Belmont Forum Collaborative Research Action Scoping Workshop
Florence (Italy), 5-7 June 2017

PERIPERI U (2006-2017): A Collaborative Programme in Capacity Development in Disaster Risk Reduction – Through African Universities

Djillali BENOUAR

PERIPERI U Partner

IRDR SC Member

IRDR ICoE
Integrated Research on Disaster Risk
International Centre of Excellence

PERIPERI U
PARTNERS ENHANCING RESILIENCE FOR PEOPLE EXPOSED TO RISKS

USAID
FROM THE AMERICAN PEOPLE

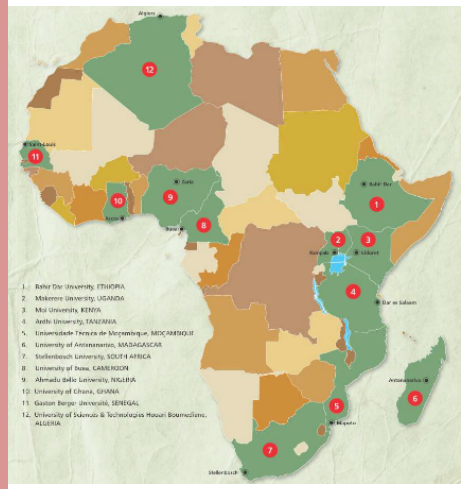
Periperi U

PERIPERI U | PARTNERS ENHANCING RESILIENCE FOR PEOPLE EXPOSED TO RISKS

Conceptualised *within Africa* in early 2000s, then incubated & grown purposefully > 2006.

Now an agile, fully operational univ. architecture for DR capacity building for **integrated disaster risk *research* AND DRM *practice*.**

12 univs, 185 staff, eight languages.



A Transboundary Partnership of African HEIs

Demonstrable expertise in *DR curricula integration* across multiple disciplines ➡ surge in (sub)national DR research capability.

28 DR-related academic progs & modules since 2005

+/- 1,000 students registered (2017),

87 short courses that reached 2,400 people (2011/16).

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http://www.riskreductionafrica.org

dbenouar@gmail.com

What Innovations Make Periperi U Work?

An HEI partnership that is transboundary and cross-disciplinary.

A deliberately incremental approach.

Flexibility in curriculum design.

Multiple mutually reinforcing interventions.

What Would Make it More Effective?

Innovative approaches to student funding

Internship and placement opportunities

Nationally and locally commissioned research

A ‘re-think’ on international technical assistance

THANK YOU

www.riskreductionafrica.org

Current Challenges on Disaster Risk Reduction

Scoping meeting CRA
Disaster Risk Reduction and Resilience – DR3

The Belmont Forum

Florence, Italy, 5-7 June 2017

Sálvano Briceño
Science Committee
Integrated Research on Disaster Risk (IRDR) of ICSU/ISSC/UNISDR
Former Director UNISDR (2001-2011)

www.irdrinternational.org, www.preventionweb.net

What is Disaster Risk Reduction (DRR)?

- A conceptual framework consisting of ways and means:
  - To minimize disaster risks (hence, loss of lives, livelihoods and property) by reducing the degree of vulnerability and increasing resilience capacity
  - To avoid (**prevention**) or to limit (**mitigation** and **preparedness**) the adverse impacts of natural phenomena, as an essential requirement for sustainable development

Natural hazard + Exposure **X** Vulnerability - Capacity **=** Disaster Risk

Global Trends - Disasters are NOT natural

Greater exposure to natural and human-induced hazards, climate change and variability

Socio-economic: poverty & unsustainable development styles, unplanned urban growth and migrations, lack of risk awareness & risk governance institutions & accountability...

Physical: insufficient land use planning and safety awareness, housing & critical infrastructure in hazard prone areas...

Ecosystem & natural resource depletion (coastal, - coral reefs, mangroves…-; mountains; watersheds; wetlands; forests…)

"Quote from the 2015 UN Global Assessment Report on Disaster Risk Reduction (by UNISDR)"

- "Managing risk, rather than managing disasters as indicators of unmanaged risk, now has to become inherent to the art of development; not an add-on to development, but a set of practices embedded in its very DNA. Managing the risks inherent in social and economic activity requires a combination of three approaches:

  - 1. **Prospective risk management**, which aims to avoid the accumulation of new risks;
  - 2. **Corrective risk management**, which seeks to reduce existing risks;
  - 3. **Compensatory risk management** to support the resilience of individuals and societies in the face of residual risk that cannot be effectively reduced.

Priority issues for policy action and scientific research…

- *2015 Sendai Framework for Disaster Risk Reduction* - SFDRR provides **general guidelines**, which require setting priorities…
- **Identifying priorities,** different in each nation and community but they have to be clearly identified for greater effectiveness…
- A general priority is ***balancing implementation pace with accelerating need*,** given the rapid increase of vulnerability…
- Giving higher priority does not always mean allocating more resources but rather ***doing things differently*** (a paradigm shift, i.e., integrating risk considerations, awareness-raising, education…)
- **Reducing vulnerability is a task for each sector** and policy needs to recognize and facilitate this (agriculture, health, education, energy, environment, tourism…) and at all levels (local to int'l)

Priority issues for policy action and scientific research

- Develop further SFDRR **targets and indicators** for sectors and levels for measuring and assessing progress

- **Governance** focusing on reducing risk and vulnerability, from local to international, ensuring the paradigm shift, separating it from the emergency management, important but different…

- **Awareness-raising** and education intensive efforts with involvement of leaders (high level authorities, private sector, NGOs, communities) at all levels, in particular for **building safety** for homes, schools, hospitals, critical infrastructure**…**

- DRR an essential requirement for various sustainable development goals **- SDGs**…

- DRR as key **first step for climate change adaptation** and main purpose of mitigation – 2015 Paris Agreement…

- Hazard risk reduction recognized as essential **ecosystem service** by environmental policies and legislation

Priority issues for policy action and scientific research…

- **Ethical perspective** of risk reduction, rights-based approach, equity & poverty reduction, accountability & transparency for disaster losses & impacts, participatory and democratic approaches, decentralisation, community engagement…

- Identifying **obstacles to DRR (cultural, economic, political, etc.)** is essential to avoid turning in circles and rehashing mistakes…

- Obstacles are difficult to address as they usually respond to specific interests, hence the **need to be strategic** and in the case of DRR, very patient as we are dealing with obstacles that have existed for centuries…

- E.g., the term **"natural" disasters**, which has traditionally enhanced the perception that these disasters are either acts of god or nature, hence little we can do about them, which in turn suits very well narrow minded or incompetent authorities who prefer to blame god or nature…

谢谢

THANK YOU

www.irdrinternational.org

www.preventionweb.net

www.unisdr.org

www.gfdrr.org

www.globalnetwork-dr.org

The vision of disaster risk reduction:

building resilience into sustainable development

The six principles of sustainability

www.colorado.edu/hazards/publications/informer/infrmr3/informer3c.htm

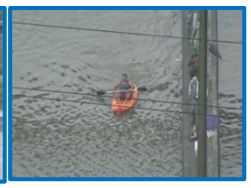
Natural Disasters in Brazil: over 95% of disasters are climate-related


Forest fires, Floods, **Drought**, Mass Moviments


Droughts, Floods, **Flash Floods**

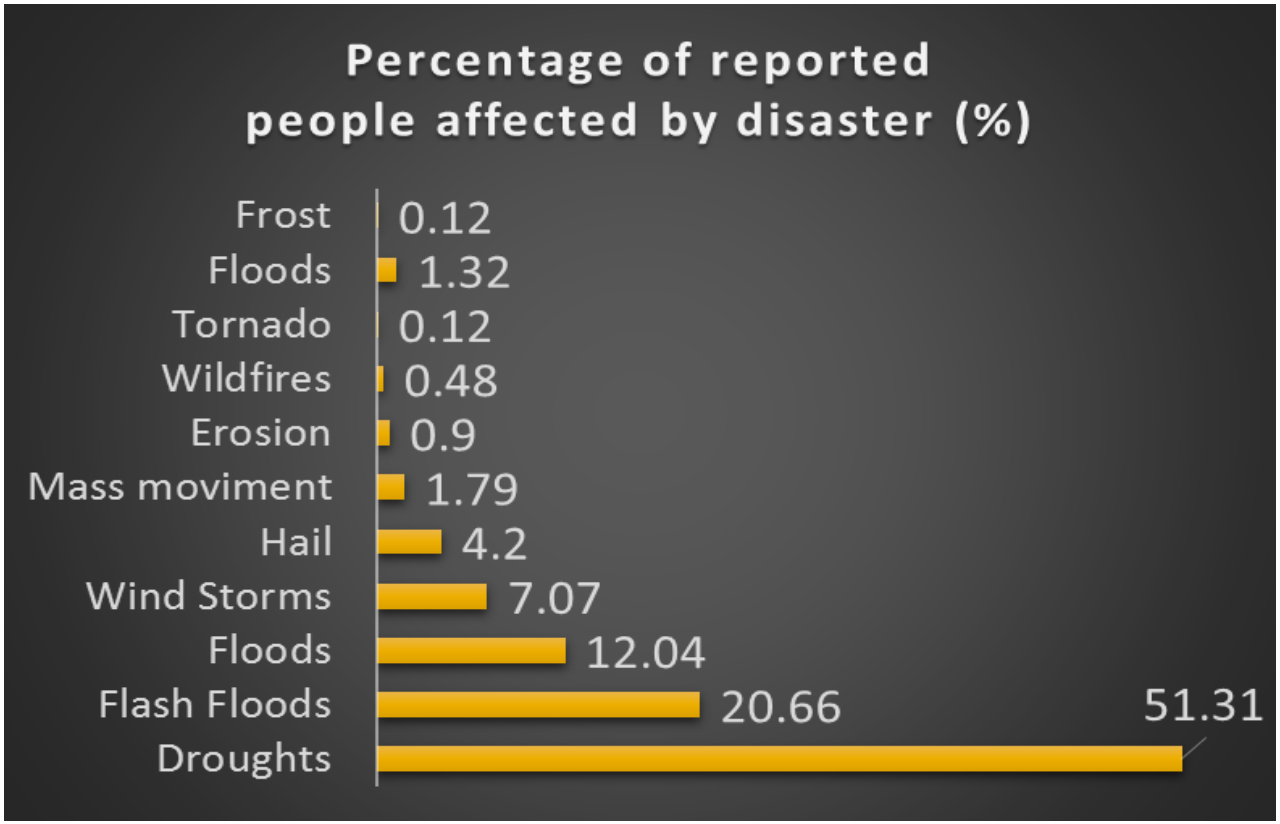

Wildfires, Floods, Erosions


Wildfires, **Flash Floods**, Floods, **Droughts**, **Landslides**

Flash Floods, Wind Storms, Hails, **Landslides**

Natural Disasters in Brazil



Landslides and flash floods cause over 90% of fatalities!

Source: Brazilian Atlas of Natural Disasters 1991-2012

Post-2011 DRR Policy in Brazil: A Paradigm Shift
National Plan for Risk Management and Response to Disasters

Relief and recovery

Prevention

Building structural resilience (slope, stabilization, drainage and flood control)

Response

Mapping and understanding risk

High resolution mapping of risk areas for 1000 municipalities

Monitoring and warning

Strengthening early warning networks

(e.g., 4 thousand automated raingauges, 9 weather radars, 300 riverflow sensors, data integrations, modeling, hazard prediction, etc.)

STRATEGY OF THE PLAN

1.KNOWLEDGMENT

Data base data sharing and Research

2. MONITORING SYSTEM AND EARLY WARNING

Increase of the observational network

3. NATIONAL TASK FORCE
Multidiciplinary team

Atividade adotada pelo Brasil

4. INFORMATION AND COMUNICATION

5. CAPACITY BUILDING

Development of the capacity to act at all levels (federal, state and municipality)

Cemaden
Centro Nacional de Monitoramento e Alertas de Desastres Naturais

FAPESP

CEMADEN – National Early Warning and Monitoring Centre of Natural Disaster

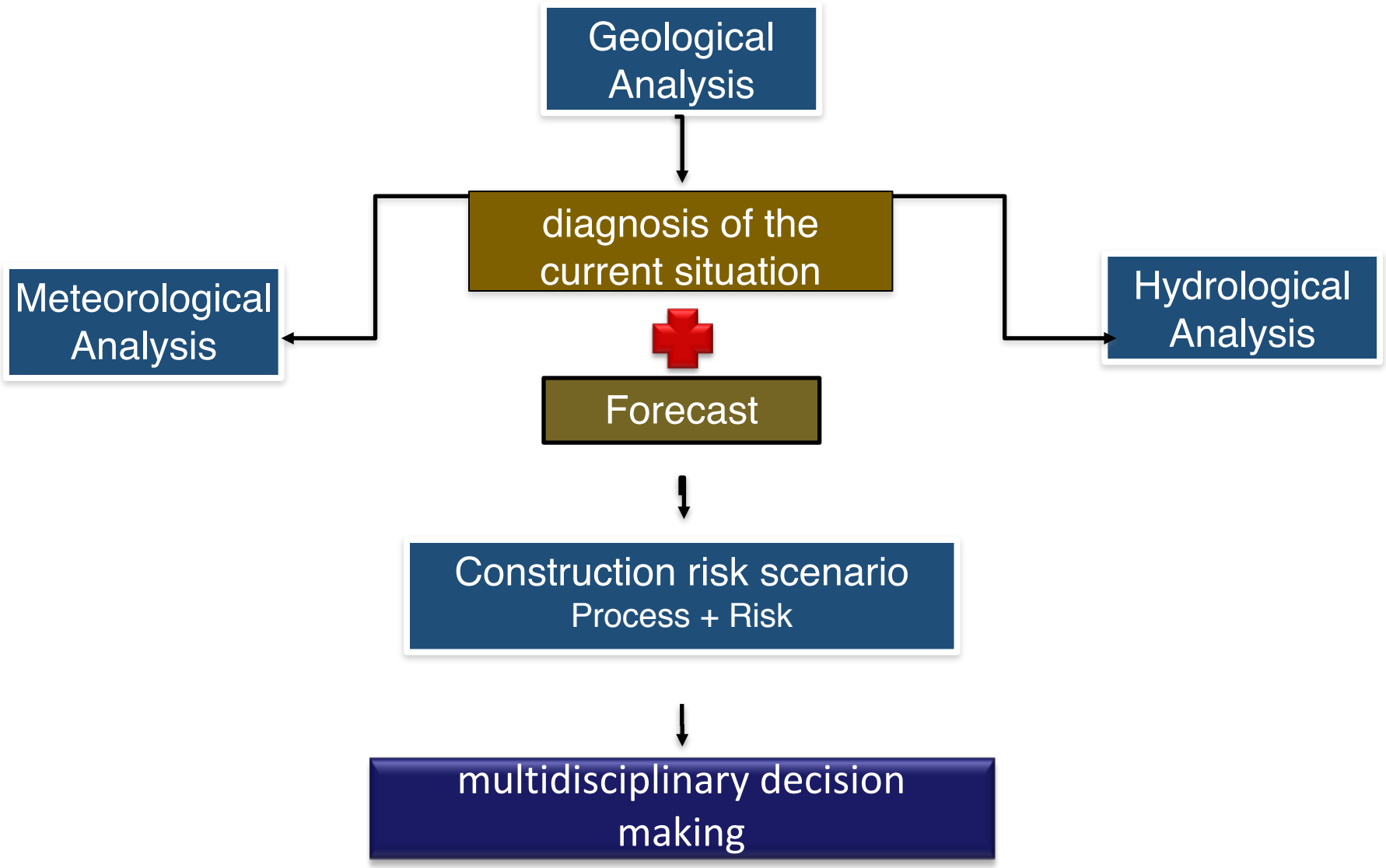
Created at July 2011

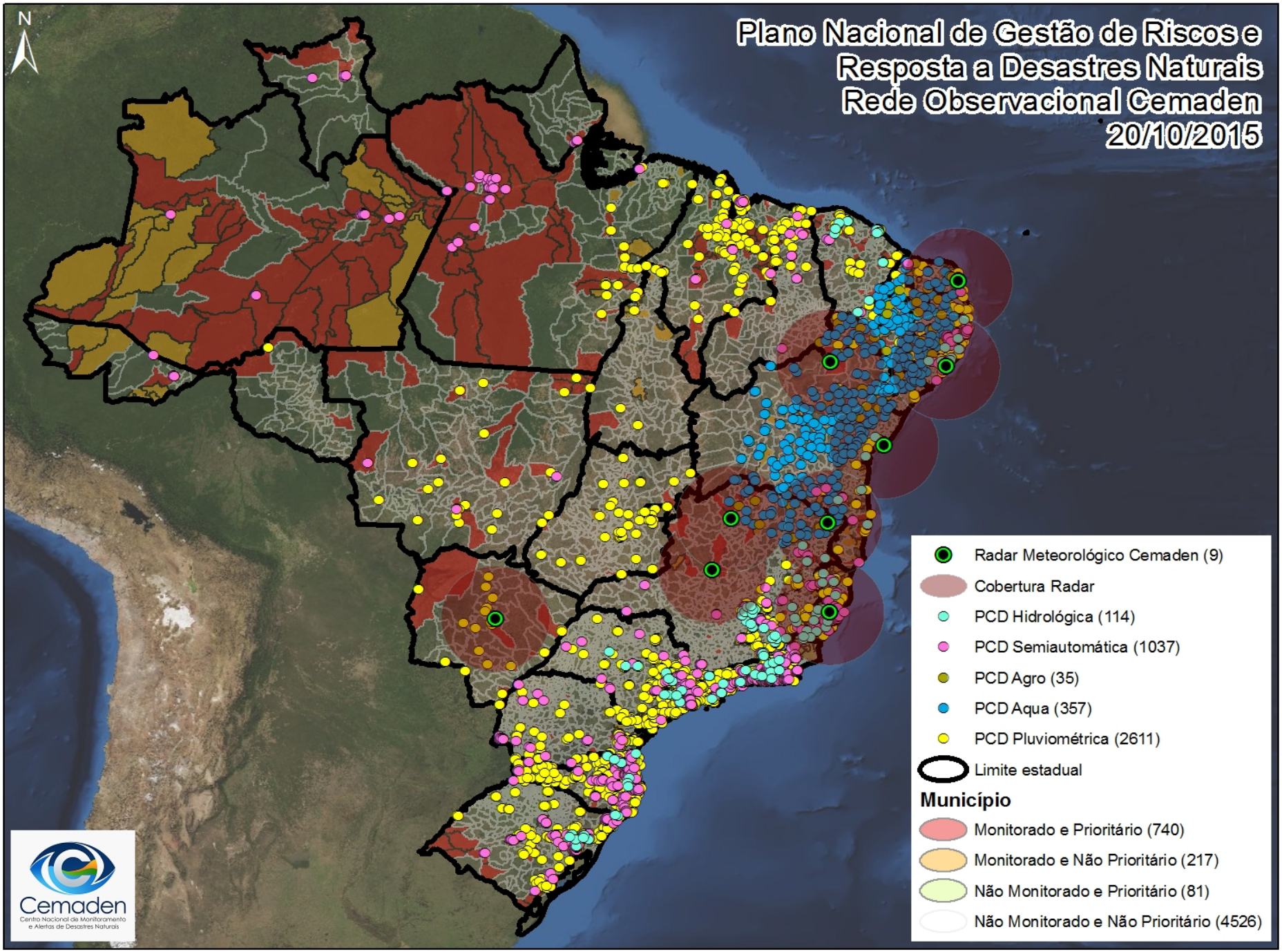
MISSION: develop, test and deploy a police forecasting system of natural disasters in vulnerable areas throughout Brazil.

