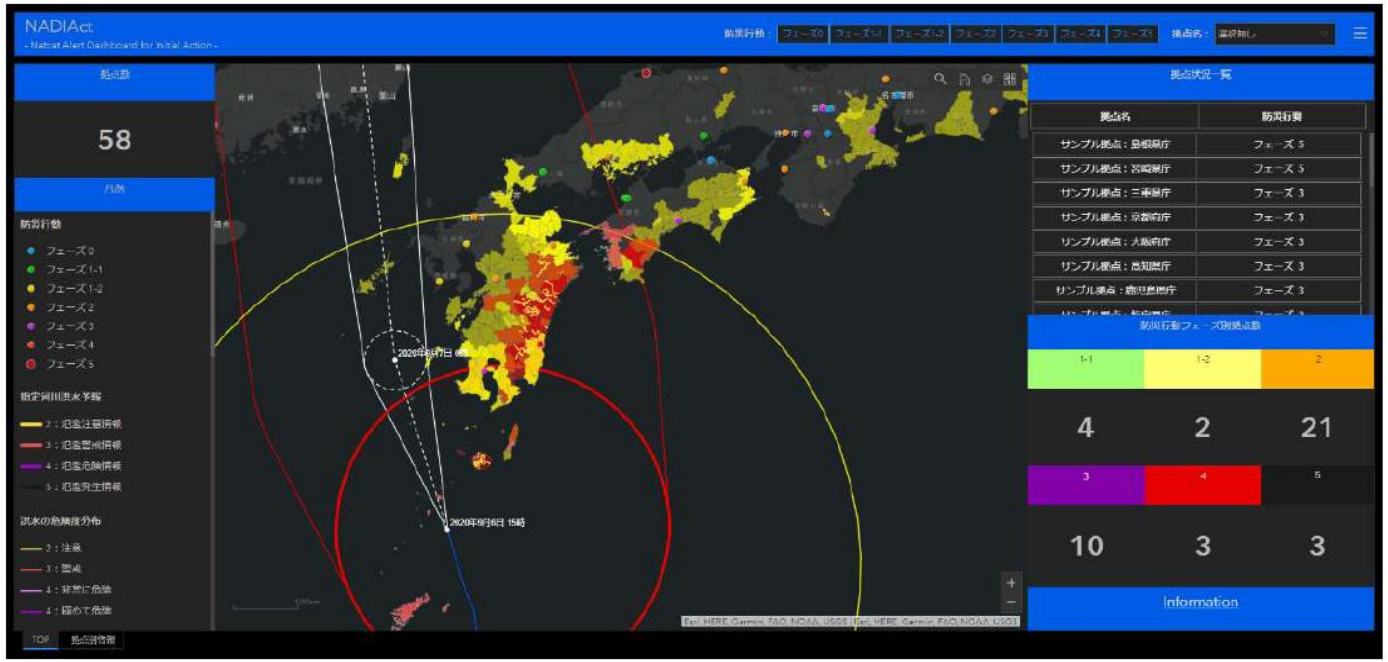
- By transferring disaster risks, power producers can make the most of its capital.
- Defining maximum affordable risk retention level would help power producers design optimal risk financing program.



Case Study 3: Enabling real-time disaster response

Key features of NADIAct (Natural catastrophe Alert Dashboard for Initial Action)

1. Real-time display of disaster conditions throughout Japan
2. Displays recommended initial action in the face of disasters
3. Offers advices on day-to-day disaster response to corporates/local municipalities



(Tokio Marine Holdings)

Conclusion

- Traditionally, public/critical infrastructure has been largely uninsured for disaster risks.
- Given the increasing threat of natural disasters as well as the national budgetary constraints due to the ongoing fight against pandemic, the need for cost-effective risk financing is on the rise.
- The accumulated knowledge of and technological advancements made by the private sector insurance companies is underutilized.
- By promoting public-private collaboration, insurance companies can contribute more to enhance societal disaster risk resiliency.

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Risk Financing Programs for Critical Infrastructure Services – New Zealand's perspective

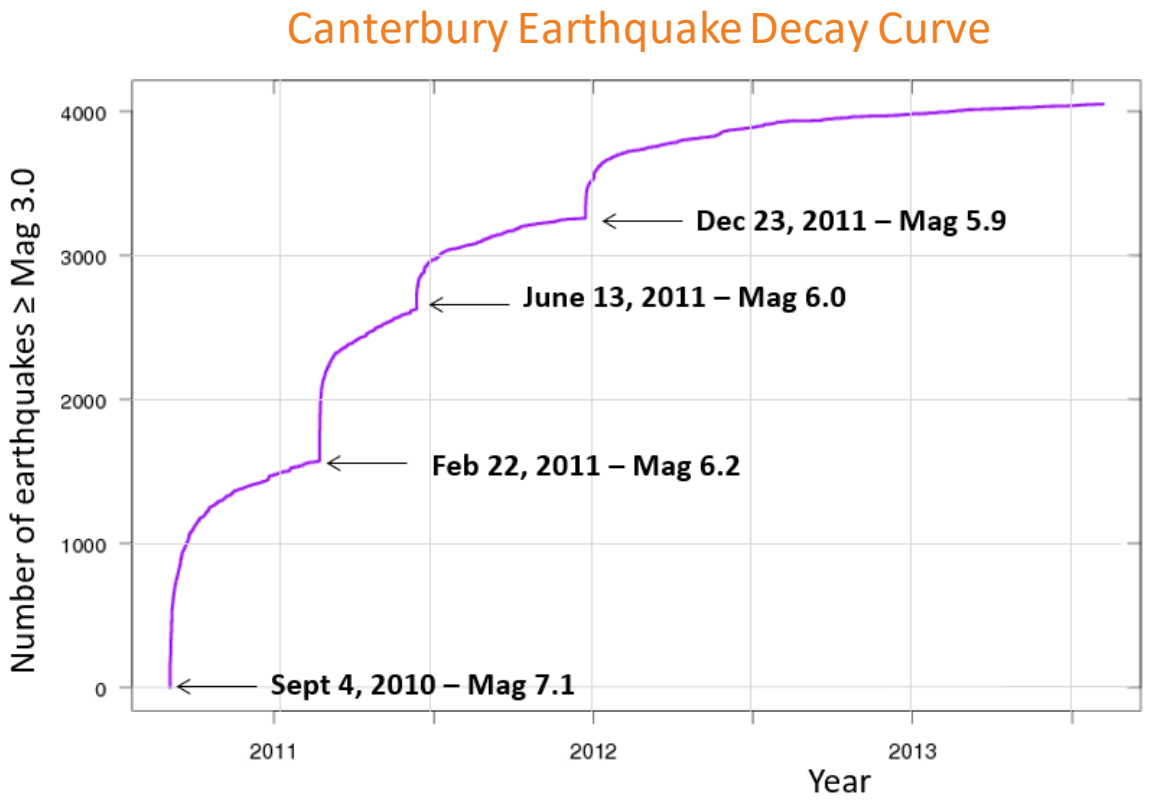
Roger Fairclough,
Chair of New Zealand Lifelines Council