As CEMADEN works

- Operating since December 2011
- Full monitoring regime (24 x 7)
- nearly 1000 cities monitored
- more than 7,000 warnings already issued

PROCEDURES TO WARNING EMISSION

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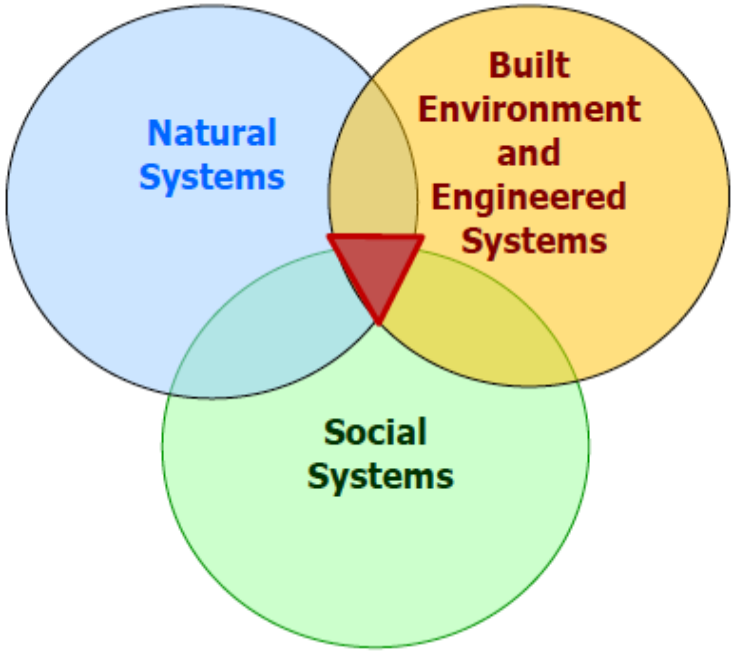
Plano Nacional de Gestão de Riscos e Resposta a Desastres Naturais
Rede Observacional Cemaden
20/10/2015
Radar Meteorológico Cemaden (9)
Cobertura Radar
PCD Hidrológica (114)
PCD Semiautomática (1037)
PCD Agro (35)
PCD Aqua (357)
PCD Pluviométrica (2611)
Limite estadual
Município
Monitorado e Prioritário (740)
Monitorado e Não Prioritário (217)
Não Monitorado e Prioritário (81)
Não Monitorado e Não Prioritário (4526)
Cemaden
Centro Nacional de Monitoramento e Alertas de Desastres Naturais

From a classical scientific point of view

- Where is each type of hazard likely to be presented and why?
- What scientific principles govern the process responsible for the disaster?
- How often do these hazards develop into disasters?
- How can each type of disaster be predicted and/or mitigated?

But .....



Disasters are complex problems
Requires integrated knowledge and understanding Holistic view

- Threats to local communities, national security
- Consequences amplified by unsustainable development
- Variability in exposure and vulnerability of communities and assets

We consider that, at least, four themes should be included in the DR^3

- **DROUGHT, DESERTIFICATION, SAFETY (FOOD, WATER, ENERGY), ECOSYSTEM SERVICES AND RESILIENCE**
- **MANAGEMENT OF NATURAL DISASTER RISK IN URBAN AREAS**
- **RISK ASSESSMENTS AND MODELING OF NATURAL DISASTERS**
- **DISASTERS, SCIENCE AND PUBLIC POLICIES**

co-designing, co-working, co-implementing

Disasters, Science and Public Policies

From a social science perspective, the concept of disaster implies a combination of social, political and cultural dynamics, and their occurrence mirrors interactions between ecosystems and social groups.

The application of this concept emphasizes that a disaster is not an isolated event in time and space. On the contrary, disaster is understood as a process that unfolds over time, affecting humans and nature in a spatial dimension much larger than the specific location of the critical event.

Socio-environmental disasters can be said to spark public debate and interest in science, both related to how the disaster happened and to how it can be mitigated. Brazil, for example, has suffered many socio-environmental disasters recently, including deaths related to heavy rains in Rio de Janeiro and the mining-related disaster in Mariana, Minas Gerais.

These disasters help to jump-start investments in Science (creating institutions such as CEMADEN) and research agendas around topics such as extreme events, climate change and adaptive capacity, as well as the damage to the Rio Doce basin and how to recuperate it. There is a need to develop a more nuanced and complex understanding of those interrelationships. Research that sheds light on how and to what extent disasters influence science and public perceptions and attitudes around it, and how these interactions help to harness science and technology to better address disasters in light of public worries and doubts would be particular interest.

Disasters, Science and Public Policies

- The role of education as a key element of increased resilience to natural disasters
- Communicating risk to policy and to society
- The use of mobile communications technology to increase resilience to natural disasters
- Socio-environmental disasters, science and the public
- Disaster risk governance and policies of vulnerability reduction
- Cost-benefit analysis of disaster risk reduction policies
- Human in the Loop of Managing Early Warning of Couple Dynamics and Risks with Poor Observations, Incomplete Understanding and Hybrid Modeling
- Production of Environmental Indicators on mapping vulnerabilities and impacts to reduce disaster risk

DROUGHT, DESERTIFICATION, SAFETY (FOOD, WATER, ENERGY), ECOSYSTEM SERVICES AND RESILIENCE

Many of the world's most vulnerable people live in arid and semiarid regions. Close to 1 billion people, among the poorest in the planet, live in regions characterized by recurrent hydric stress. Drylands occupy nearly half of Earth's land area and are home to a third of the human population. Drylands are highly vulnerable to increases in human pressures and climatic variability. In arid, semiarid regions as well as in drylands, water scarcity limits the production of crops, forage, wood, and other services ecosystems provide to humans. In this theme research project should brings out linkages between arid, semiarid regions, drylands, desertification and global climate change, biodiversity loss, and how different future development paths will affect these regions.

DROUGHT, DESERTIFICATION, FOOD, WATER, ENERGY SECURITY, ECOSYSTEM SERVICES AND RESILIENCE

- Integrated risk assessment and management of natural disasters on a changing climate
- Changing nature of climate extremes and risks to natural ecosystems (e.g., forest fires)
- Drought and desertification (including resilience, deforestation, fires, biodiversity conservation, water, energy and food security)
- Drought and Desertification: Threats to Water and Food Security
- Land degradation and Drought: Threats to Food Security
- Natural Disasters and Water security (or food)
- Climate Change-Drought and Food Security
- Modeling of soil water seepage and slope stability
- Nexus Food-Water-Energy Security in Brazil in the context of changes in climate and land-use;
- Climate Change extremes and Land Use Change in relation to land degradation and desertification processes in Semi-Arid regions of Brazil.

MANAGEMENT OF NATURAL DISASTER RISK IN URBAN AREAS

Increased urbanization and expansion of urban construction into hazardous areas, mainly in developing countries, have led to an escalating impact of landslides and flash floods. Landslides and flash floods are directly associated with loss of lives, property and infrastructure damage, and environmental destruction.

Understanding the multidimensional features of cities vulnerabilities is essential to find routes for disaster risk reduction. What are the root causes and dynamic pressures of vulnerability? How and to what extent, do vulnerabilities intertwine in the phases of anticipate, cope with and recover from harm?

Other important issue for this theme is that multi-hazards early warning systems (key recommendation in Sendai Framework) is poor addressed in scientific world. More studies are necessary in order to understanding the different characteristics of these types of EWS, as well as their needs of adaptation according to diverse social contexts of vulnerability.

Other important theme to be addressed is the development, integration and standardization of a database of natural disasters in order to generate information that allows for a broader understanding of the causative factors, the calculation of critical rainfall thresholds, and the magnitude and impact of natural disasters.

MANAGEMENT OF NATURAL DISASTER RISK IN URBAN AREAS

- Disaster risk management in urban areas (including resilience, landslide, flash floods, inundation, adaptability, ecosystem services)
- Qualitative and Quantitative Assessment of Vulnerability and risk to Disasters;
- Multi-hazards early warning systems
- Low cost monitoring systems for landslides
- Database modeling to manage landslides risk areas
- 3-D modeling and mapping of landslides hazard and risk areas

RISK ASSESSMENTS AND MODELING OF NATURAL DISASTERS

In recent years, there has been a growing recognition that disasters cannot be adequately handled withn the framework of conventional models (met/hydro/geo/economic).

On the other hand empirical, input-output, social accounting, and other types of models are based on a number of assumptions that are questionable in catastrophes. The problem can be redefined considering a series of challenges that disasters pose to conventional modeling: data availabitity; scope; broad influences; uncertainty; non-linearity, etc. In this theme research project should tackle these challenges in order to understand and prepare for future events.

The following proposed lines of research addresses one or more of the challenges noted above.

RISK ASSESSMENTS AND MODELING OF NATURAL DISASTERS

- Data assimilation and mathematical modeling of natural hazards of hydrometeorological origin such as landslides, floods and coastal storm surges and floods
- Disaster risk modelling
- Computational intelligence-based nowcasting systems to flash floods forecasts
- Critical environmental thresholds in the deflagration of landslides and the influence of anthropic factors
- Attribution of impacts and extremes for disaster risk reduction
- Impacts and extremes on hydrological cycle for water consumption and use in agriculture
- Vulnerability indicators and coastal community resilience
- Community vulnerability and resilience to natural disasters.
- Mapping risk and vulnerability

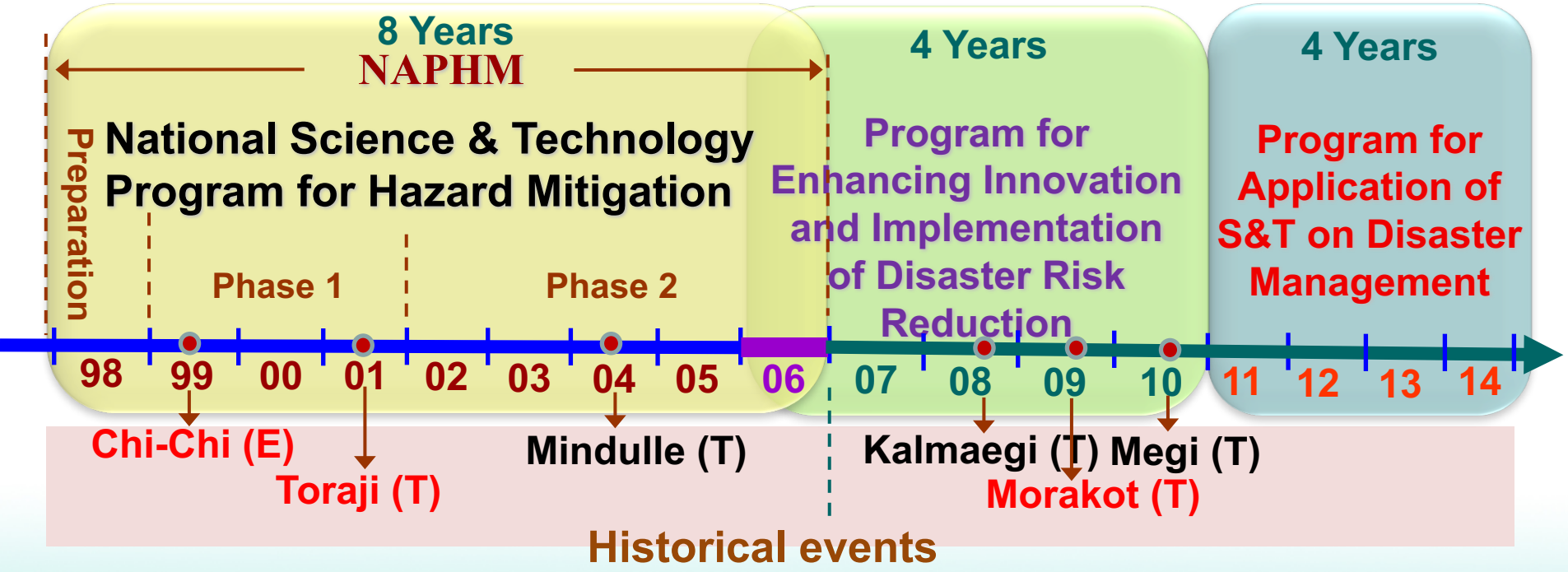
Institutional Implementation on Solution-based Disaster Risk Reduction

Dr. Shang-Hsien (Patrick) Hsieh
Executive Sectary
the Program on Applying Science and Technology for Disaster Reduction

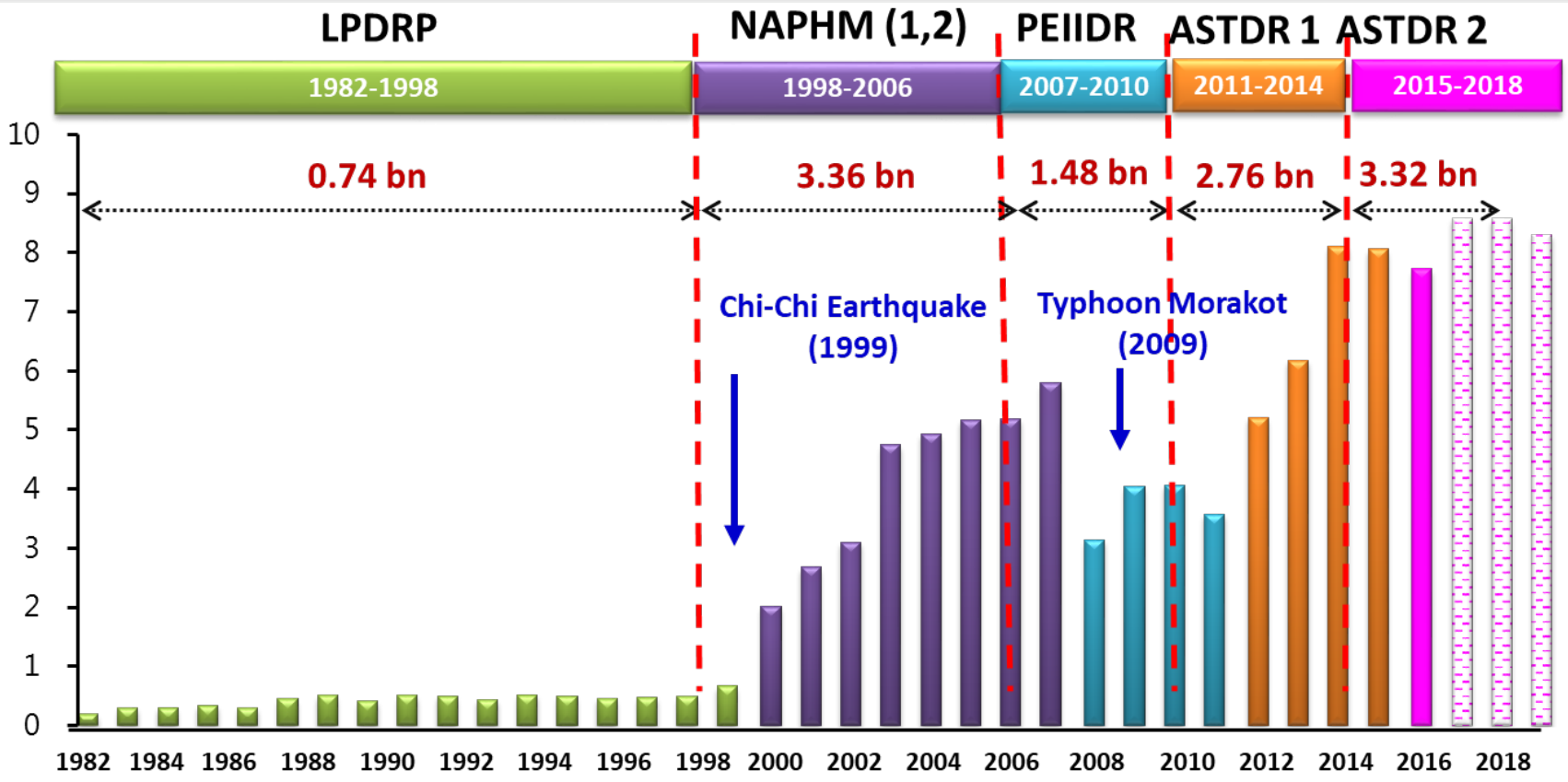
Institutional efforts on science-oriented disaster risk management

Key elements to follow

- Integrated research projects, but emphasize feasibility and practical implementation
- Inter- and intra-government partnership for topics design and implementation
- Always “Learn from Disasters !”



Continuous investments on DRR through launching research projects at national level



bn: billion NTD (NTD 1 bn = USD 32.26 M)

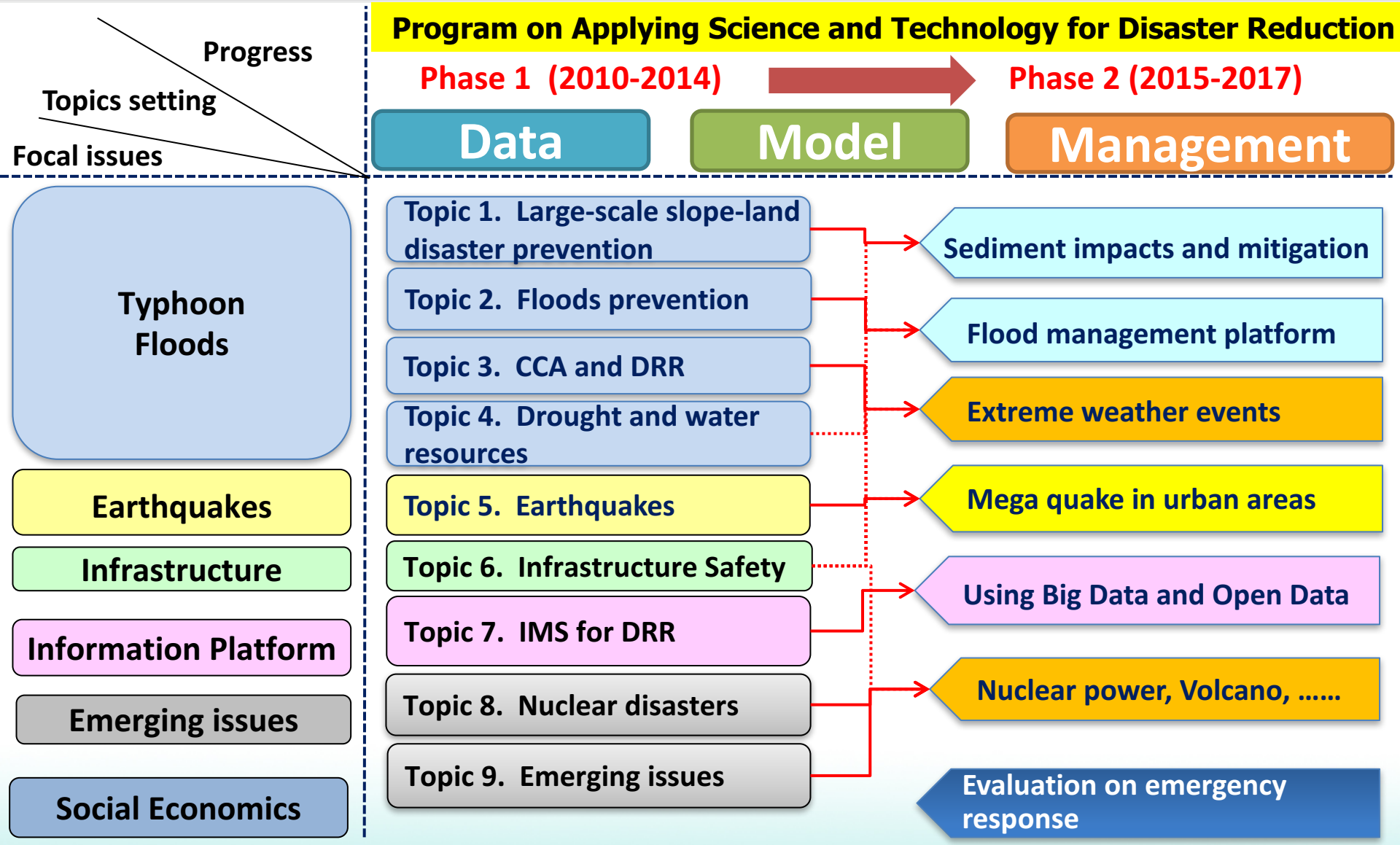
LPDRP: Large-scale Projects on Disaster Research Program

NAPHM: National Science and Technology Program for Hazard Mitigation

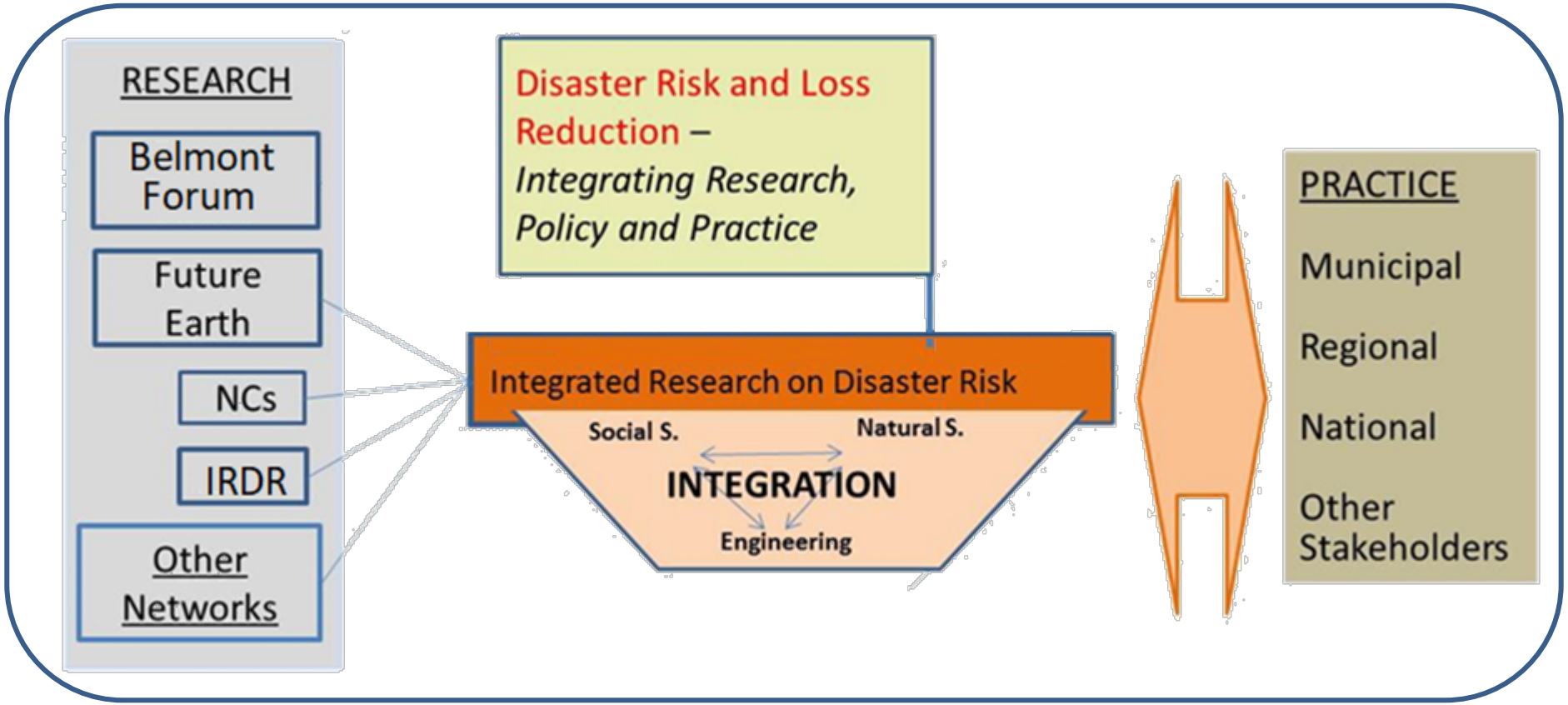
PEIIRD: Program for Enhancing Innovation and Implementation of Disaster Reduction

ASTDR: Program on Applying Science and Technology for Disaster Reduction

To identify solutions for focal topics through inventory check on demand and supply of DRR (on-going process)



DR3 Project Scope based on outcomes of all scientific research achievements



1. To integrate sciences;
2. To work with policy makers/practitioners;
3. To provide the vision as well as the practical steps to be followed;
4. To reduce loss.

To promote a regional collaboration on Disaster Risk Reduction and Resilience (DR3)

- **Goals setting:**
  - Reviewing regional and sub-regional plans of disaster management to understand the current status of physical and social vulnerabilities.
  - Hosting dialogues with representatives of local governments to find out gaps and demands on science-based disaster management.
  - Seeking trans-boundary comparisons with others and inter-disciplinary collaborations through Blemont Froum and relevant scientific programs.
- **Core spirits of the project**
  - Co-design , Co-work and Co-implement with local governments proposing their demands

Possible topics to cover for enhancing regional capacity building

1. Natural Disaster Risk Management
2. Technological Disaster Risk Management
3. Disaster Forensics and Impact Assessment
4. Enhancing Decision-Making of Disaster Risk Reduction through Application of Science and Technology
5. Promoting Public-Private Partnership for Societal Resilience
6. Reducing Disaster Risk in Urban Areas
7. Plans and Implementations of Post-Disaster Recovery

Thanks for your attention

Scheme of the Disaster Management Information Platform (DMIP)

Resources/ Participants

Research Models

Public Information

Display

- Data investigation
- Overlay mapping
- 2D、3D display

Data

- Achievements of the program
- Basic data, monitor data, and interpretation
- Results of model-integrated computing

Model

- Disaster potential scale
- Disaster simulation
- Disaster damage assessment
- Vulnerability assessment
- Damage and loss assessment

Management

- Data interpretation
- Climate index
- Water resources index
- Damage index of typhoon

High performance computing, high speed internet, massive storage, remote replication, communication and cooperation, and load balancing

Services

- Sharing achievements
- Providing map files
- Providing data
- Model-integrated computing
- Data display
- Remote replication

Application

- Large scale slope land
- Flood disaster
- Climate change
- Drought and water resources
- Earthquakes
- Disaster Management Information Platform

Users

Government authorities

- Emergency response platform
- Disaster reduction platform
- Communication and cooperation
- Research and development

Academic and research institutes

- Global science education
- Disaster prevention education
- Development of prediction models

DR3 theme 3 : Assessing the Current Landscape

Actions through co-designing, co-working and co-implementing among key stakeholders to build disaster resilience

Lessons learned from Great East Japan Earthquake in 2011

6 years experiences from 2011 to 2017

Restoration Process & Roles of Multi Stakeholders

June 6 2017

Mikiko Ishikawa, Prof. of Chuo university, Japan

Resilience

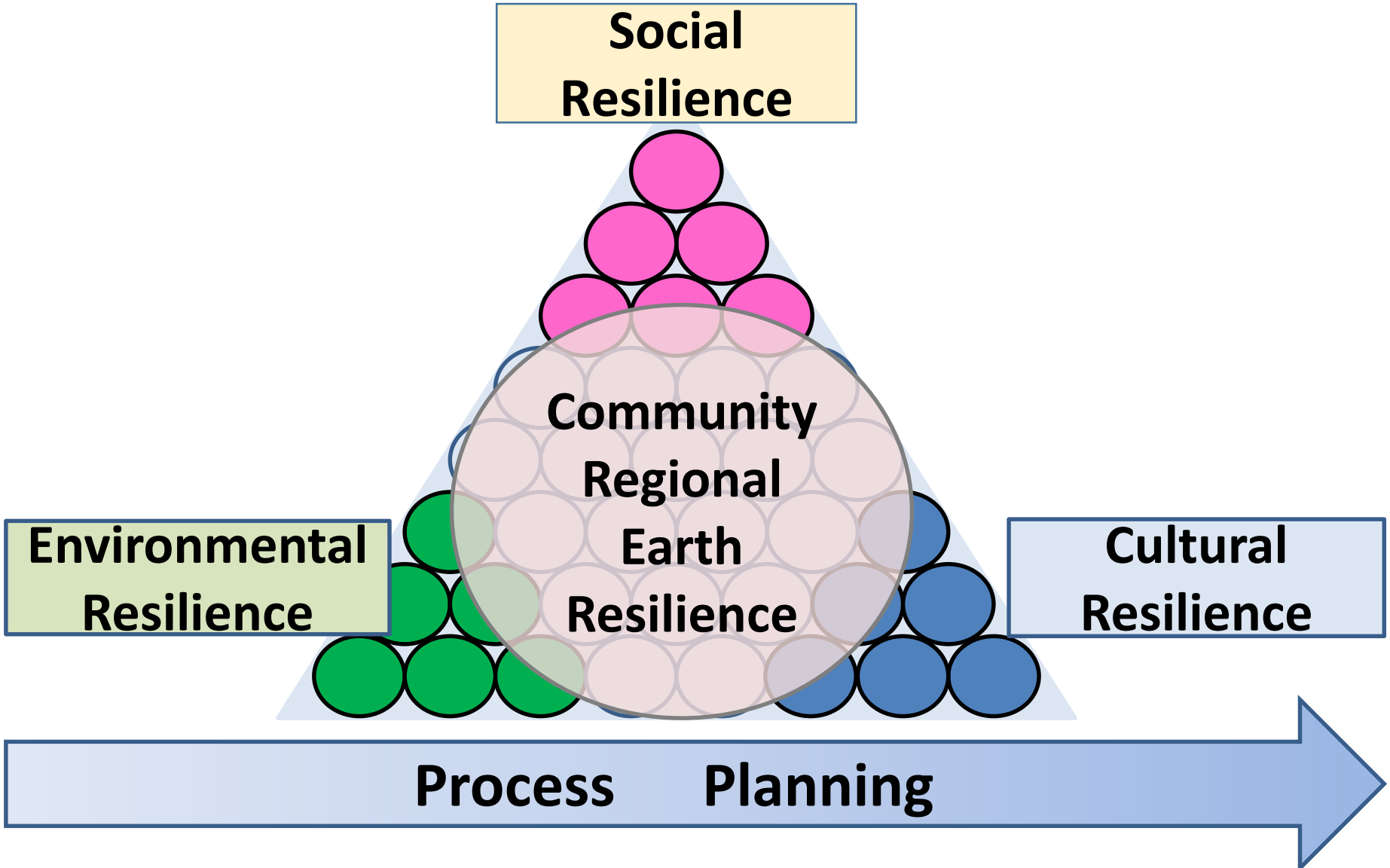
Resilience is defined as:

"The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions",

United Nations Office for Disaster RiskReduction (UNISDR),
"2009 UNISDR Terminology on Disaster Risk Reduction",
Geneva, May 2009 (http://www.unisdr. org/we/inform/terminology)

Assumption: Resilient Infrastructure

Learned from 6 years' experiences from Great East Japan Earthquake



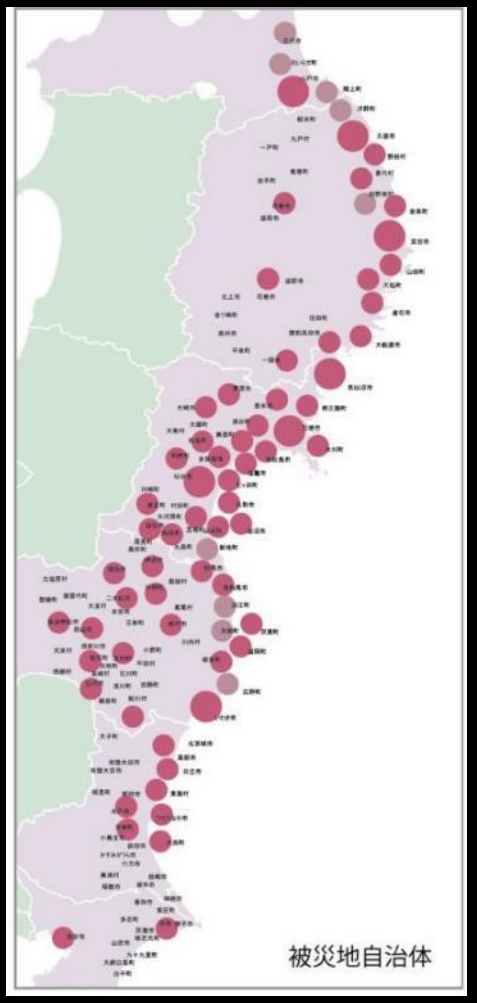
Great East Japan Earthquak in 2011

Great East Japan Earthquake

Date: March 11. 2011

dead 15,879
missing 2,712
Completely destroyed Houses
130,000
Partially destroyed Houses
265,000

Radiation Accident Fukushima



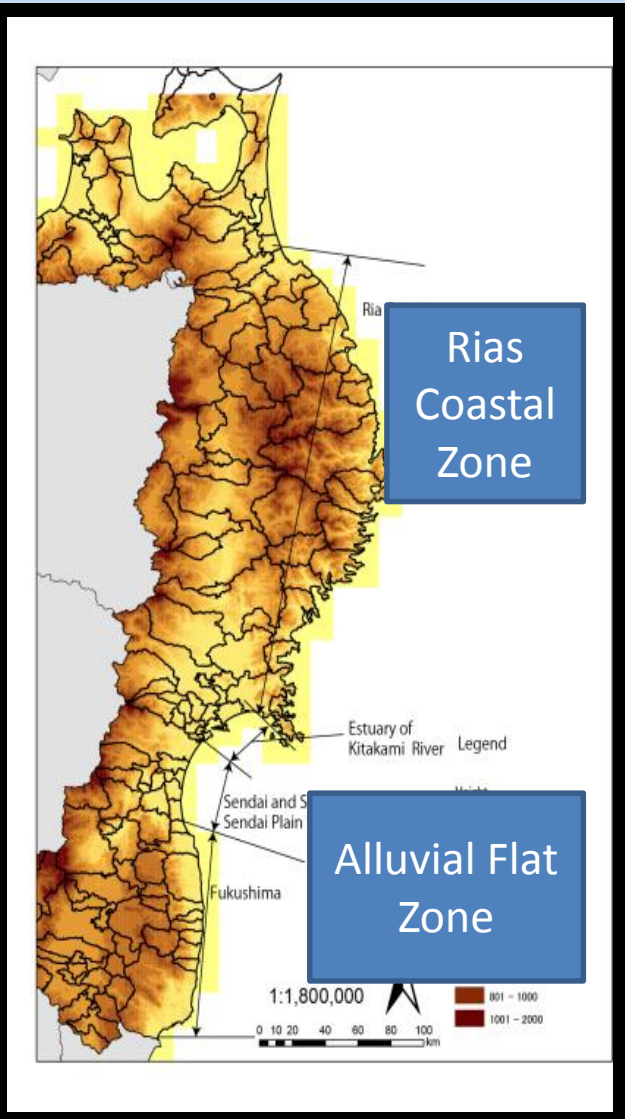
Many traditional Local Communities

For creating Resilient Infrastructure

We have to consider Structure & Diversity ,together.

Rias Coastal Zone

Hight of Tsunami
15-20 m
To escape to the higher land



Alluvial Flats Zone

There is no higher land to escape

Is it possible to find the safe place to live ?

Resilieint Infrastructure

Five components: Process Planning, Environmental Social, Cultural, and Community Resilience

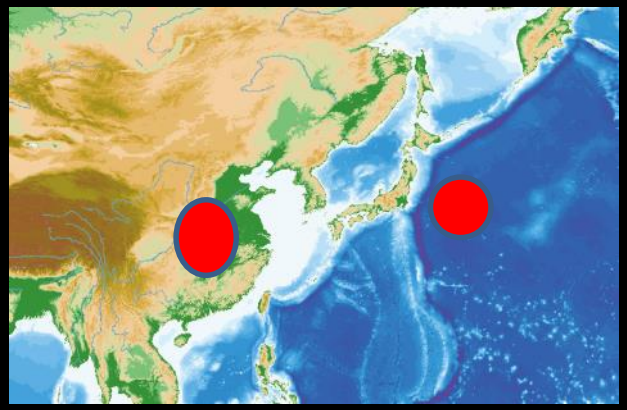
1. Process Planning

In order to recover from the huge hazards, Timely action, that means Process Planning, is essential to be introduced.

Immediate Action Example

Pairing Support

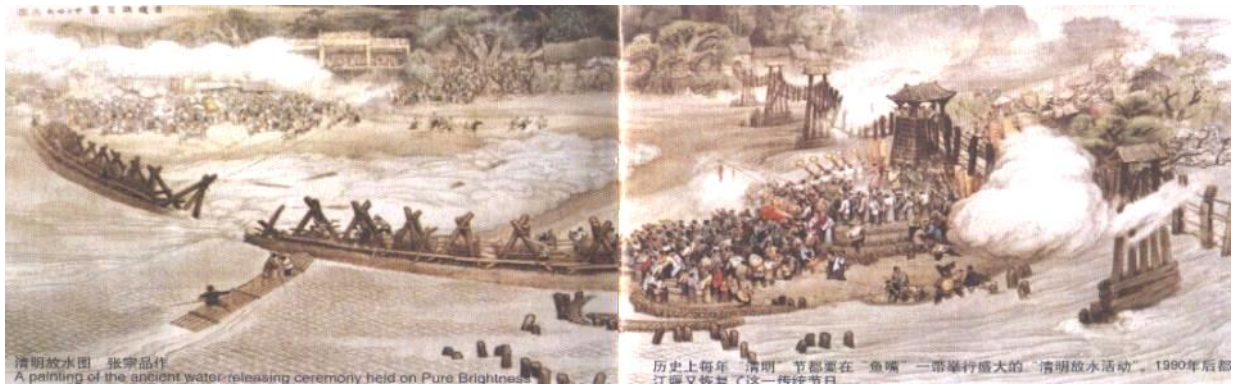
Introduced in Sichan Earthquake, and Great East Japan Earthquake



Different Stages of Restoration 2011-2017

Pairing Support in Sichuan Great Earth Quake in 2008

Since the damaged area was huge, Chinese Government ordered that un-damaged city should help the certain damaged city from the starting point of recovery to the restoration process. Same system had introduced in Great East Japan Earthquake.



Resilieint Infrastructure

Five components: Process Planning, Environmental Social, Cultural, and Community Resilience

2. Environmental Resilience

In order to absorb, and recover from the hazard effectively,

the basic structure and system of natural environment should be analyzed scientifically, and implemented based on the rational planning.