11 March, 2021

New Zealand Lifelines

Example of Providing Financial Support to Critical Infrastructure Services – Canterbury Earthquake Sequence 2010 - ongoing

- Event; September 4, 2010 Magnitude 7.1 earthquake, epicenter 45km west of Christchurch central – considerable damage
- Event; February 22, 2011 Magnitude 6.2, epicenter Christchurch – most damaging
- > 10,000 recorded earthquakes



Canterbury Earthquakes 2010 +

Christchurch City Damage

- Residential
- 100,000 homes damaged
- 7,860 homes in red zone

Central City

- **70% commercial buildings**
- **3000 businesses displaced**
- **Cordon – 387ha**

Social

- **185 casualties from 20 countries**
- **6,800 treated for injuries**

Infrastructure

- **52% road network (1000km)**
- **31% sewer network (528km)**

Example of Providing Financial Support to Critical Infrastructure Services – Sewer Network

- 31% of sewer network damaged (528km)
- Owner of sewer network; Christchurch City Council (CCC)
- CCC carried insurance through a mutual funding arrangement across multiple local councils distributed throughout New Zealand – accumulated capital by annual contributions and supplemented by international reinsurance arrangements.
- September 2010 event exhausted all funds available through the mutual insurance scheme.
- By February 2011 event the extent of sewer damage had not been fully assessed.
- Following February 2011, due to extent of damage across road and water services, as well as common corridors, Government led establishment of a government/council/construction industry consortium "Stronger Christchurch Infrastructure Rebuild Team" or "SCIRT" to:
  - Coordinate effort
  - Gain efficiencies, ensure quality
  - Minimize costs to taxpayer and others
  - Ensure councils continued to financially contribute within their capacity to do so

Example of Providing Financial Support to Critical Infrastructure Services – Sewer Network

- Learnings:
  - Decision making in higher uncertainty (earthquake intensities expected to decline over time)
  - Levels of insurance; book value (financial), replacement cost, replacement cost + (gross under-insurance)
  - Multiple events; cascade or coincidental
  - Duration of effects
  - Damaged sewer system led to groundwater contamination led to contamination of potable water bores distributed throughout city
  - Government financial mechanisms and capacity to apply funding (contingent liability)
  - Insurance models (uninsured, self insured, partially insured, inability to secure insurance, multiple parties (mutual), national)
  - Business impacts (MERIT – Measuring the Economics of Resilient Infrastructure Tool)
  - Extent of funded recovery; less than, same as or better than pre-event? Funding "additionality" relative to BAU?
  - Community impacts – ongoing disruptions
  - Alternate means of delivering service

Conclusion / Takeaways / Recommendations

- New Zealand continues to learn and improve
  - Has further strengthened emergency management to establish National Emergency Management Agency (NEMA).
- Recommend national risk assessments across all hazards
  - Have greater focus on consequences rather than probability (e.g. New Zealand had exercised and prepared for pandemics, also biohazard incursion and many others).
- Assess consequences against a community wellbeing framework
  - As greatest impacts may not be physical damage e.g. pandemic.
- Reduction in demand is often overlooked
  - e.g. treatment plants, refineries, gravity sewer flows
- Ensure economic first, second and third order impacts are considered.
- Ensure financial capacity, capability and policy mechanisms to manage adverse events.
- New Zealand's experiences have been included in this new report on "Financial Protection of Critical Infrastructure Services".
- Highly recommend report and adoption

World Bank Group Report Launch:
Financial Protection of Critical Infrastructure Services

IGNITE PRESENTATIONS

Dr. Jen JungEun Oh
Infrastructure Sector Leader, World Bank

Beatrice Cassottana
Postdoctoral Researcher, Singapore-ETH Centre

Hendrik Rosenthal
Director – Group Sustainability, CLP Group

Artis Nikki Tortola
Deputy Administrator, Technical Services
National Electrification Administration
Republic of the Philippines

Moderator: **Lit Ping Low**, Disaster Risk Finance and Insurance Program, World Bank

World Bank Group Report Launch:
Financial Protection of Critical Infrastructure Services