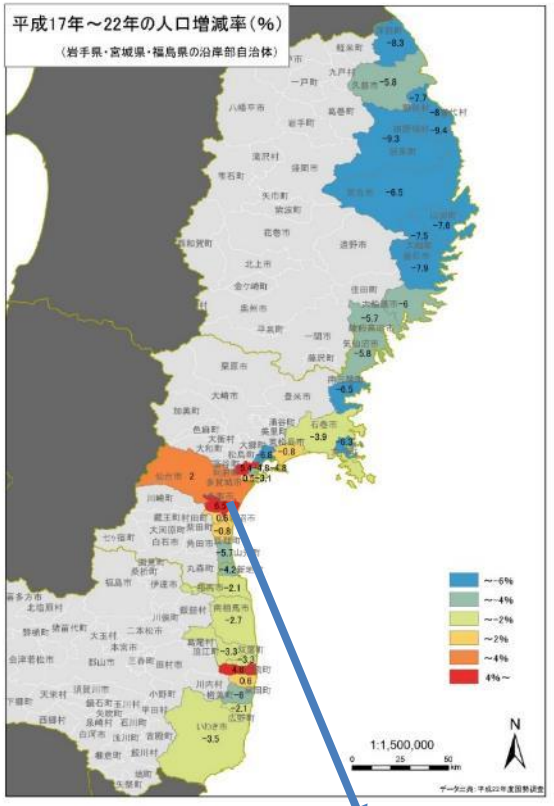
Case Study Area : Iwanuma City, Miyagi Pref. Japan

Population : 40,000, belong to Sendai Metropolitan Area

Problem : Alluvial Flats area

No higher land to escape

Population change ratio
(2005-2015)



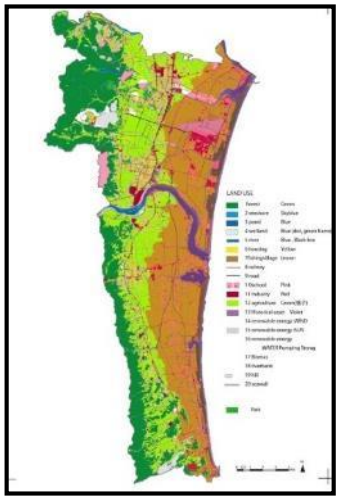
Iwanuma City

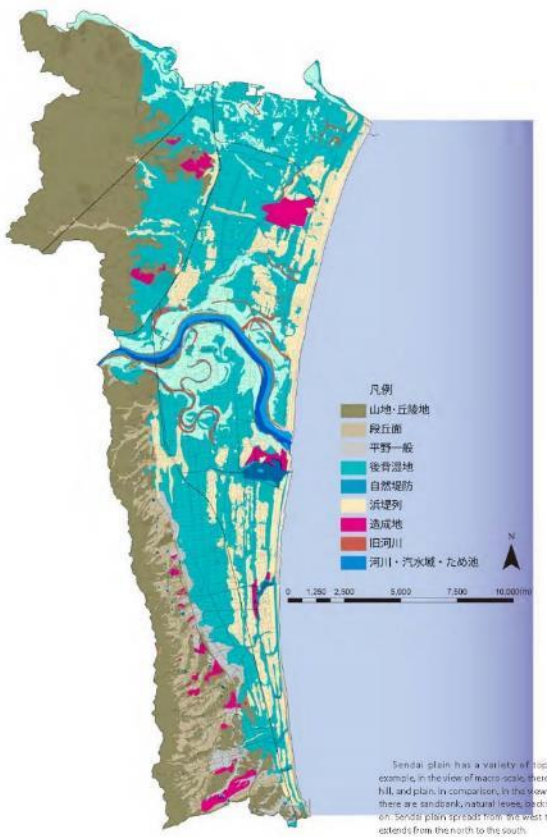
Comprehensive Survey, just after Tsunami, took place and found the place where some architectures and trees remained
(Role of University)

Findings
Micro Geography is the key factor to resist the power of Tsunami

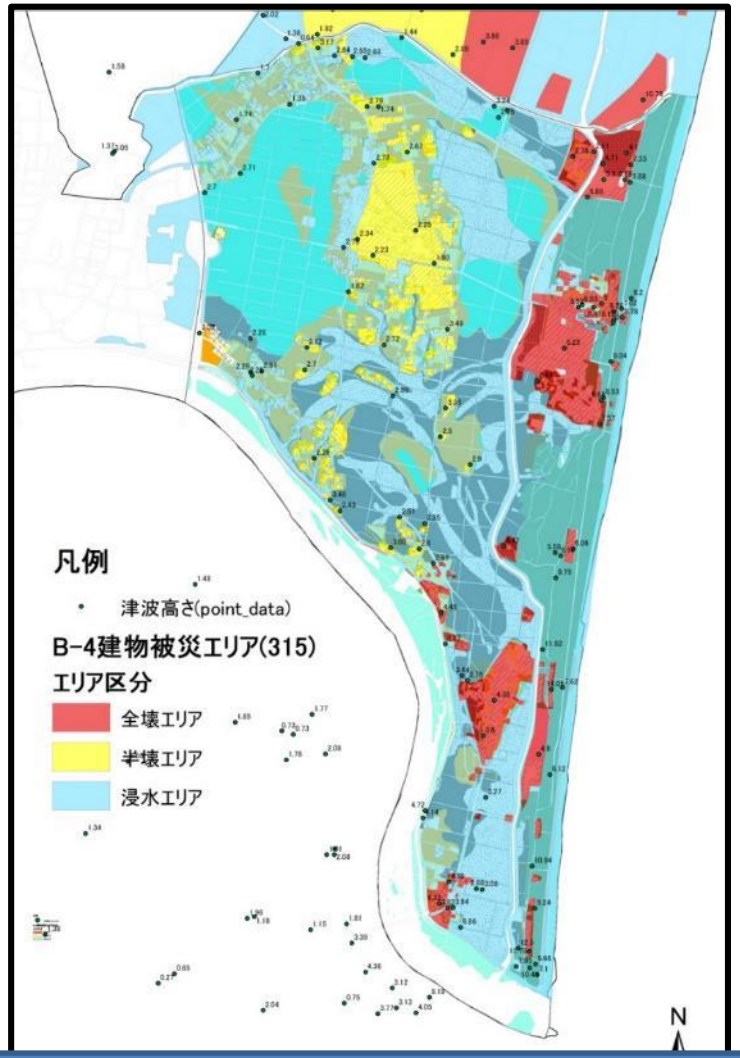
Analysis of Damaged Area of Tsunami

Micro Geography





Micro Geography



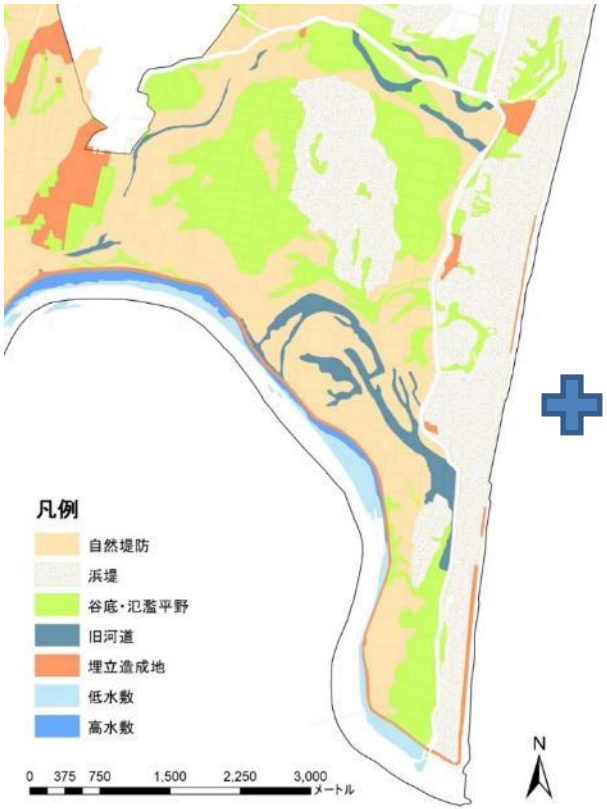
Relationship Between Micro Geography & Damage by Tsunami

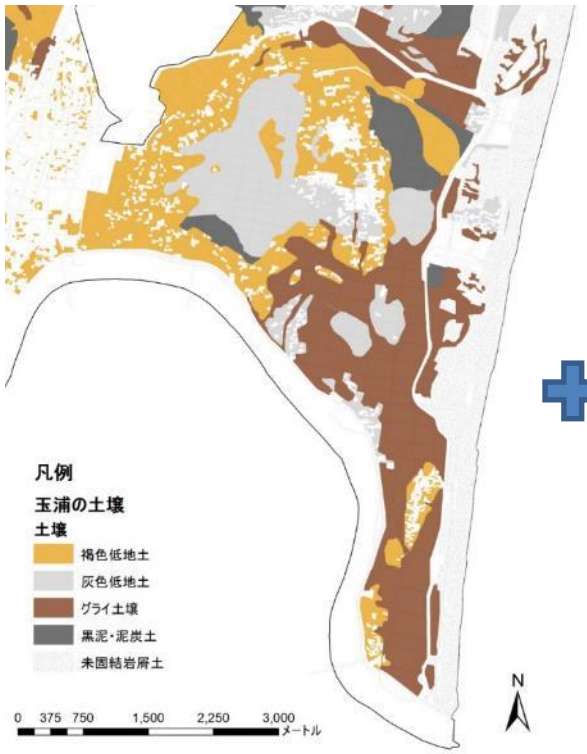
Based on the analysis of Damaged Area,Fundamental Natural Landscape Unit was identified
(Role of Planner)

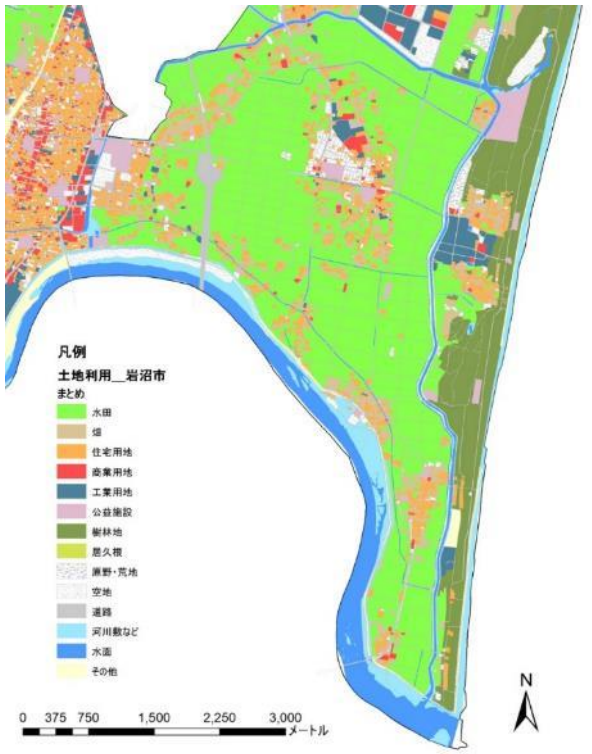
Geography

Soil

Vegetation

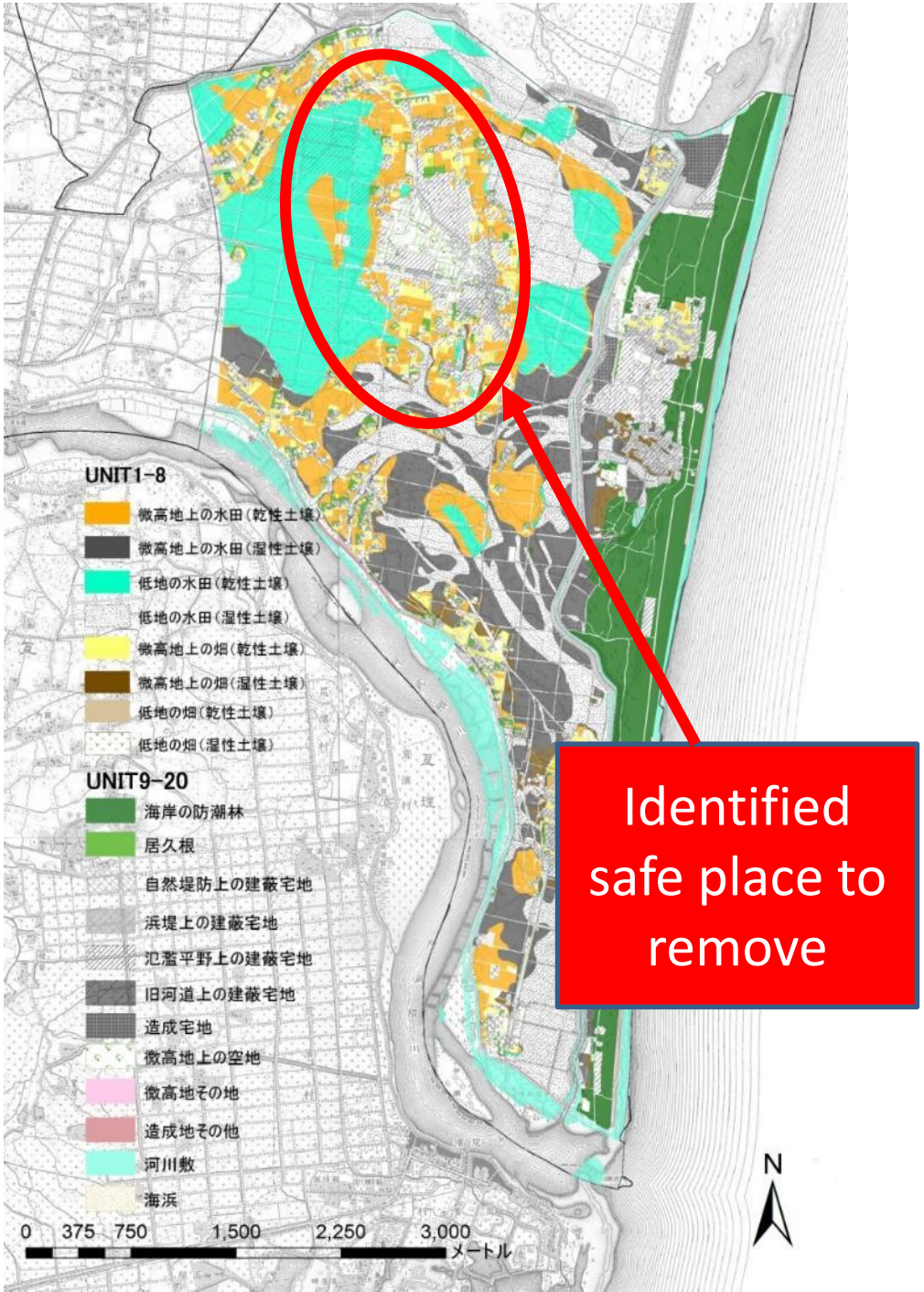






Natural Landscape Units

Fundamental Unit for the Restoration (Role of Planner)



Resilieint Infrastructure

Five components: Process Planning, Environmental Social, Cultural, and Community Resilience

3. Social Resilience

In order to proceed the restoration process for
creating safe living environment,
promoting economic activities,
timely decision making system is essential, and
various stakeholders have to work together

Social Resilience , Actions through co-designing, co-working and co-implementing among key stakeholders (Iwanuma City, Japan)

	Stage 1 Grand Design	Stage 2 Citizen Workshop	Stage 3 Formal committee	Stage 4 New Machizukuri
Period	April 2011-Sept.2011	Oct.2011-June 2012	June 2012-Nov.2013	Jan.2014-present
Leading Organization	Reconstruction Committee Chair: Academic Scholar	Citizen workshop Supported by university	Tamaura-Nishi Machizukuri Committee Appointed by City	Tamaura-Nishi Machizukuri created by survivors
Role of National Government	First Law for the Restoration Budget	Restoration Law established :National Level	Observer	Observer
Role of Miyagi Pref.	Restoration Plan	Restoration Plan established:Pref.Level	Observer	Observer
Role of Iwanuma City	Grand Design Committee	Restoration Plan Established:City Level	Leader	Observer
Role of Refugees	Representatives To Grand Design Committee	Everybody had a right to join workshop	Making Restoration Plan	Community Rebuilding Activities
Role of university	Leading role to create plan	Leading role for running workshop	Leader & Adviser	Collaborator
NPO	Various Activities	Join the workshop	Observer, Various Activities	Various Activities

Stage 1 Grand Design

<7 Goals for the Restoration >

1: To Setting up temporary houses as soon as possible for the survivors.

2: Finding a suitable location to for the re--establishment of the six villages

3: Revitalizing agriculture as a first priority

4: Create new employment using the advantages of the city's airport

5: Promote natural energy projects

6: Develop a system of multiple defense system against tsunami by creating a "Hill of Hopes for Thousand Years Hill of Hope" on coast

7: Revitalizinge the cultural landscape as the city's identity.

<Gendered Innovation>

1.Equal Representatives to the Reconstruction Committee

2.Promoting Small Agriculture by female as a first step.
This step became a break-through in revitalizing agriculture

Stage 1 : Small Agriculture for Tomatos

Stage 2 Free Workshops

Survey

Workshop : Discussion & Presentation

Stage 2 Free Workshops

Creative Activities For community Opening “Everybody’s House” July, 2013

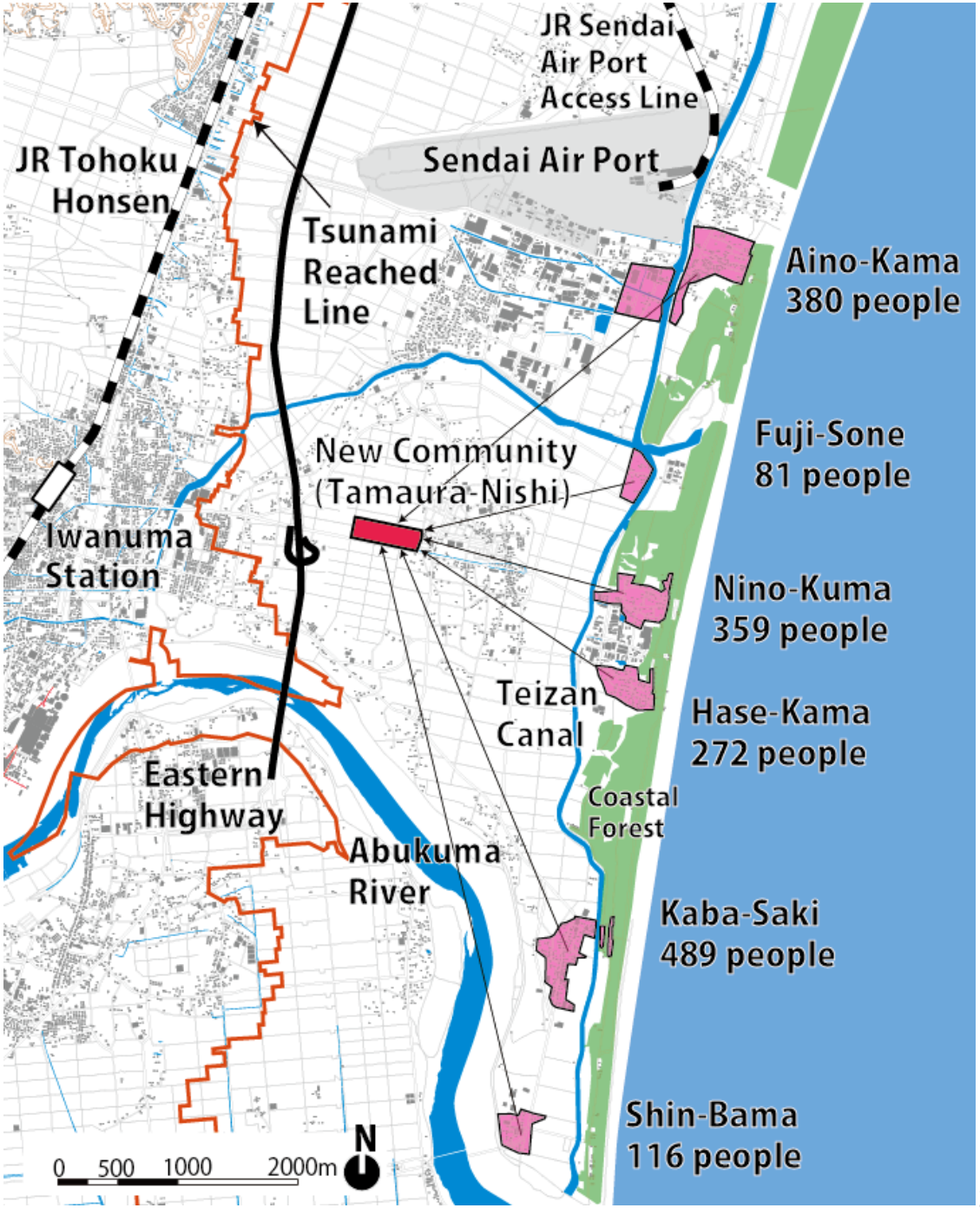
Small Agriculture

Meeting Place for children

Stage 3

Formal Committee & Creative Actions together with Survivors and Supporters

Compact City



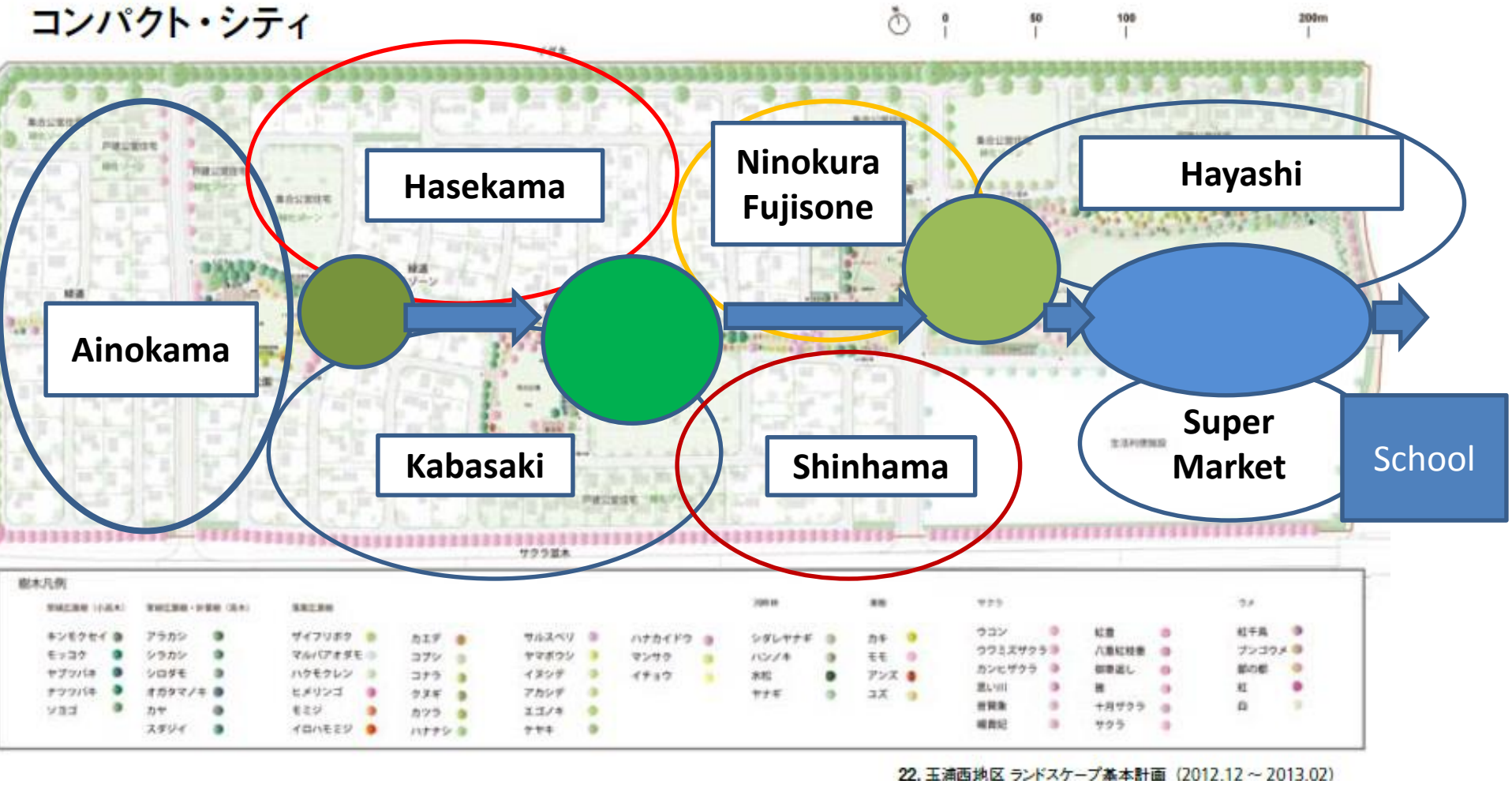
Original Restoration Plan proposed from Iwanuma City
June, 2012

Discussion
More than 300 times

Final Plan

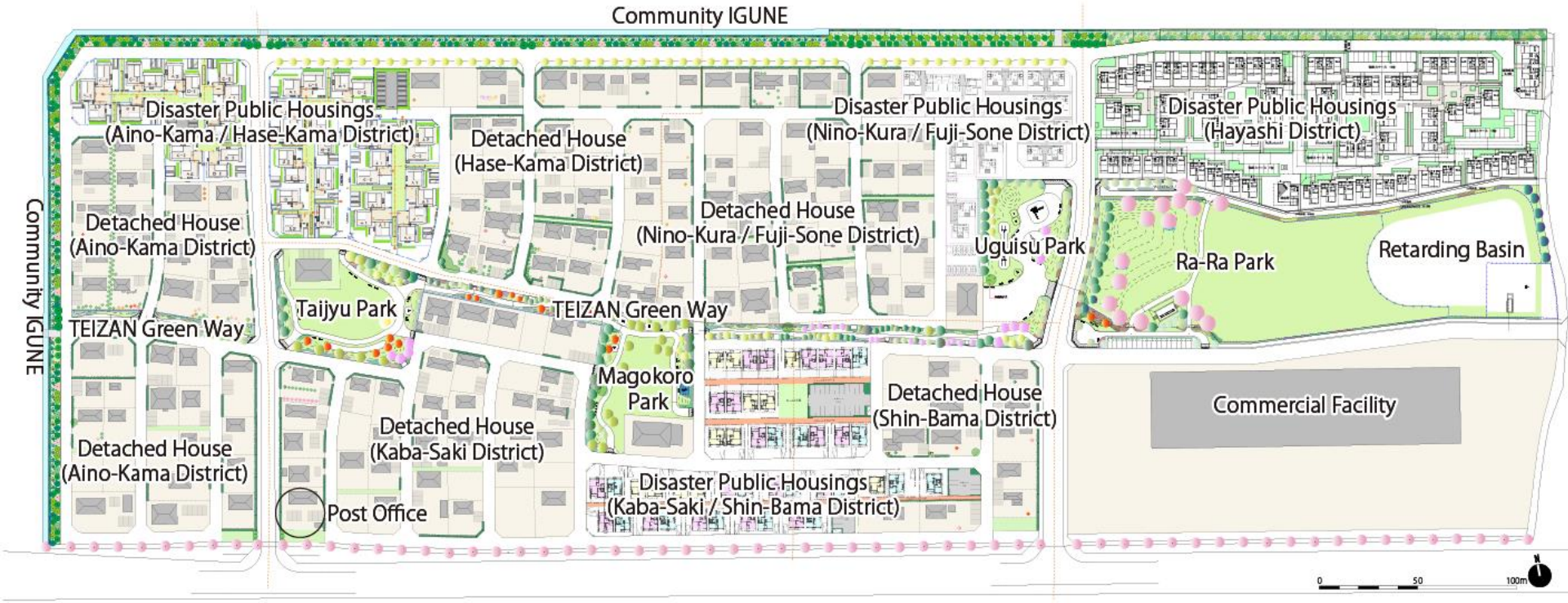
Together with Refugees, City, University, Supporters
（Nov. 20, 2013）

Keeping the tie of Community



22. 玉浦西地区 ランドスケープ基本計画（2012.12 ~ 2013.02）

Stage 4　New Machizukuri (Town Planning)
（Feb. 2014 ～）



Resilieint Infrastructure

Five components: Process Planning, Environmental Social, Cultural, and Community Resilience

4. Cultural Resilience

It is essential to find cultural structure of the place for achieving " Resilience".
Sometimes, it is difficult to find, especially when the site had completely destroyed. However, we have to continue to seek for, and should be implemented.

Finding
Cultural Landscape
Igune(Agricultural Forest)

Igune : Protect North-east Wind
Weaken the power of Tsunami

Scientific Research (History & Vegetation)

4 名取郡北方柳生村絵図
仙台市史『資料編4 近世3 村落』付録

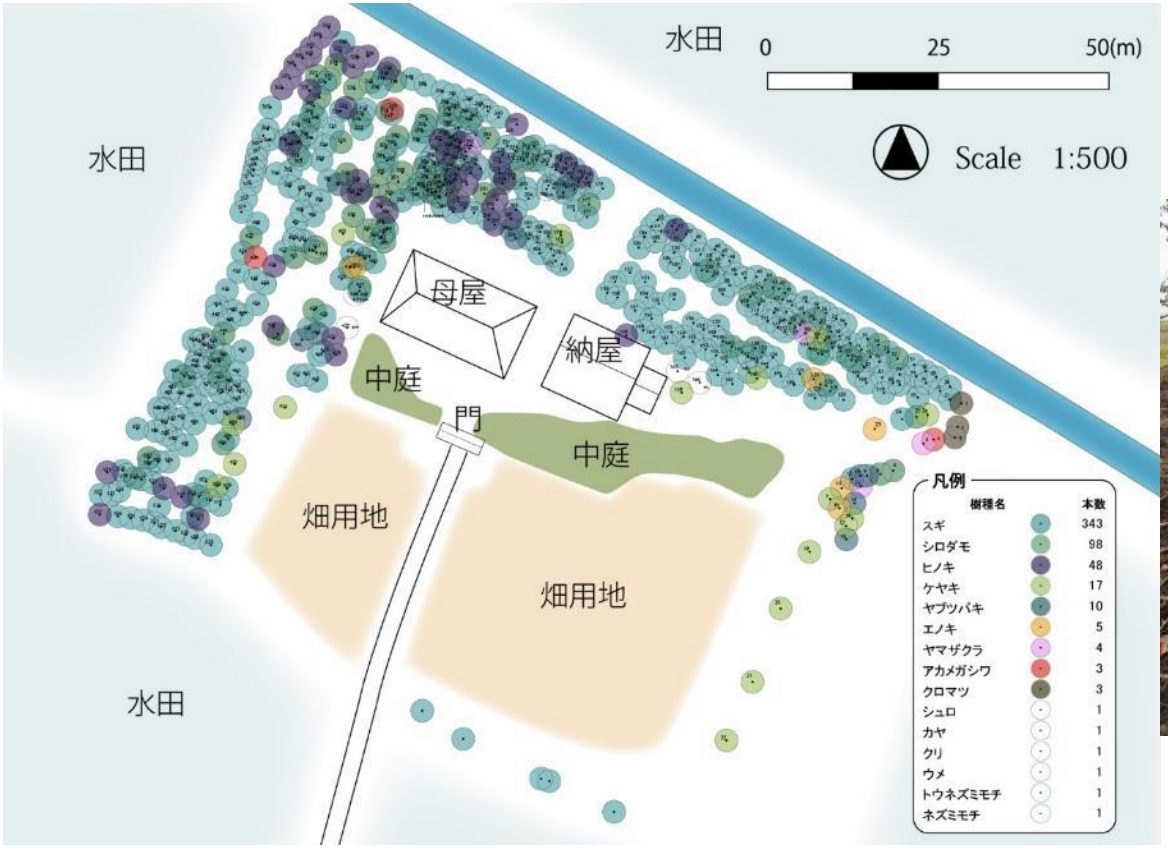
居久根毎木調査
対象敷地 ： A家

調査日：2011/08/27
調査メンバー：
石川・大澤・片桐・根岸・氏家

No.	樹種	樹高	幹周り	塩害
1	クロマツ	7	23	3
2	クロマツ	7	31	2
3	クロマツ	6	20.5	3
4	アカメガシワ	10	14.5	1
5	ヤマザクラ	6	16	3
6	シロダモ	6	19.5	4
7	ケヤキ	12	34	0
8	シロダモ	6	13	4
9	ヤブツバキ	4	7.5	4

調査データ
（A家 537本）

Advice for re-planting



Creating Community Forest (Igune)

5. Community Resilience & Regional Resilience

Community Resilience and Regional Resilience is synthesis of environmental, social, and cultural resilience through process planning.

Creating Commons as the core of community
（Aug. 2014----）

Planting Lawn
In Aug. 2014

Planting Symbolic Trees

Herb Garden (Sept. 2014)

Collaboration : Japan herb society, Miyagi Pref. Medicine Dept. Tohoku University

Creating Community Festival by Children

April 2015

July 2015

Regional , Earth Resilience
Creating Multi-Defense System for safe region

Community

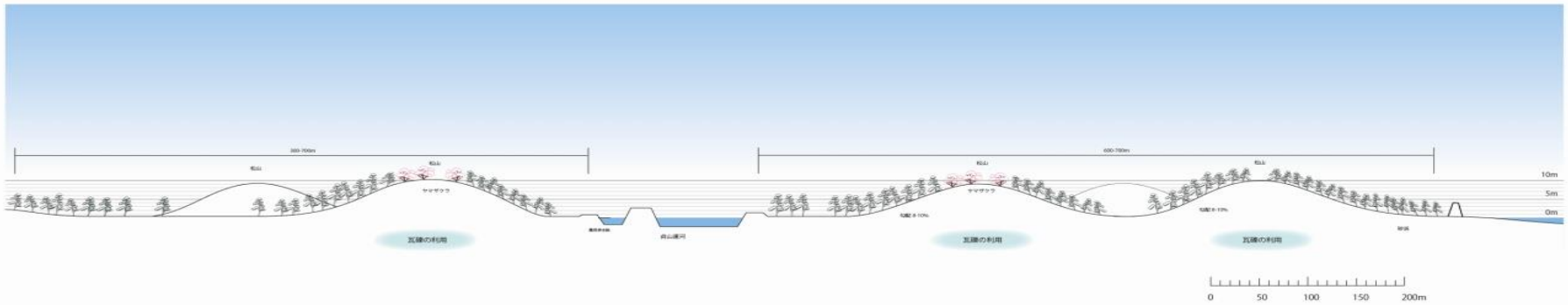
Canal

Hill

Coastal Forest

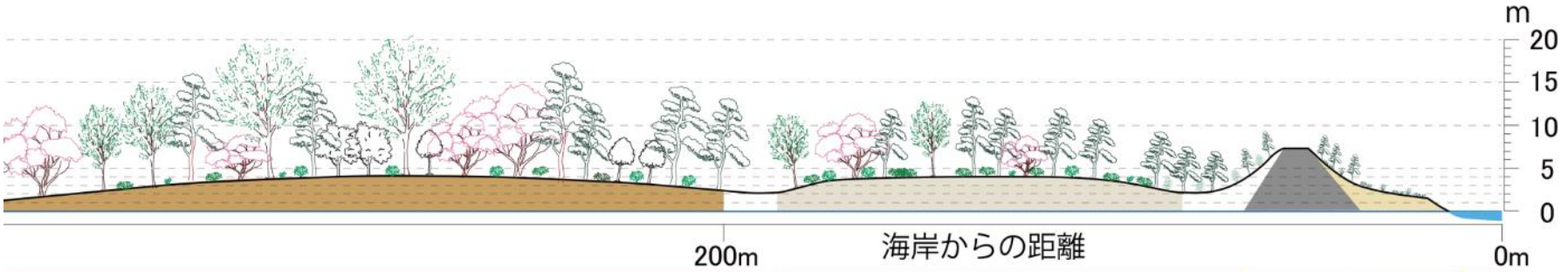
Multi Defense System
Hills of Thousand Hopes

■千年希望の丘構想

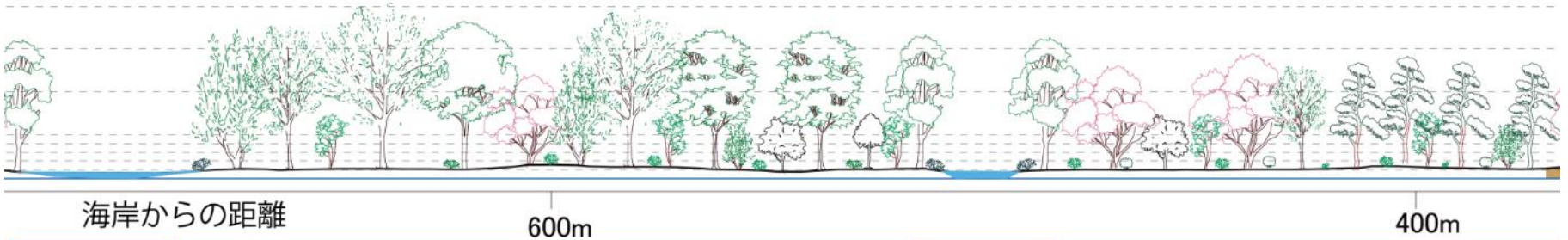


Multi- Defense System : Planting Coastal Forest
By Many people from all over the world

Ecosystem of Coastal Forest
Proposal for resilient forest and enriching bio-diversity



砂丘林ユニット	道路	後浜・クロマツ林ユニット	クロマツ堤防	海浜植生	海
浜　堤	道路	人工盛土地（後浜）	防潮堤	海浜	海
クロマツ、アカマツ		クロマツ	クロマツ		
コナラ、ヤマザクラ、カスミザクラ		コナラ、ヤマザクラ			
マサキ、シャリンバイ、ネズミモチ、オオバグミ		マサキ、シャリンバイ、ナワシログミ			
ツルウメモドキ、イボタノキ、ヤマハギ、カマツカ		ツルウメモドキ、イボタノキ、ドクウツギ、ヤマハギ			
テリハノイバラ、センボンヤリ、コウボウシバ、ジャノヒゲ、ヤダケ		ハマヒルガオ、テリハノイバラ、コウボウシバ、ケカモノハシ	ハマヒルガオ、コウボウムギ等	ハマニンニク、コウボウムギ等	

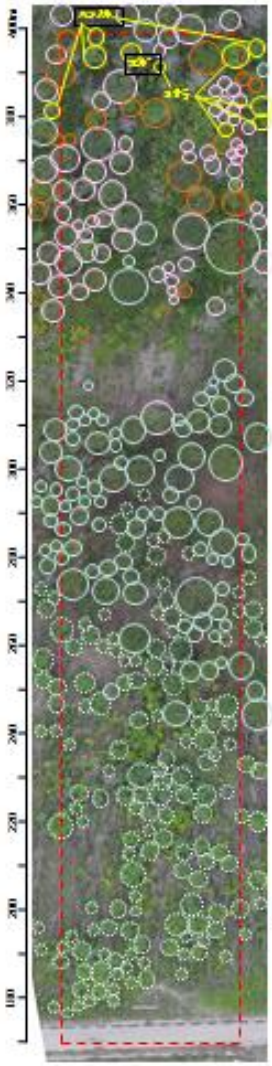


湿地・潟湖	海岸性里山ユニットII	クロマツ・ハンノキユニット	海岸性里山ユニットI
後背湿地	後背湿地	後背湿地	後背湿地
	モミ	クロマツ	アカマツ
	ウラジロカシ、アカガシ		モチノキ
ハンノキ	ケヤキ、エノキ、ヤマザクラ、コナラ、エゴノキ	ハンノキ	ヤマザクラ、ウワミズザクラ、コナラ、イヌシデ
	シロダモ、ヤブツバキ、イヌツゲ、ヤツデ、アオキ		マサキ、シロダモ、ネズミモチ、イヌツゲ
ヤナギ類、オニグルミ、ウメモドキ	アオダモ類、ウメモドキ、アキニレ、ヤマウルシ、ズミ	ウメモドキイボタノキ	ヤマツツジ、アオダモ類、コマユミ、ヤマグワ、カマツカ、ガマズミ
ヒメガマ、ガマ、ヨシ、マコモ、サンカクイ、チゴザサ	ヤブコウジ、ツタウルシ、ツタ、キズタ、アズマネザサ	オニナルコスゲ、ヌマトラノオ、シロバナサクラタデ、シロネ	テリハノイバラ、ヤブコウジ、ツタウルシ、ジャノヒゲ、アズマネザサ

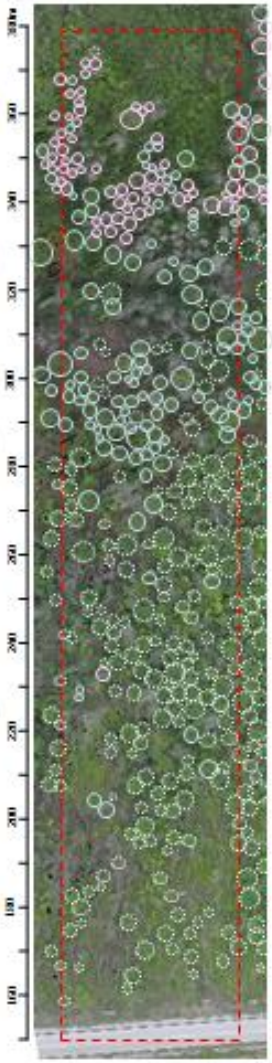
Innovation for Monitoring System

UAV　Robin

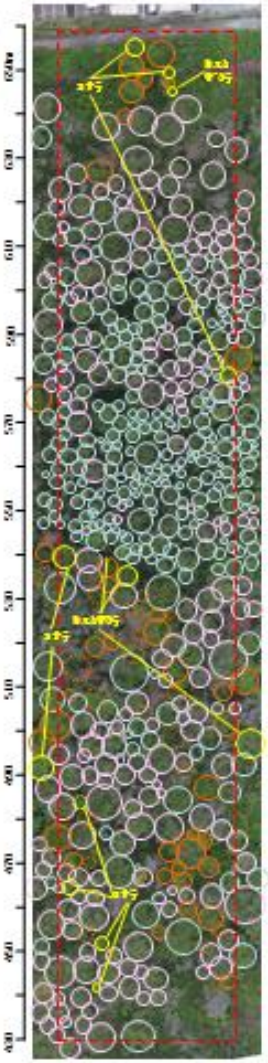
Utilizing UAV, we are developing the monitoring system of coastal forest.