IGNITE PRESENTATIONS
Pathway to Resilient Transport for Vietnam

Dr. Jen JungEun Oh
Infrastructure Sector Leader, World Bank

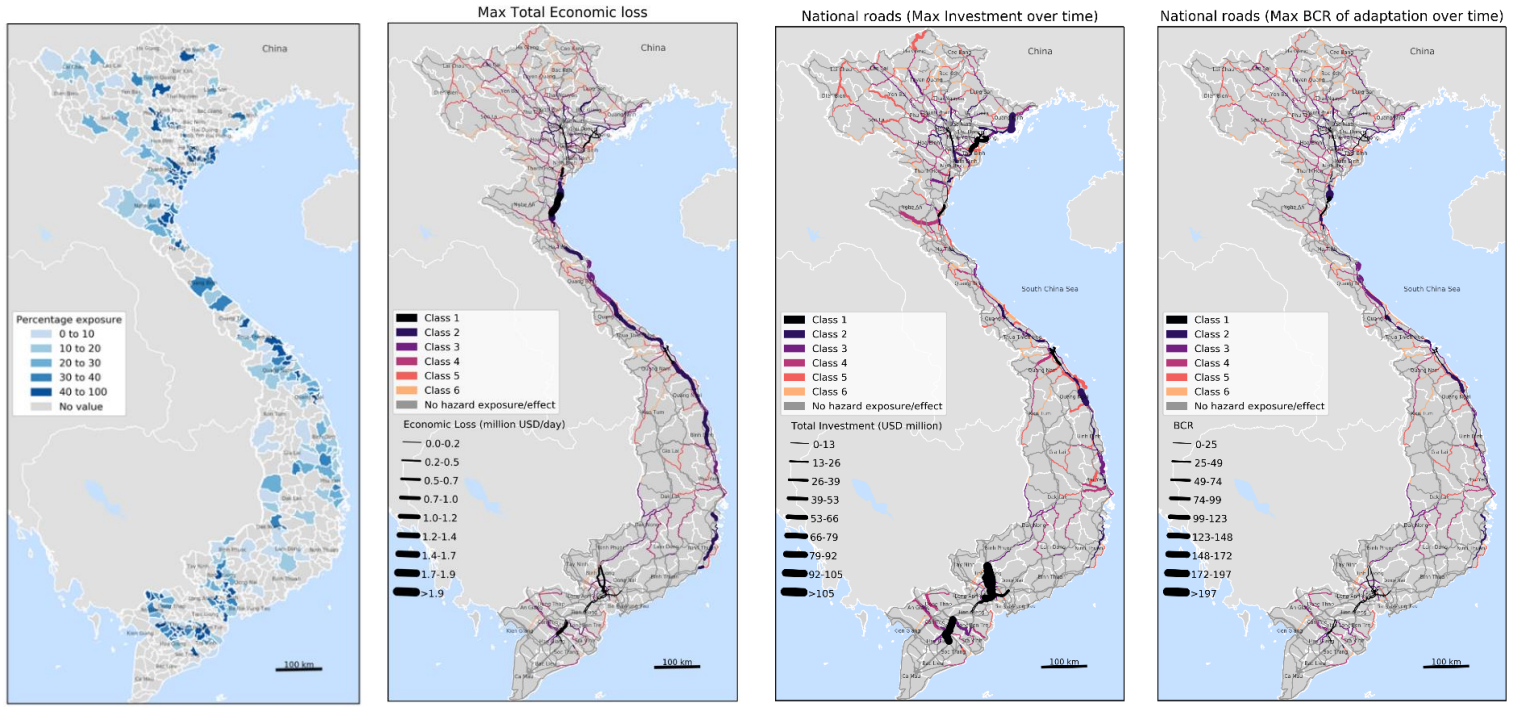
11 March, 2021

Data-Driven, Evidence-Based Decision-Making can Strengthen the Resilience of Critical Infrastructure

- 60% of the land area and 71% of the population are exposed to two or more multi-hazard events
- This could result in annual average asset losses amounting to 1.5% of GDP and loss in consumption amounting to 2% of GDP

Decision-Making under Uncertainty

System-of-systems methodology for geospatial analysis

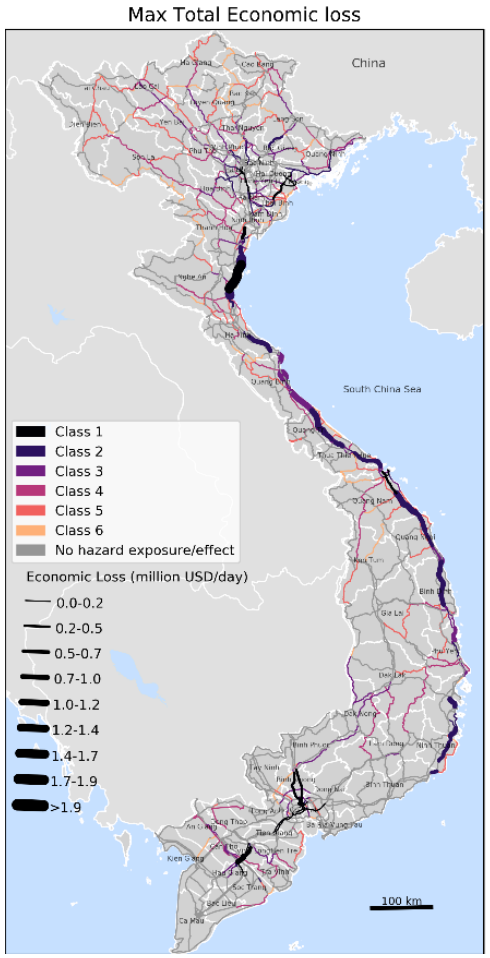


Risk exposure → Criticality → Investment costs → Benefit-cost ratio

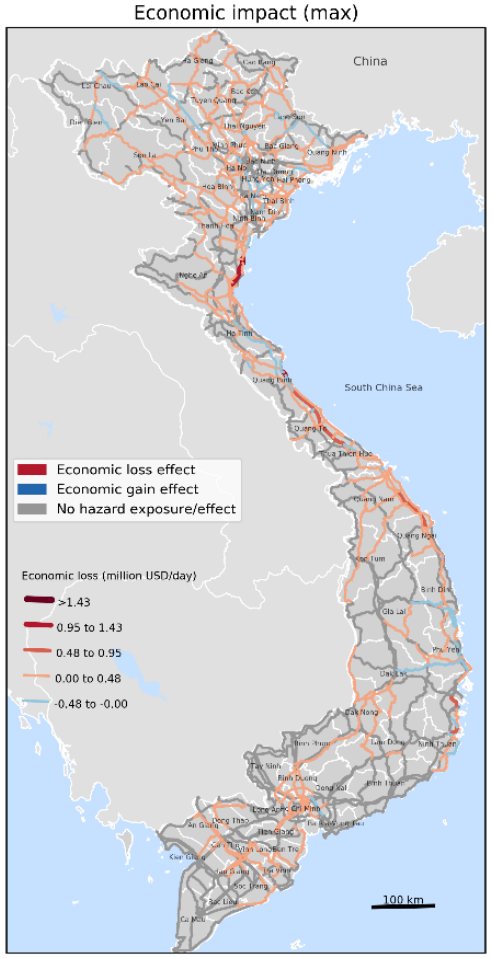
Evidence-Based Investment Planning and Multi-Modal Strategy can bring Significant Economic Benefits

- A 10% shift from roads to other modes shows: substantial decrease in expected economic losses by ~25%

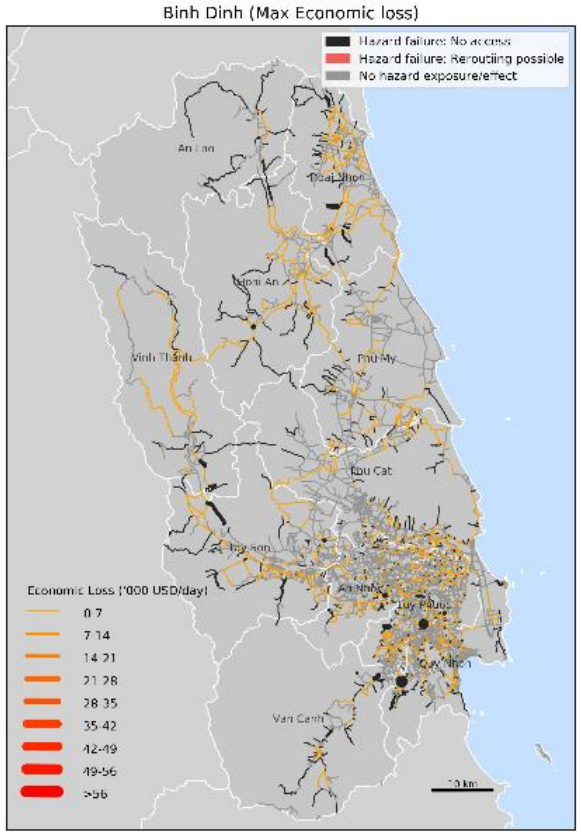
Current modal share

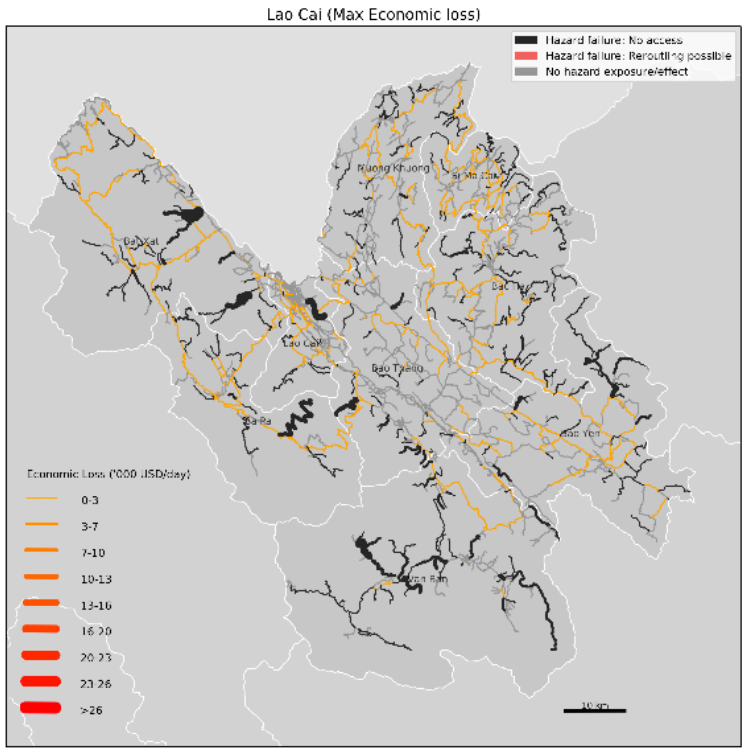


10% shift away from roads



- Provincial-level application to maximize the returns on investments under tight fiscal conditions





Significant increase in upfront public investments are called for, through stronger institutional foundation and coordination

The project informed:

Decision-makers of the importance and usefulness of criticality analysis in prioritizing adaptation measures

Government's Socio-Economic Development Strategy and 5-year Implementation Plan

Key Findings

Transport network in Vietnam is under significant risk due to exposure to various natural hazards

Climate change increases likelihood of catastrophic events and expected economic loss, thus, making more investments economically justified

Beyond national corridors, secondary roads and rural roads are backbone of resilience, providing redundancy

Next Steps

Institutional coordination on data standards and sharing needs to be strengthened, to improve quality and coverage of infrastructure location and quality data, hazard exposure data, socio-economic data

Coordination between infrastructure asset management and budget allocation functions

Engineering research on climate adaptation interventions to transport is a priority to enhance rural resilience

World Bank Group Report Launch:
Financial Protection of Critical Infrastructure Services