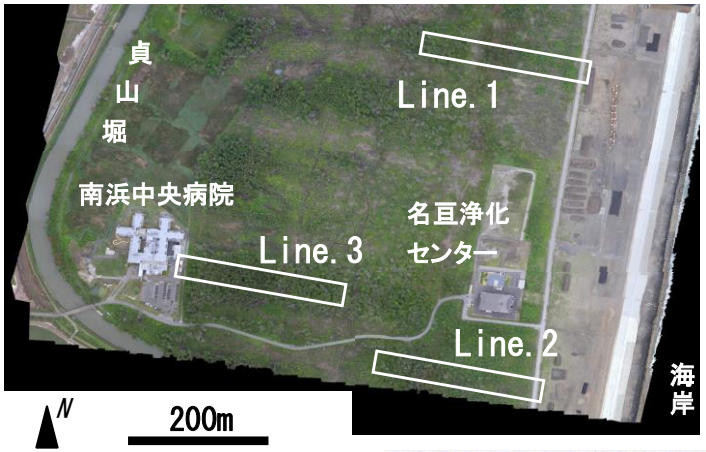
Line.1



Line.2



Line.3



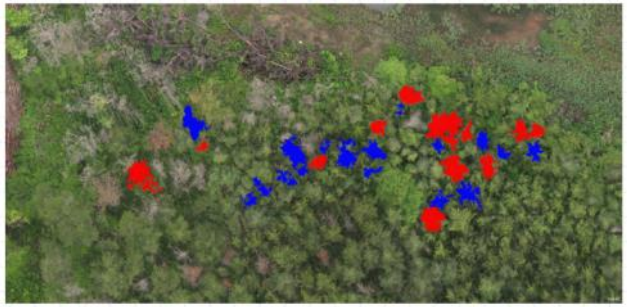
クロマツ

アカマツ

アカマツ
クロマツ
ヤマザクラ
コナラ
ニセアカシア

点線は亜高
木～中木

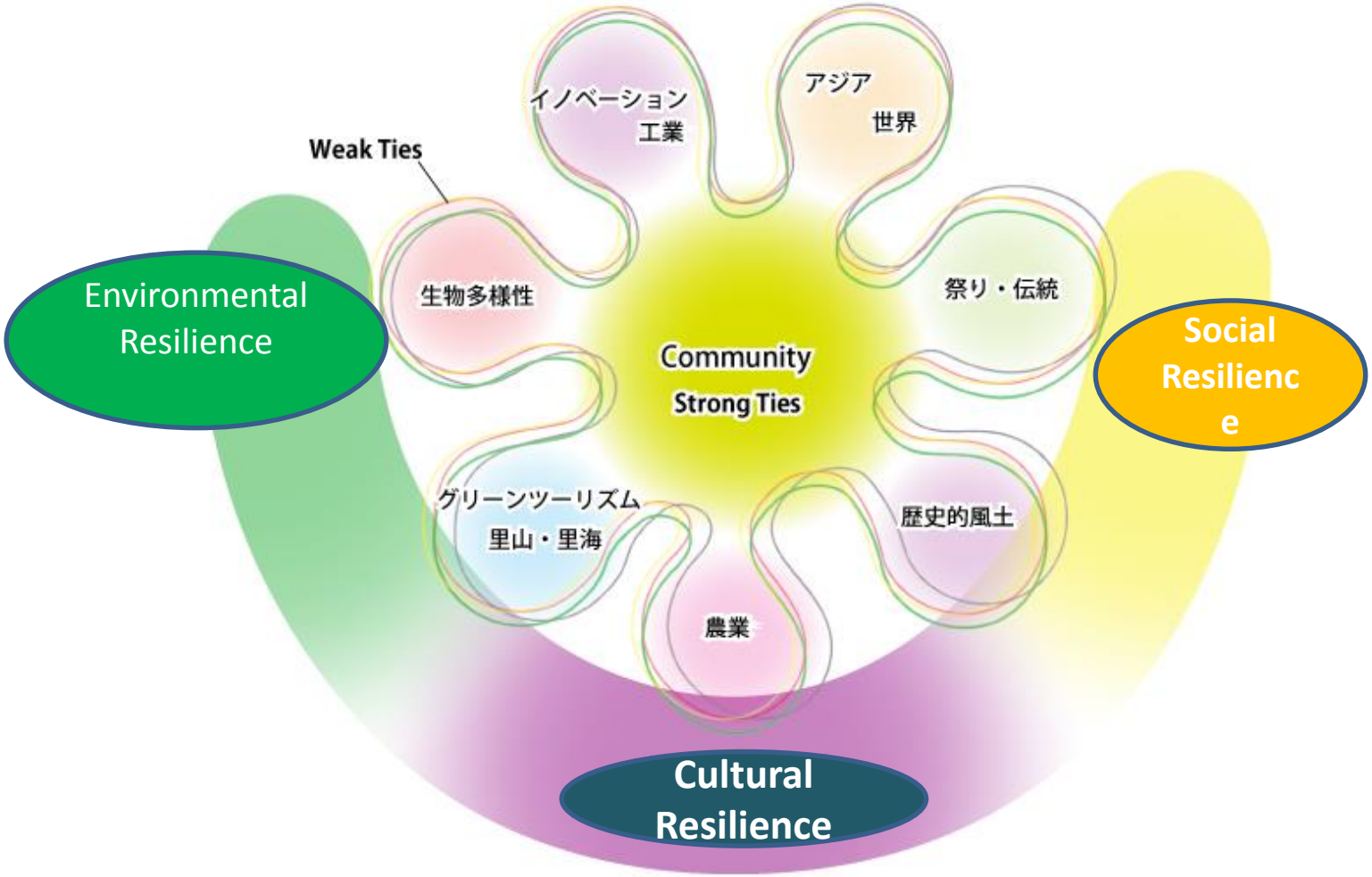
◆ 2013年8月に植生調査を行い、樹種判別のグランドトゥルースデータとしてクロマツ、アカマツを計33本分取得した。



青色：クロマツ　赤色：　アカマツ

Innovation for Identifying the spices

Iwanuma Model



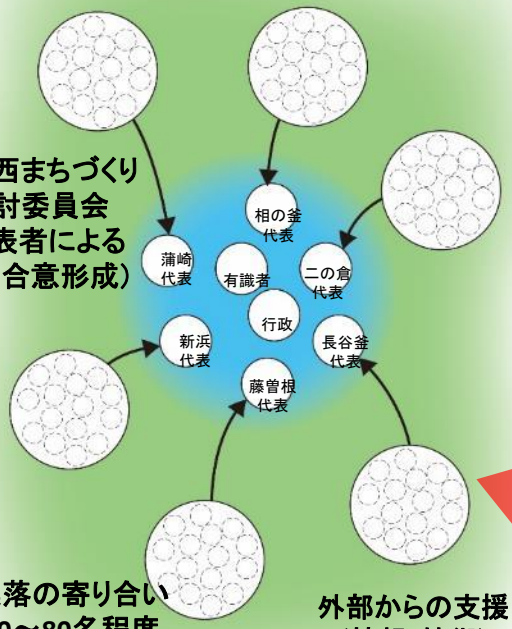
Wave Movement for Creating Community Ties

Resilient Infrastructure from Community to Region , and Earth

Community Scale	Local Scale	Regional & National Scale
Refugees, City, NPO, University	Citizen, City, Pref., NPO, University	National Government, Pref., Scientist, Planner, University

家族や知人、隣人との話し合い

玉浦西まちづくり検討委員会（代表者による議論、合意形成）



集落の寄り合い
30～80名程度
（伝統的合意形成）

外部からの支援
（情報・技術）

生きがいとしての農業

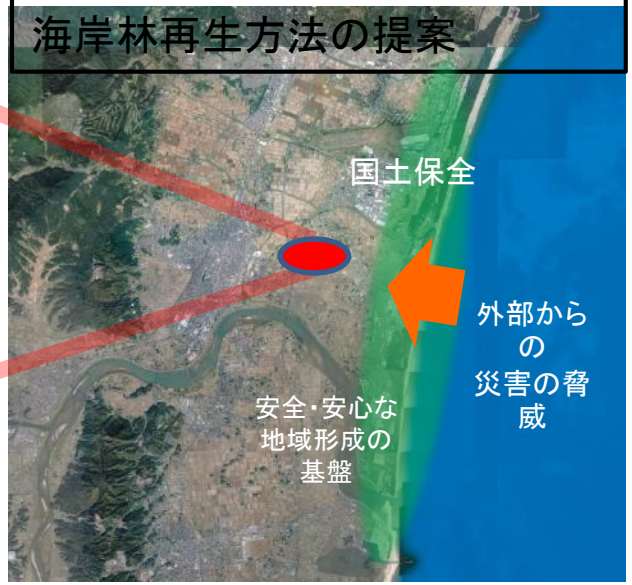
住民同士の交流

コミュニティ

企業同士の交流

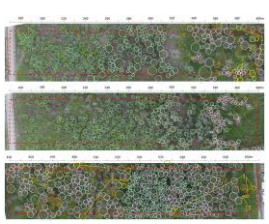
企業活動としての農業

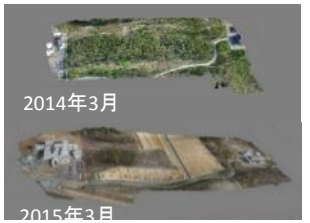
海岸林再生方法の提案



Collaboration

Innovation for new method for managing coastal area





Conclusion

In this presentation, I analyzed the characteristics of the resilient infrastructure through the 6 years' experiences from Great East Japan Earthquake in 2011. The following 7 points have clarified.

1. **To develop Resilient Infrastructure for promoting DR3.**
2. **Resilient Infrastructure consists of five major components ; Process Planning, Environmental , Social, Cultural and Community Resilience.**
3. **To reduce the risk effectively, and create "Build Back Better", it is essential to introduce Process Planning.**
4. **To enforce Natural Resilience, scientific approach for creating Green Infrastructure is the urgent issue.**
5. **To develop Social Resilience, multi-stakeholders should be involved, and diversity is the key factor.**
6. **To excavate Cultural Resilience, people find the pride of place and the dignity of life.**
7. **Community Resilience is the synthesis of four factors, and a fundamental structure of region and earth of our future society.**

Risk, Life and Science

Fumiko Kasuga

Global Hub Director– Japan, Future Earth Secretariat

Senior Fellow, National Institute for Environmental Studies

Belmont Forum Scoping meeting CRA 'Disaster Risk, Reduction and Resilience – DR3'
Florence, Italy, Accademia dei Georgofili, 5 – 7 June 2017

My professional career

- Government researcher until March 2016
- Ministry of Health, Labour and Welfare, Japan
  - National Institute of Infectious Diseases
  - National Institute of Health Sciences
    (research institute for food and drug safety)
    - Microbiological food safety
      - Risk assessment
      - Epidemiology
- Future Earth Global Hub Director – Japan since May 2015

Foodborne illnesses = disaster

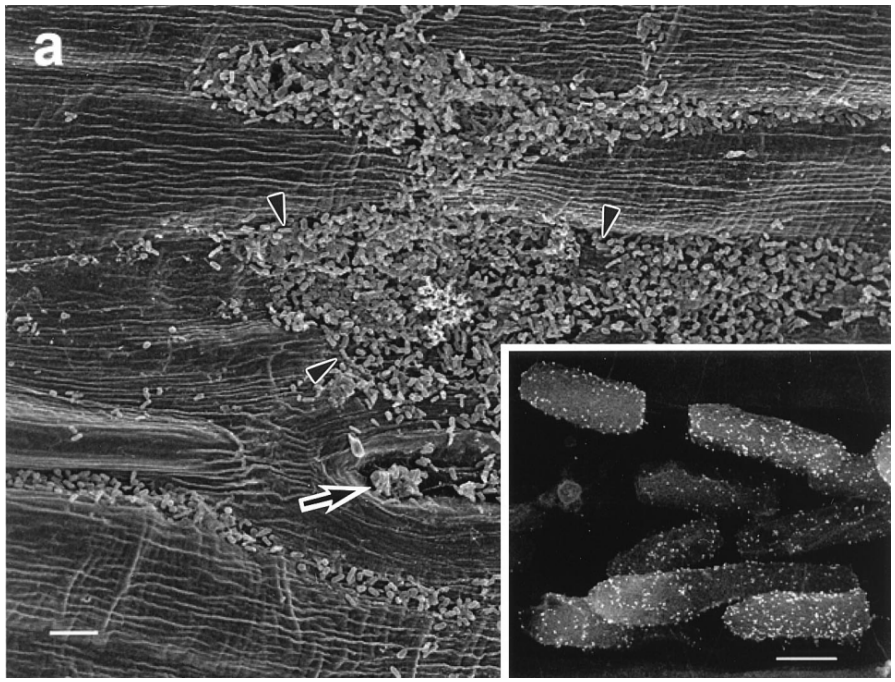
- Foodborne infections, outbreaks: infectious diseases, food is a vehicle of pathogens
- Accidental contamination of food with toxic agents: manmade disasters
- Intentional contamination: crime, food defense

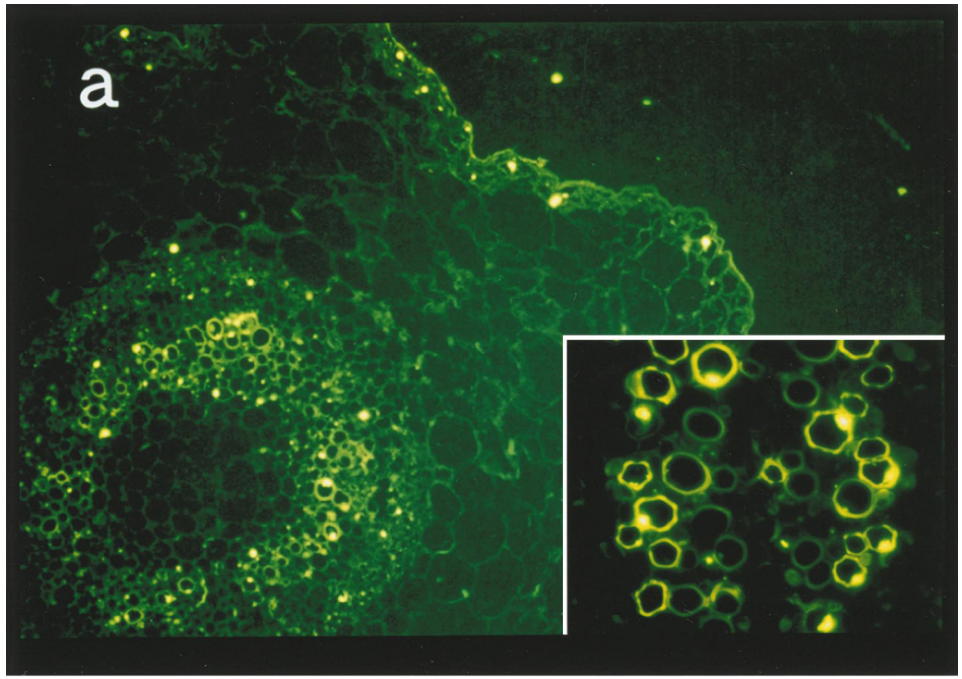
Outbreak investigations

- Recognition of foodborne events
- Investigation: Identification of causative hazards, vehicle food, and source of contamination
- Control measures
  1. Ban, Recall: To urgently stop the ongoing outbreak
  2. Penalties, Training programmes: To prevent similar incidents
- Reporting and recording
  1. Long-term monitoring for trend analysis
  2. Basic data for risk assessment

Large scale outbreaks of Enterohemorrhagic *E. coli* O157:H7 due to school lunches 1996

- In one of the outbreaks in Sakai City, Osaka, 7,966 people infected, 3 pupils died. Another patient died of sequelae in 2015.
- Radish sprout was highly suspected as causative food.



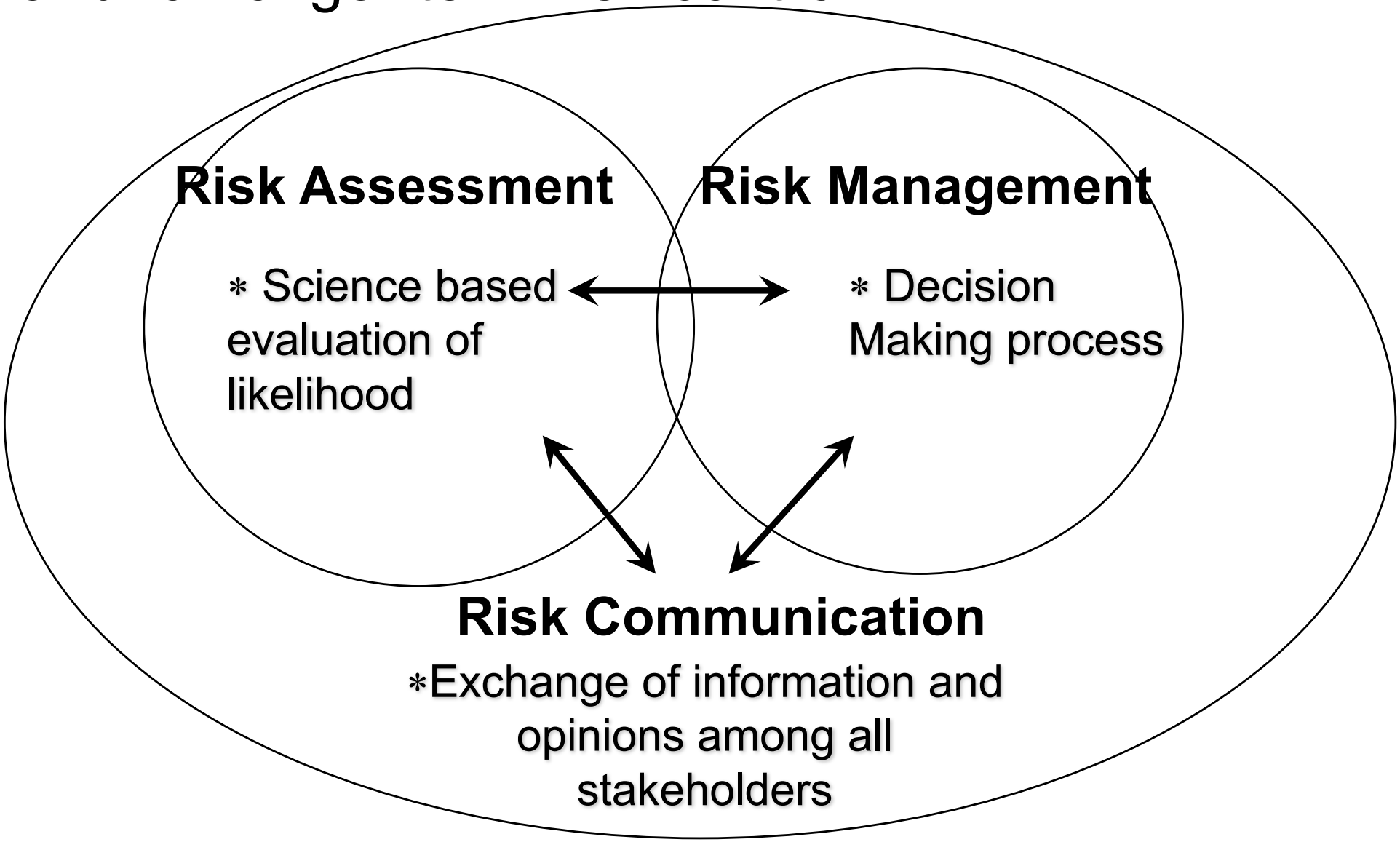


APPLIED AND ENVIRONMENTAL MICROBIOLOGY, 1998, p. 1532–1535 Vol. 64, No. 4
Enterohemorrhagic *Escherichia coli* O157:H7 Present in Radish Sprouts
Y. Itoh, Y. Sugita-Konishi, F. Kasuga et. al.