IGNITE PRESENTATIONS

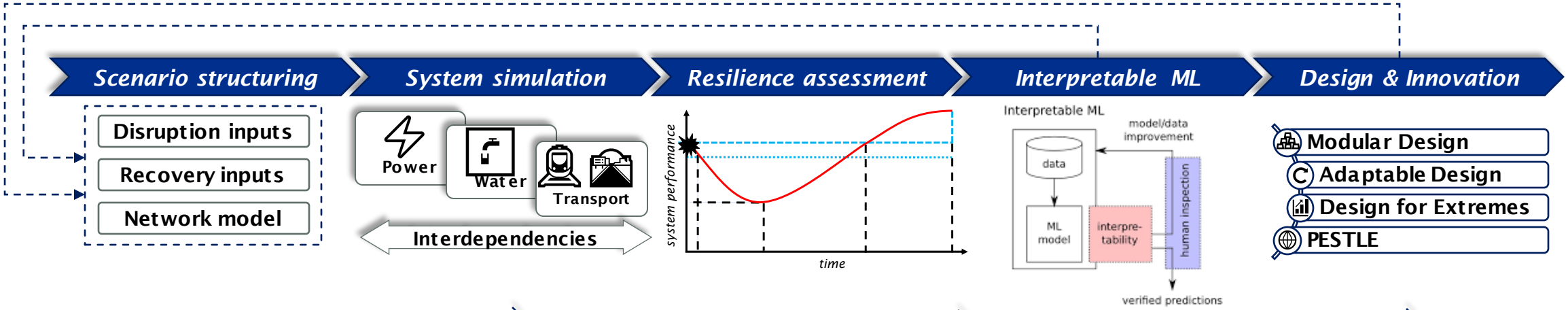
Case Studies on Actions to Strengthen the Financial Resilience of Critical Infrastructure Services against Shocks – Actions, lessons and next steps

Beatrice Cassottana,
Postdoctoral Researcher, Singapore-ETH Centre

11 March, 2021

DREAMIN' SG - Disaster REsilience Assessment, Modelling, & INnovation Singapore

- **Goal**: To develop a ***predictive tool of resilience*** using system modelling and Machine Learning (ML)
- **Overview of methods:**



- **Expected outcomes**:

(1) Simulation platform for the interdependent infrastructure

to be used to evaluate infrastructure risks and test recovery strategies

(2) Resilience prediction and analysis model

to be used to predict the resilience output given scenario inputs

(3) Novel system concepts

including solution directions to increase and maintain resilience

NEXT STEPS

- **Future research:** To develop a framework and associated tools to quantify the ***indirect economic losses due to infrastructure disruptions***

A recent example

Power outages, water shortages as Texas shivers

'Emergency': How a winter storm and power outages plunged Texas into crisis

Texas winter storm blackouts hit chip production

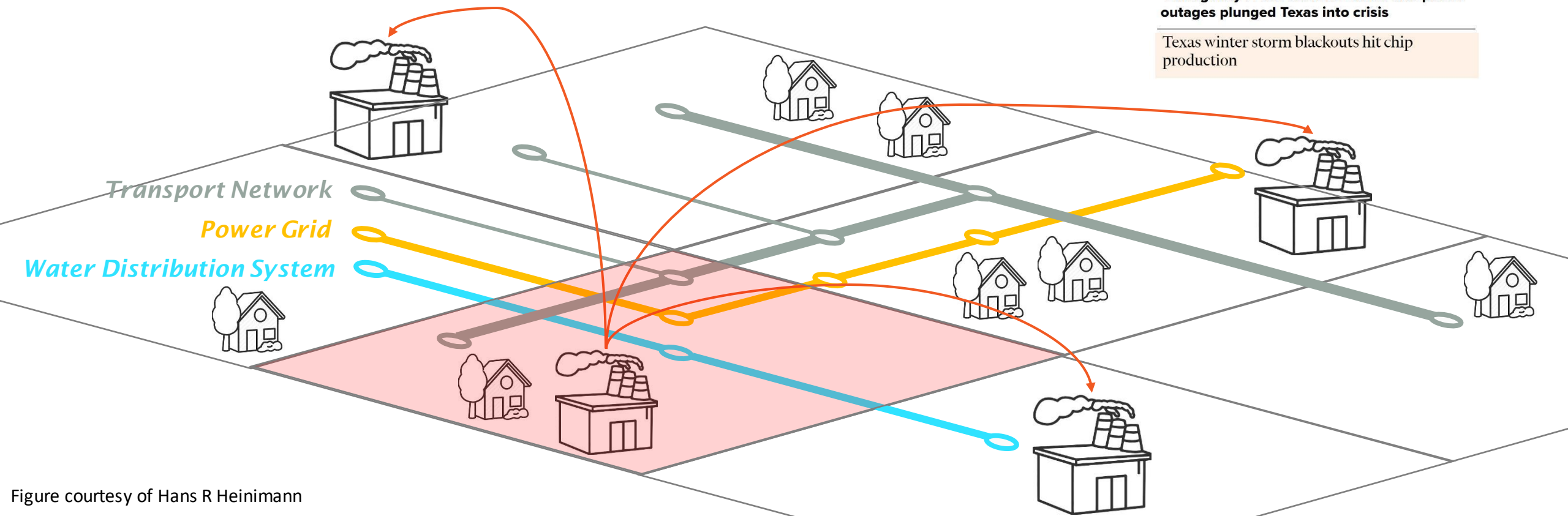


Figure courtesy of Hans R Heinimann

World Bank Group Report Launch:
Financial Protection of Critical Infrastructure Services

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Hendrik Rosenthal,
Director – Group Sustainability, CLP Group

11 March, 2021

WEATHERING THE STORM – PHYSICAL CLIMATE RISKS

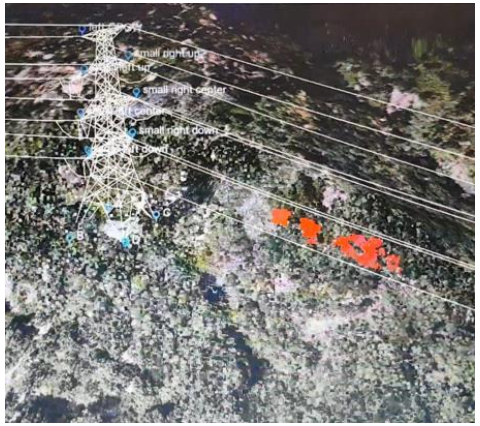



- Typhoons and floods pose significant risks to the operation and structure of overhead lines and substations in Hong Kong

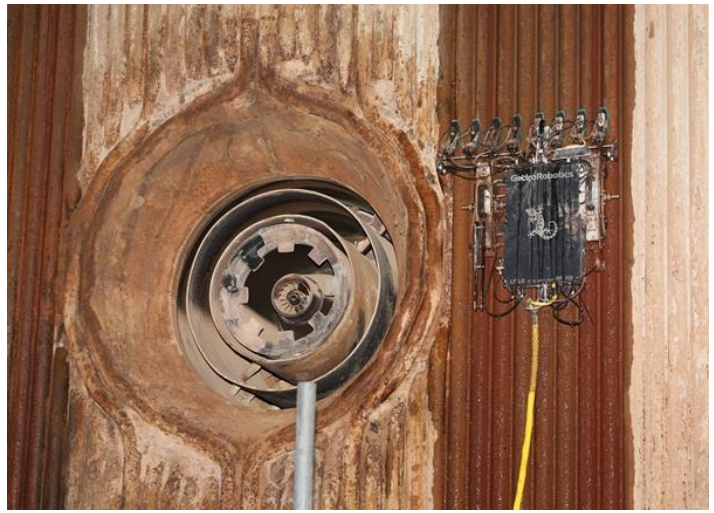

- Wind farms in India are faced with operation challenges when monsoons strike.


- Black Summer, Australia's worst ever bushfire season in 2019-2020 posed significant risks to power assets.

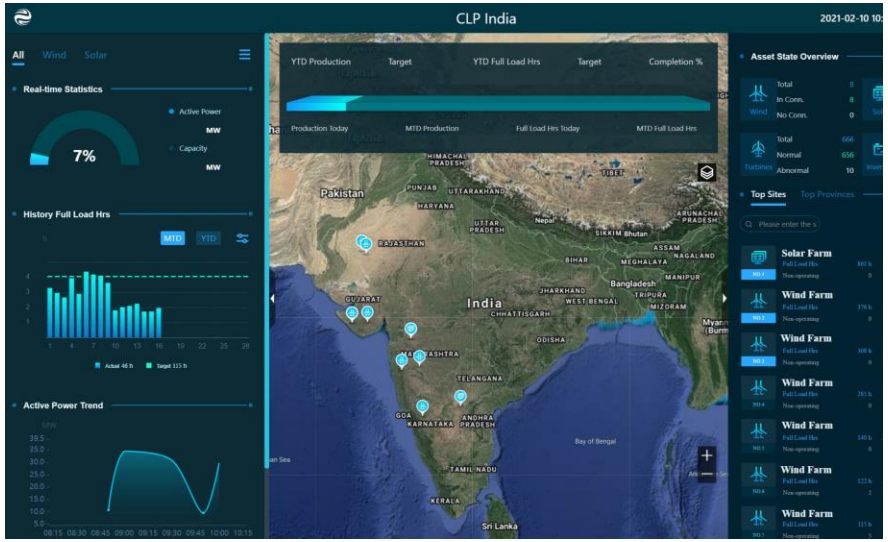
HARNESSING THE POWER OF TECHNOLOGY



- Aerial drones coupled with thermal cameras enable faster and more accurate identification of damaged and underperforming power assets.



- Robotics help enhance the efficiency and frequency of inspections.



- Centralised Analytics Platform (CAP) employed across renewable assets to capture real-time operational data for performance optimisation.

FINANCING THE TRANSITION TO A LOW-CARBON ECONOMY

- The offshore liquefied natural gas (LNG) terminal project currently under development by CLP Power and HK Electric will be crucial for ensuring fuel security and access to price-competitive natural gas for Hong Kong's transition to a low-carbon economy.

- The first new combined-cycle gas turbine at Black Point Power Station went into operation in 2020. This enables CLP to support the Hong Kong Government's target of increasing natural gas use to around 50% of Hong Kong's fuel mix for power generation in 2020. A second new gas-fired unit of similar capacity is now under development.

World Bank Group Report Launch:
Financial Protection of Critical Infrastructure Services

IGNITE PRESENTATIONS

Case Studies on Actions to Strengthen the Financial Resilience of Critical Infrastructure Services against Shocks – Actions, lessons and next steps

Artis Nikki Tortola
Deputy Administrator, Technical Services
National Electrification Administration
Republic of the Philippines

11 March, 2021

Republic of the Philippines
NATIONAL ELECTRIFICATION ADMINISTRATION
Quezon City

NEA's Insights On Opportunities And Challenges On Strengthening The Resilience Of Infrastructure Services From A Power Utility's Perspective

Presented by:

ENG'R. ARTIS NIKKI L. TORTOLA, MPE
Deputy Administrator for Technical Services

Before the:

APEC Virtual Workshop on
"Financial Resilience of
Critical Infrastructure Services against" Disasters"

March 11, 2021, 11AM (Philippine Time)

Impact Of Disasters On Distribution System Infrastructures

Asset Often Damaged

Network Asset
Poles
Cross-arms
Conductors, Wires, Cables
Distribution Transformers
Kilowatt-hours Meters