Inspection into school kitchens

Risk Analysis

- for understanding whole picture of the situation and for longer term risk control



Risk and Hazard (for food safety)

- A *hazard* is a biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect

- *Risk* is a function of the *probability* of an adverse health effect and the *severity* of that effect, consequential to a *hazard(s)* in food.

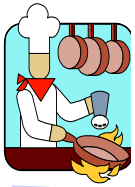
  Risk = f (hazard, likelihood, impact)

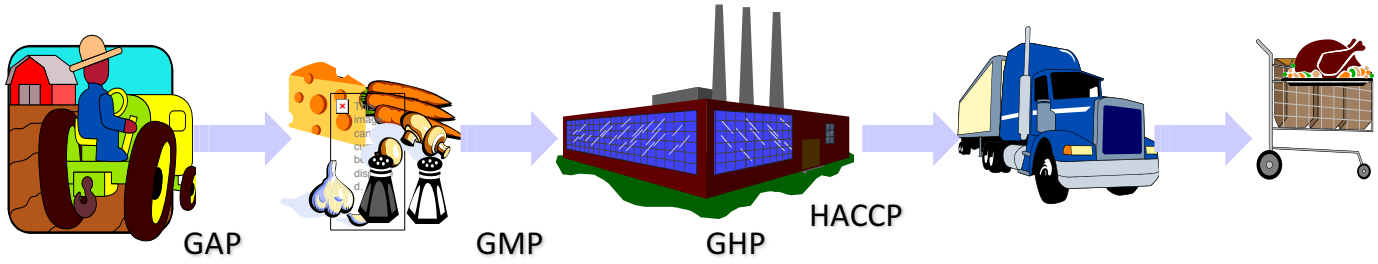
Risk assessment throughout the food chain

Public health impact

Interaction with employees, owners, local authorities at every step in the food chain is necessary.
Risk assessment team with diverse experts established.

Initiated by FAO/WHO JEMRA





Modified from slide by Leon Gorris

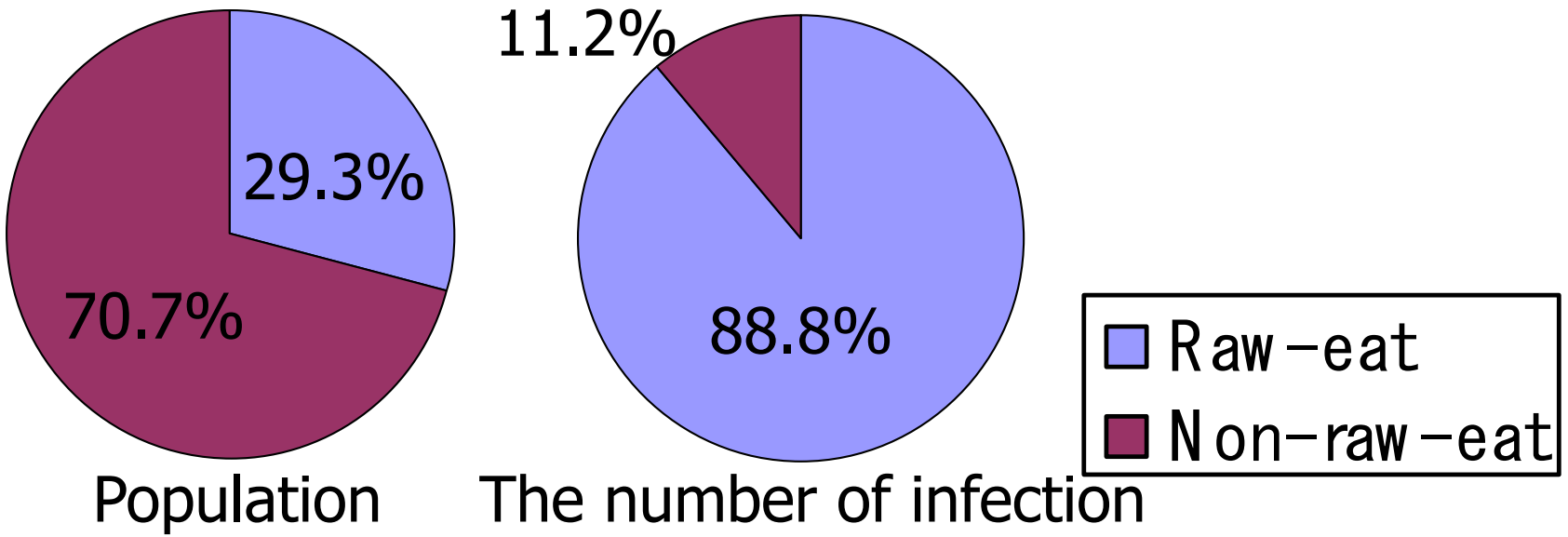
Elements of a Microbiological Risk Assessment

- Data: Published scientific literature, government data (surveillance reports, outbreak reports), industry data, contamination data (qualitative, quantitative), temperature, time, human behaviour data, etc.
- Model: Description of the system under analysis and how the elements of the system interact, (probabilistic vs deterministic, descriptive vs quantitative)
- Assumptions: Expert opinions, hypothesis

Result of *Campylobacter* risk assessment

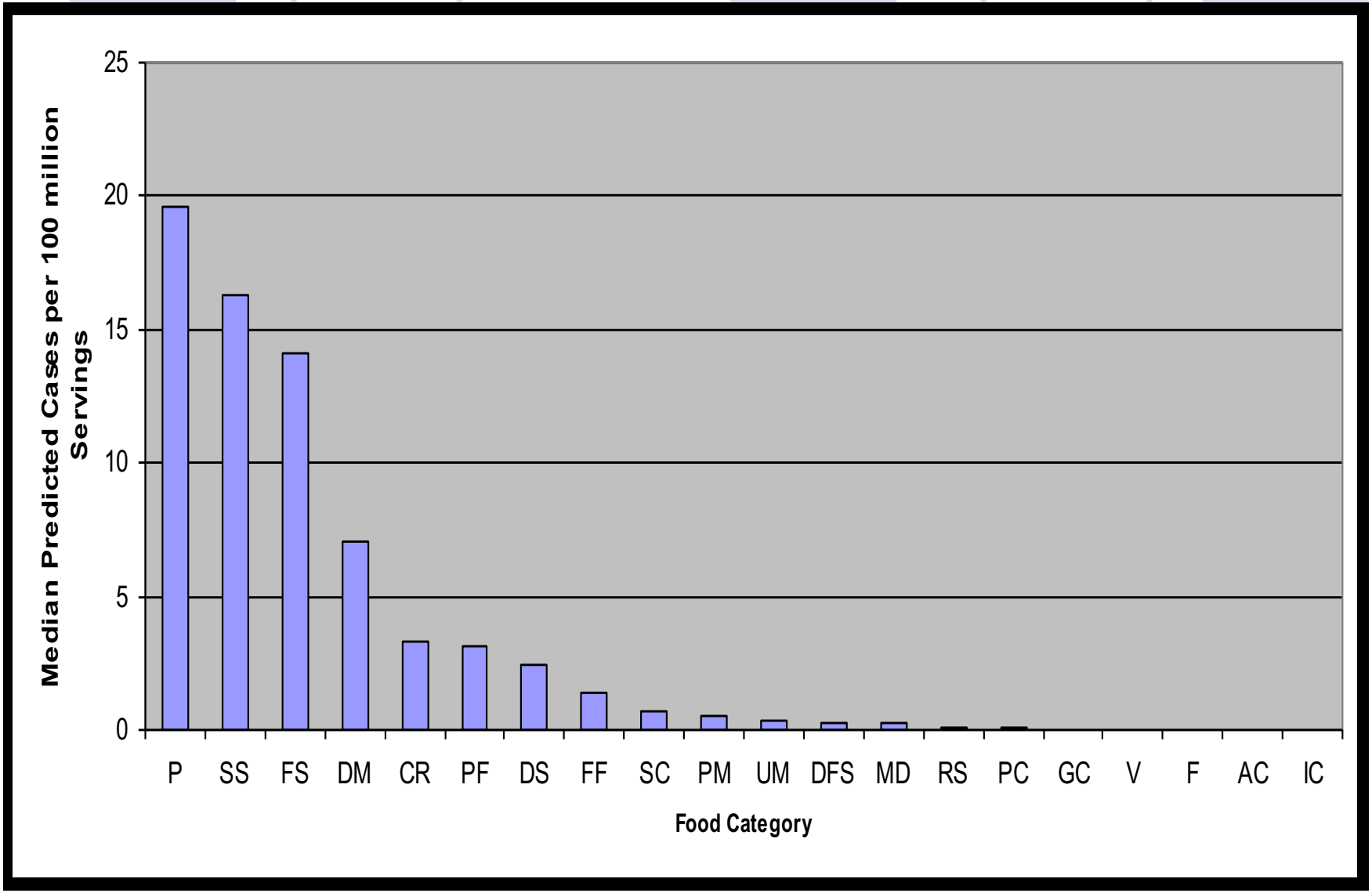
- The number of infection per year

- "Raw-eat" consumers, only 30% of population, account for ca. 90% of the number of infection
- Ave. times of individual infection per year: Raw-eat consumers(3.5) are 19 times higher than non-raw-eat consumers(0.18)



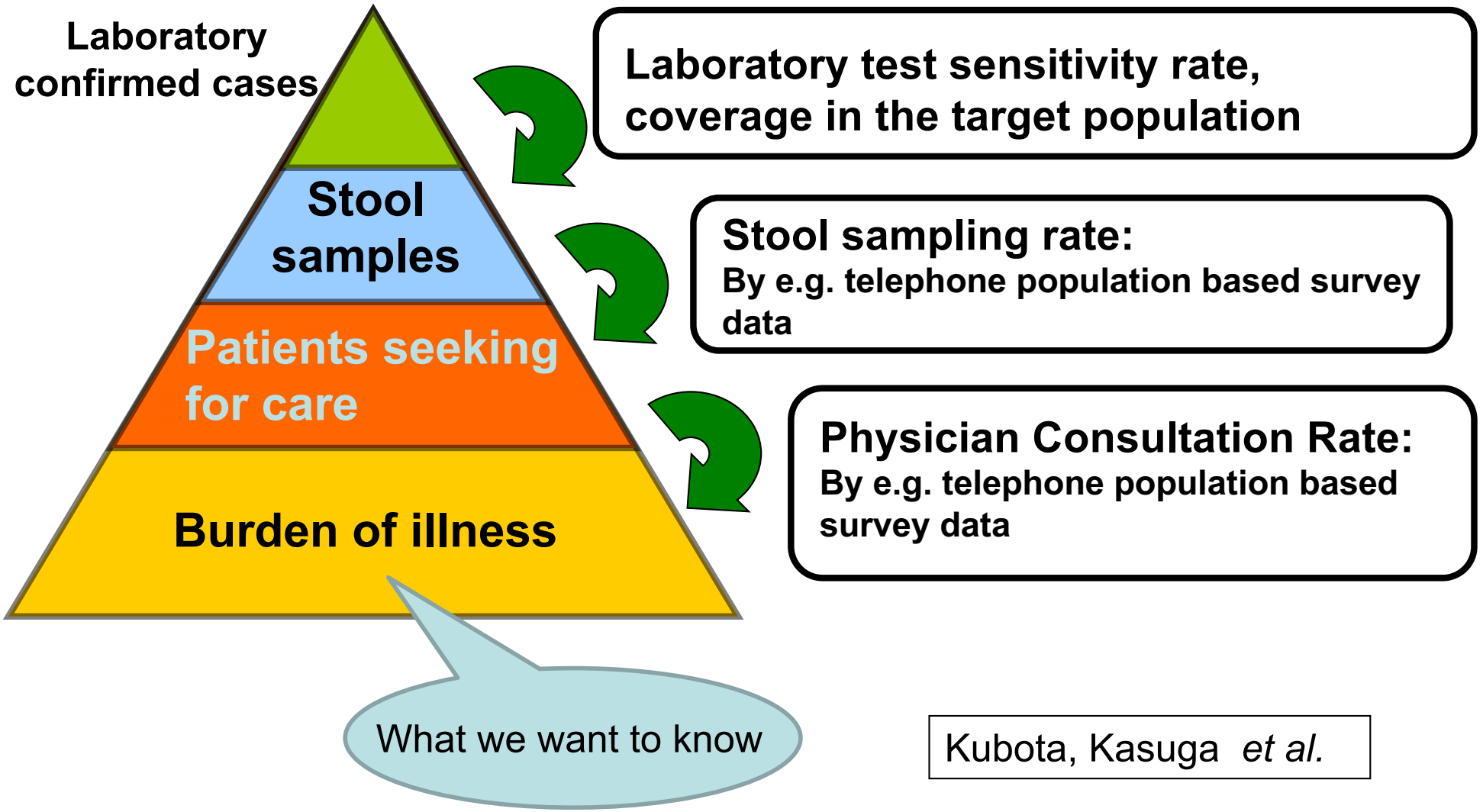
Slide by Dr. A. Hasegawa

Which food should be controlled?

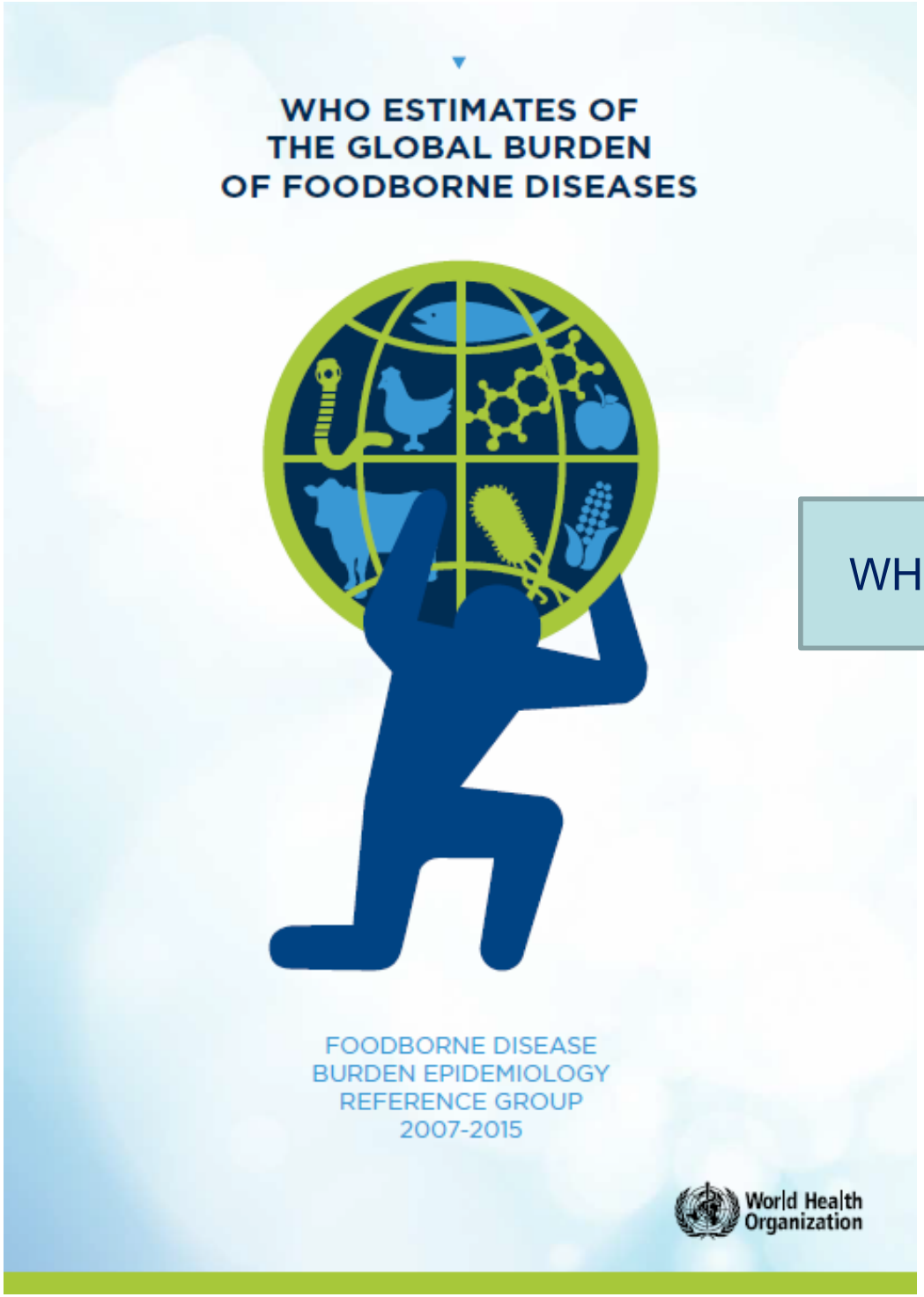


Listeria risk assessment by USFDA/USDA

Estimation of burden of illnesses



Kubota, Kasuga *et al.*


WHO ESTIMATES OF
THE GLOBAL BURDEN
OF FOODBORNE DISEASES
FOODBORNE DISEASE
BURDEN EPIDEMIOLOGY
REFERENCE GROUP
2007-2015
World Health
Organization

WHO FERG

Foodborne illnesses and death estimated by WHO FERG

HAZARD	FOODBORNE ILLNESSES	FOODBORNE DEATHS
TOTAL	600 652 361 (417 646 804–962 834 044)	418 608 (305 128–598 419)
Diarrhoeal disease agents	548 595 679 (369 976 912–888 528 014)	230 111 (160 039–322 359)
Viruses	124 803 946 (70 311 254–251 352 877)	34 929 (15 916–79 620)
Bacteria	349 405 380 (223 127 469–590 002 559)	187 285 (131 742–254 037)

Median global number of foodborne illnesses and deaths, with 95% uncertainty intervals, 2010. (WHO estimates of the global burden of foodborne diseases: foodborne disease burden epidemiology reference group 2007-2015..World Health Organization)

Lessons learned

- Difference in definition, terminology should be noted.
- Systems and logical thinking and understanding are important.
- Collaboration with and engaging stakeholders in the society - *critical*
- Data, variability, uncertainty

  Data collection is not easy.

  Data sharing is even more difficult in many cases.

  Modeling, simulation and scenario analysis are useful to complement what we observed.
- Science – policy interface - *challenging*

Science Council of Japan, Disaster Risk Reduction and Future Earth

Great East Japan Earthquake and TEPCO Fukushima-Daiichi Nuclear Power Plant accident March 11, 2011

news.livedoor.com

By TEPCO

Recommendations from
Science Council of Japan (SCJ)
– with Confident Steps towards Reconstruction –

April 9, 2012

Science Council of Japan
Committee on Supporting Reconstruction
after the Great East Japan Earthquake

UN World Conference on Disaster Risk Reduction
2015 Sendai Japan

14-18 March 2015
Sendai, Japan

Sendai Outcomes

Sendai Framework for Disaster Risk Reduction 2015-2030

Sendai Declaration

Voluntary commitments

Implementation and Commitments

Voluntary commitments by relevant stakeholders are important to identify modalities of cooperation and implement the Sendai Framework.