Non-Network Asset
Communication Antenna Poles
Office Building

Impact Of Disasters On Distribution System Infrastructures

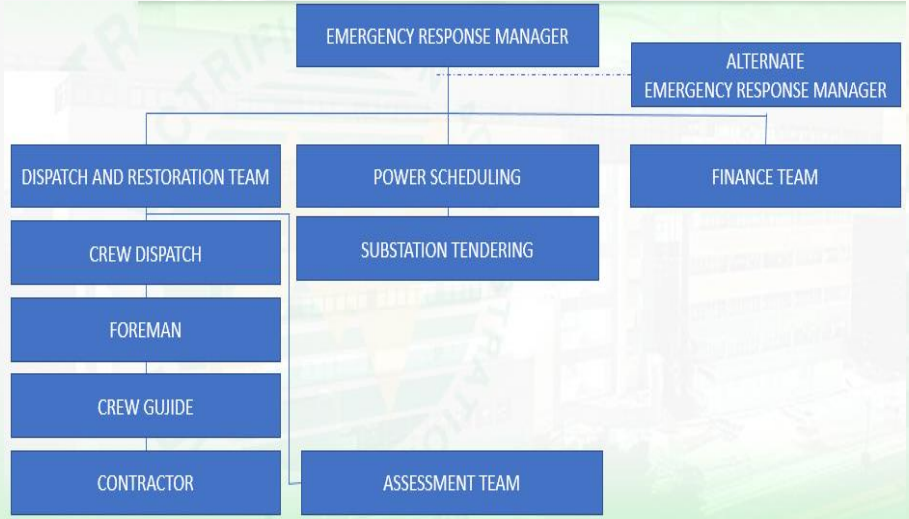
ECs (count)	2020 Disaster	Damage Cost (PHP)
2	Volcanic Eruption Taal (Alert Level 4) (January 2020)	792,538
11	Tropical Cyclone (Typhoon) Ambo (May 2020)	183,680,717.91
17	Tropical Cyclone Quinta (Typhoon) (October 2020)	174,847,064.52
14	Tropical Cyclone Rolly (Super Typhoon) (November 2020)	692,513,255.85
1	Tropical Cyclone (Tropical Storm) Siony (November 2020)	1,933,256.75
40	Tropical Cyclone Ulysses (Typhoon) (November 2020)	213,652,079.35
1	Tropical Cyclone Vicky (Tropical Storm) (December 2020)	2,630,310.27

Total 1,270,049,222.65

The Aftermath: Catanduanes/FICELCO (Super Typhoon Rolly)

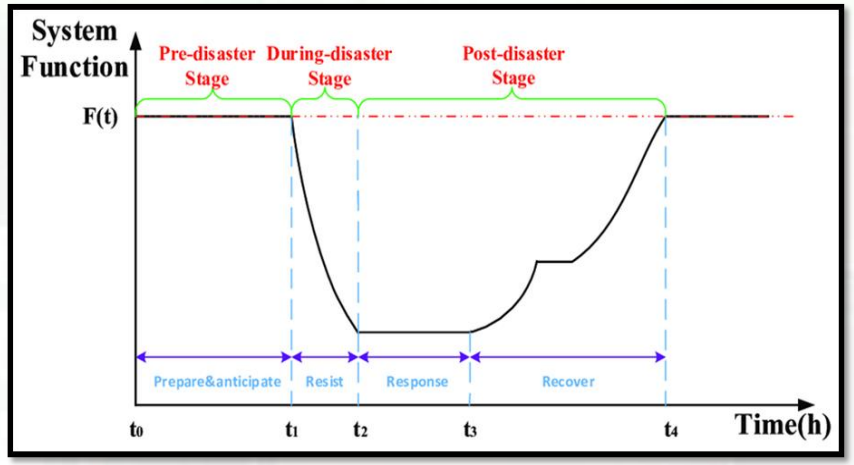
Emergency Response Framework And Protocol

The **Emergency Response Framework** basically provide the protocols, response-period and guidance to the Electric Cooperatives (ECs) and its National and Regional Associations the direction



Typical EC's Emergency Response Organization

Resilience Concept



Source: researchgate.net

for a **coordinated emergency response** to any eventuality and/or a disaster, whether it is natural or non-natural based on the ECs' established Emergency Response Organization (ERO) and Emergency Response Plan (ERP)

Preparedness and Risk Reduction

Preparedness Best Practices	
Manpower orientation, seminar and drill exercises of Emergency Response Organization and Emergency Response Plan respectively	Capability Building
Inventory of equipment and materials	Stocking
Pre-procurement of equipment and materials	Pre-stocking
Pre-hiring of manpower services	

Preparedness and Risk Reduction

Risk Reduction Best Practices	
Replacement of old poles	Routine Maintenance
Vegetation along the distribution line's ROW	
Underground distribution line standard	Mitigation
Additional down guy standard for new and existing distribution lines	Mitigation
Insertion of pole between existing long span distribution line	Mitigation
Re-routing or relocation of existing critical facilities out-off identified hazards	Mitigation
Facilities for construction are subjected to vulnerability and risk assessment.	Anticipation

Note: Mitigations are based on Vulnerability and Risk Assessments

Fund Sources To Cover The Repair of Damaged Distribution System and Facilities

- Electric Cooperatives Emergency and Resiliency Fund (ECERF)
- National Disaster Risk Reduction and Management Council Fund (NDRRMCF)
- Reinvestment Fund For Sustainable CAPEX (RFSC)
- NEA's Calamity Loan Window

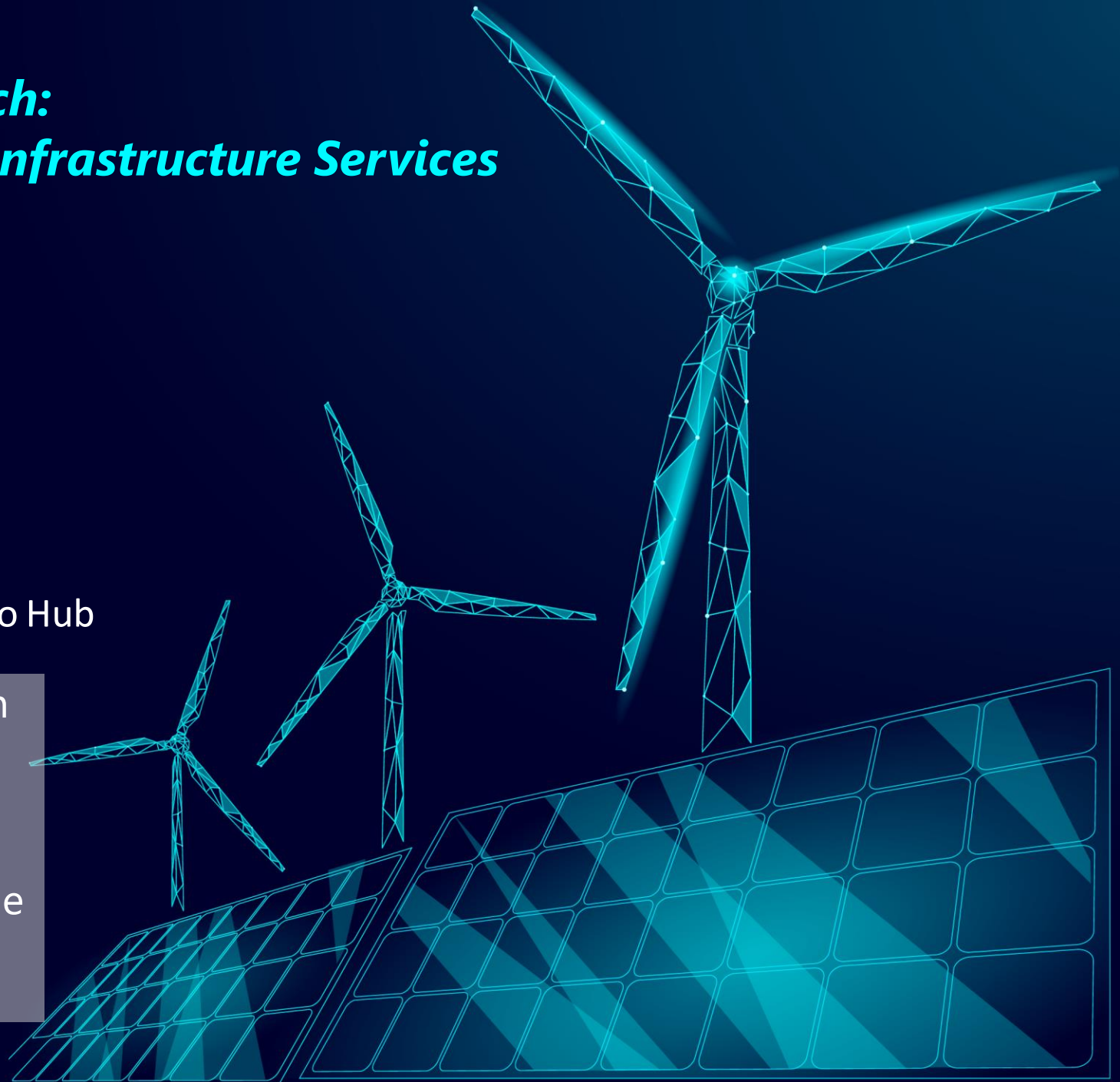
Ways Forward For A Resilient Electric Cooperatives

Revisiting the NEA standards on:

- Equipment and materials
  (starting with the poles as the main support structure of the distribution lines)
- Quality Control of equipment and materials
- Construction of distribution systems
- Maintenance of distribution systems
- Initial Discussion On Parametric Insurance

End of Presentation

World Bank Group Report Launch: Financial Protection of Critical Infrastructure Services

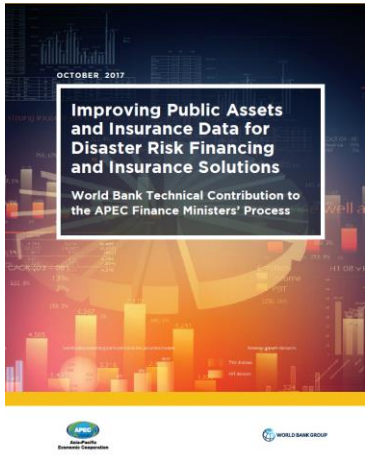


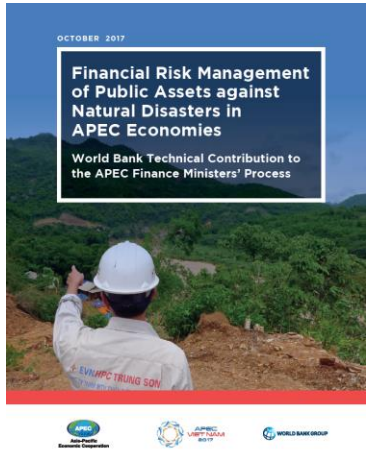
Questions and Answer

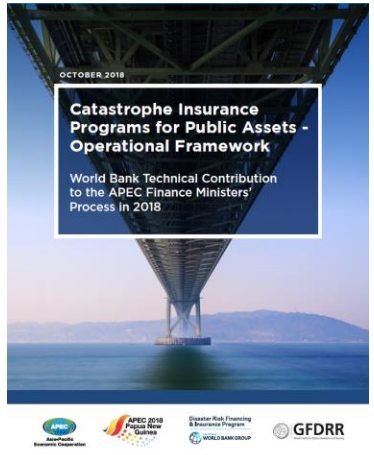
Moderator: Ms. Shoko Takemoto,
World Bank Disaster Risk Management Tokyo Hub

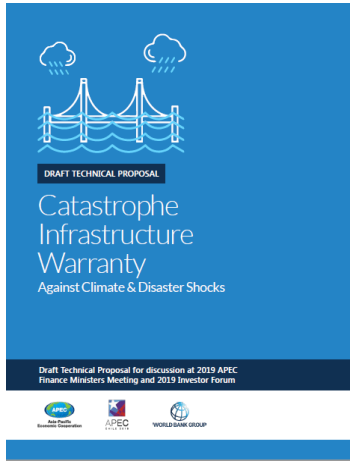
- Please submit your questions through the Q&A panel throughout the session.
- Please select "All Panelist" when submitting your questions through the Q&A panel and indicate to which speaker the question is for.

Staying engaged









2017
APEC experience and underlying fundamentals

2018
Operational Framework for protecting assets

2019
Proposed financial product to embed resilience and risk finance

2020
Protecting critical infrastructure services

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World Bank Group
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