Segments

Proceedings of the World Conference

Preparatory Meetings

Inter-Governmental Segment

Multi-Stakeholder Segment

Public Forum

Selected Interviews

Interview videos at the Third UN World Conference on Disaster Risk Reduction

Awards

Sasakawa Award

Risk Award

TV film Award

Videos

5 Days in Sendai

Highlights of the Ignite St

Awards

Inspiring Quotes

" The Sendai Conference outcome represents the "first step of our journey to a new future "

Ban Ki-moon
United Nations Secretary-General

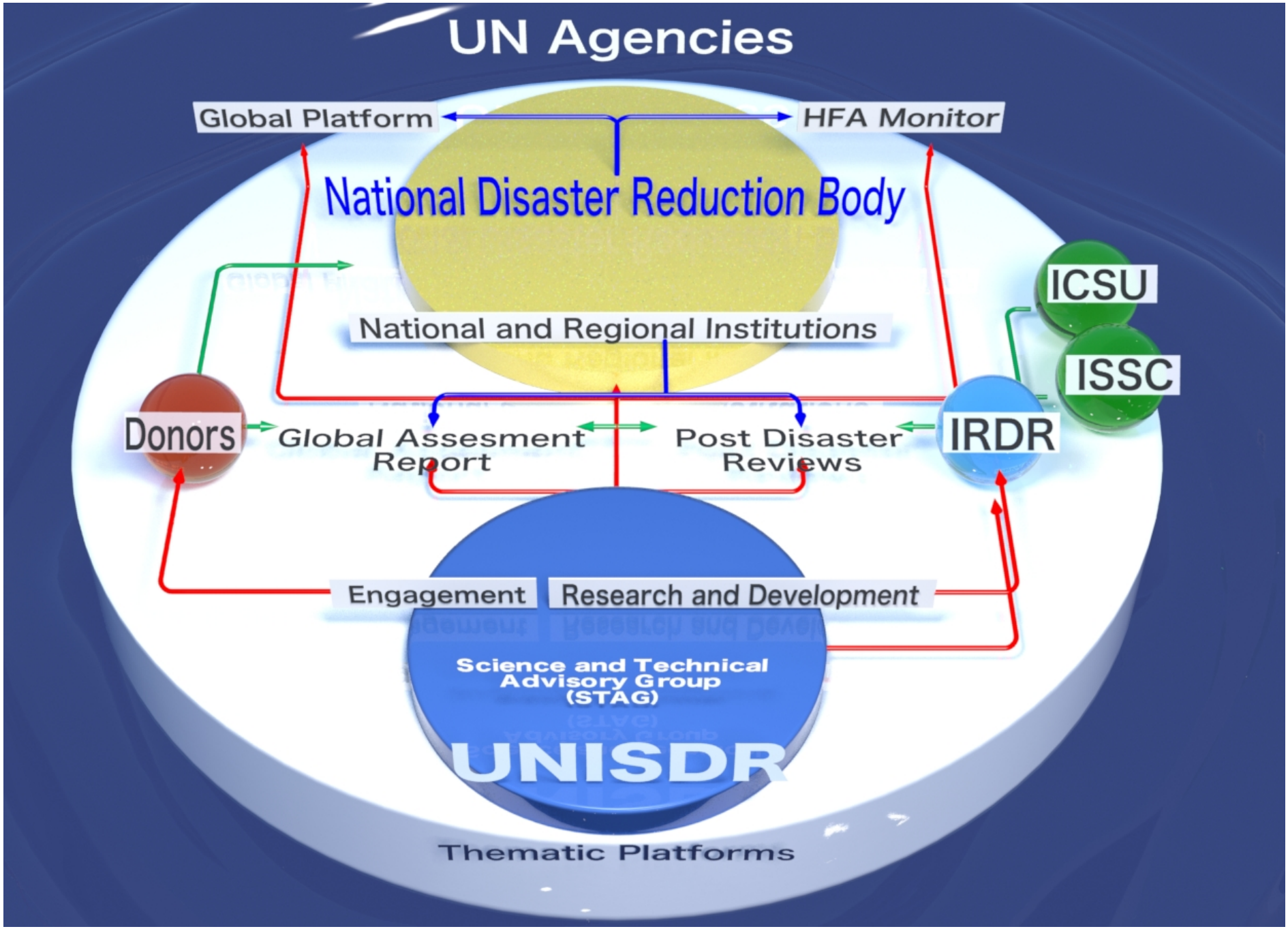
Photos

Selected Blogs

Ten things to know about Sendai disaster risk reduction deal.

How can the world better prepare for natural

New Approach to Strengthen and Support Decision-making on DRR



HOW TO REDUCE RISK FROM EXTREME WEATHER EVENTS

The Colombia mudslide, the Peru floods, and last October's Hurricane Matthew in Haiti highlight the need to address the underlying social and economic forces that place human settlements at risk.

HOW CAN THE WORLD REDUCE DISASTER LOSSES FOR THE POOR?

"The latest research findings on economic losses from disasters explain why this issue has emerged as the major concern for governments preparing for the Global Platform for Disaster Risk Reduction," says UNISDR head Robert Glasser.

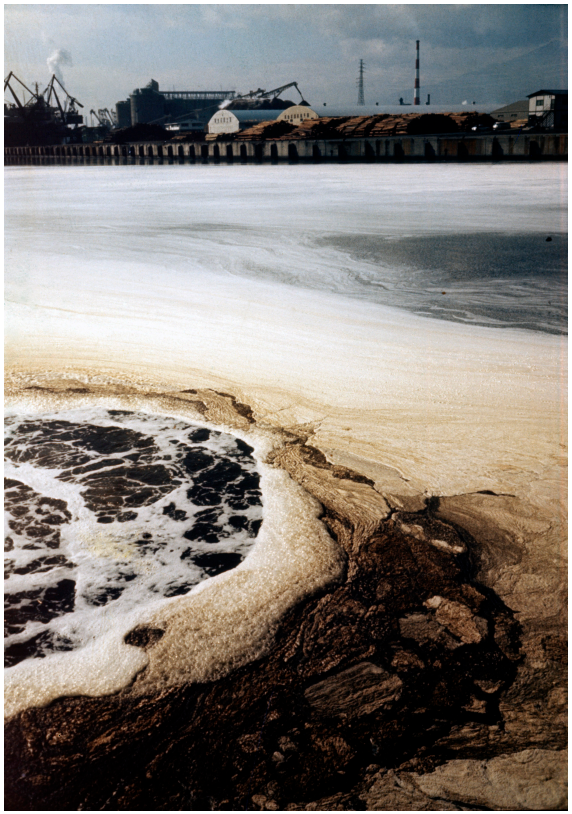
Emergent issues

(from UN Photo)

Air pollution

Epidemics

Land use change



Ocean contamination

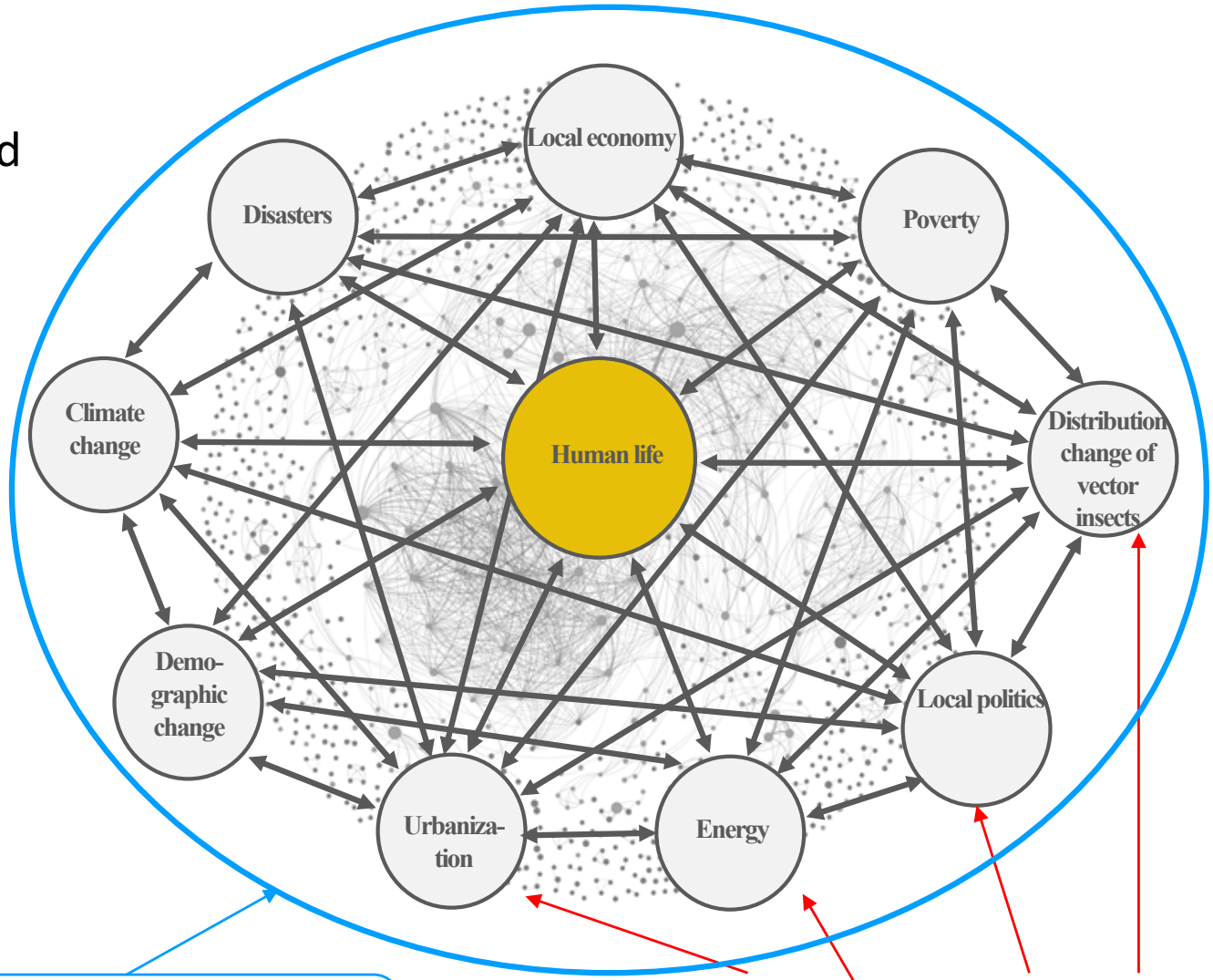
Poverty, refugees

Extreme climate disasters

(from UN Photo)

Inter-related factors in the environment and in human society

- Many factors are related each other and have impacts on human health and life.
- Human life also give huge impacts on the environment.
- We need to address to multiple challenges in **an integrated and inclusive way.**



Holistic approaches are needed by Co-Design

Many individual research topics: they are important basis for understanding issues

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research for global sustainability

Future Earth characteristics:

- Research informing solutions
- Interdisciplinarity
- Stakeholder engagement

Picture from the animation:
“Welcome to the Anthropocene”

Future Earth Alliance ⇒ Governing Council

Future Earth Secretariat

Executive Director and Global Hub Directors

Josh Tewksbury
Colorado

To be announced very soon

Executive Director

Wendy Broadgate
Stockholm

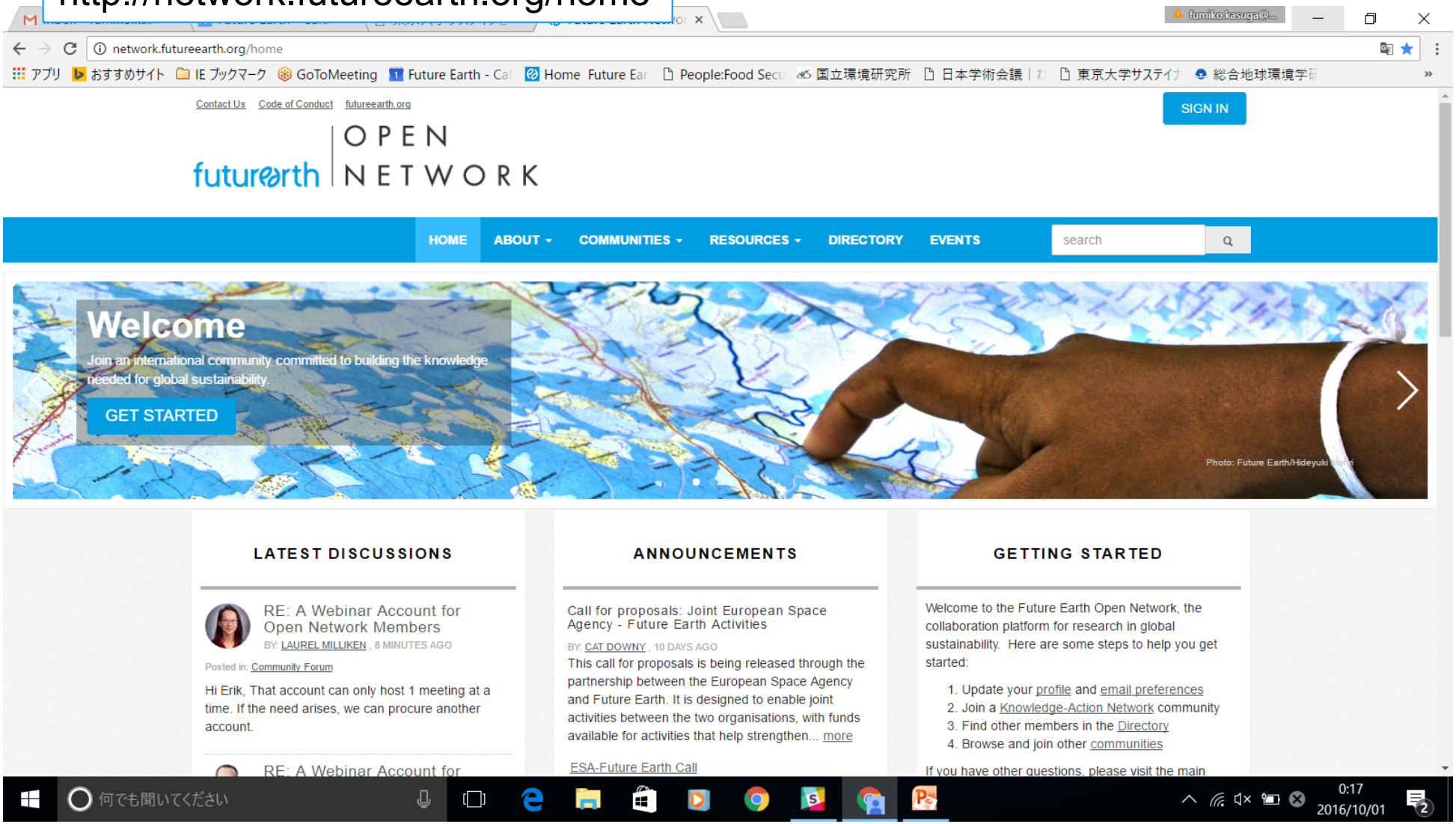
Anne Hélène Prieur-Richard
Montreal

Thorsten Kiefer
Paris

Fumiko Kasuga
Tokyo

How to get involved in Future Earth? – via Open Network

http://network.futureearth.org/home

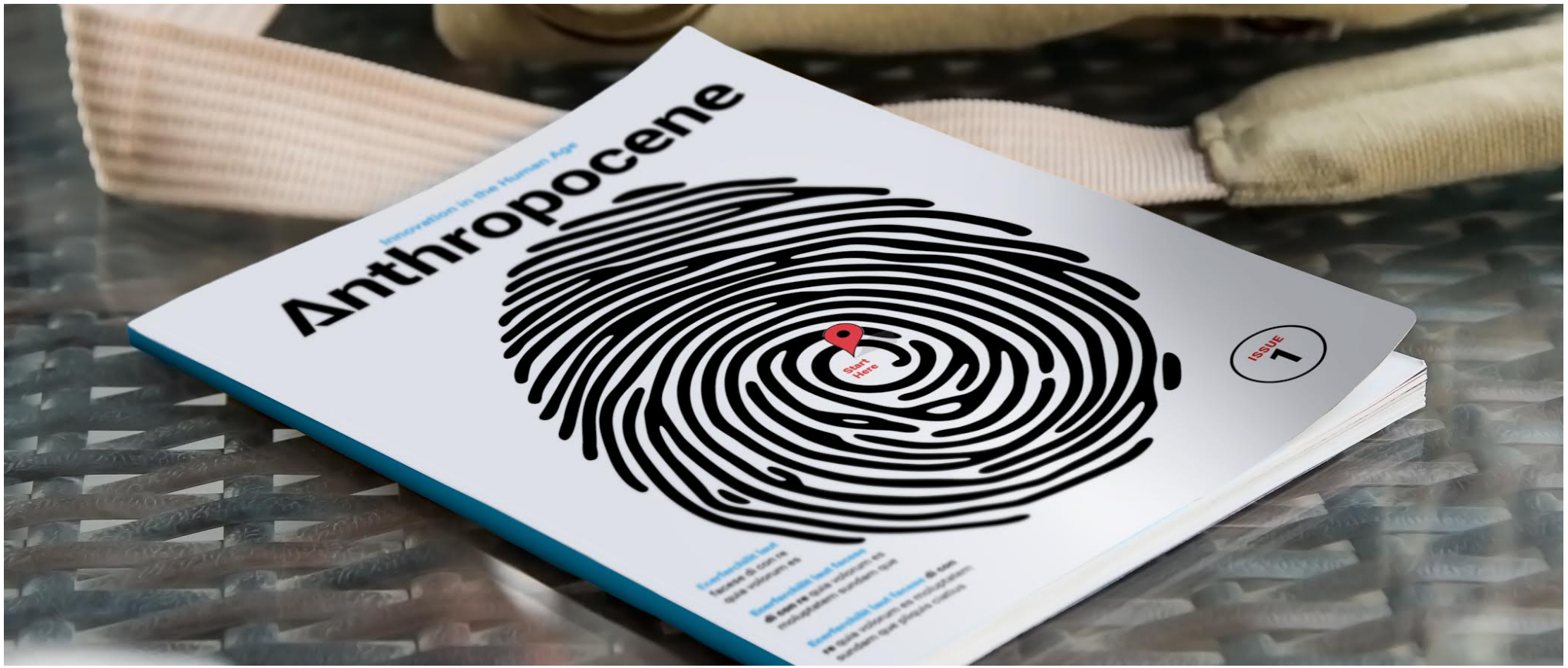


Anthropocene Magazine

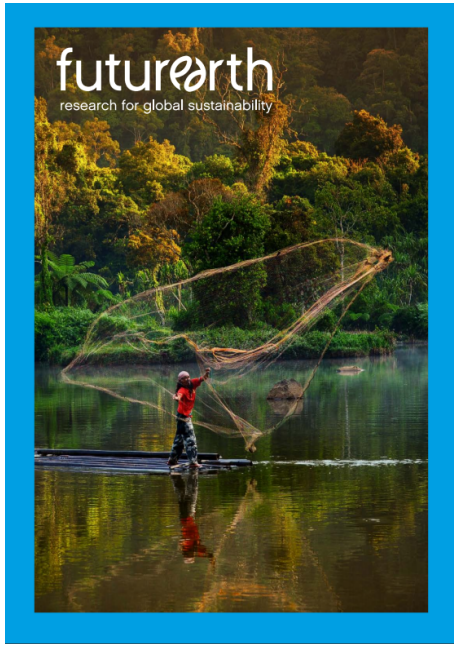
futurearth
research for global sustainability

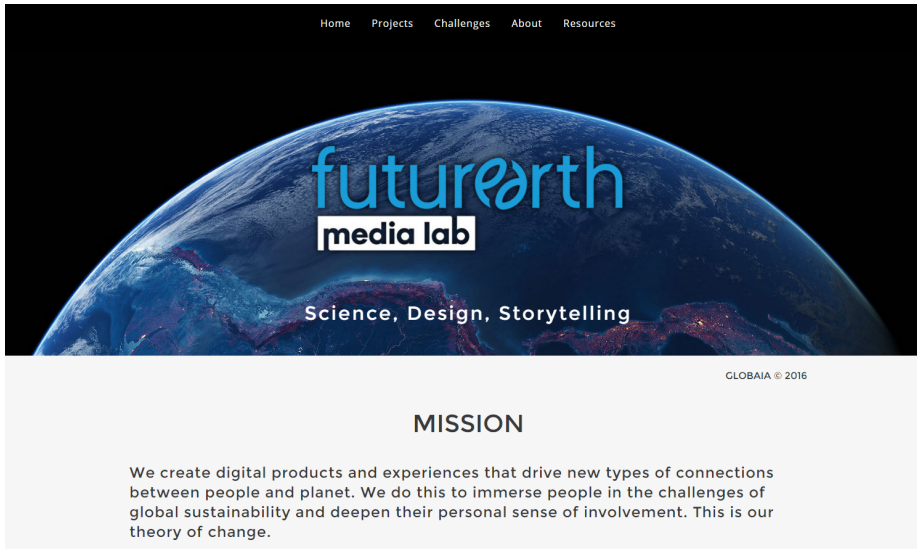
Fee download
Not scientific articles or news, but new web magazine to connect people by sciences

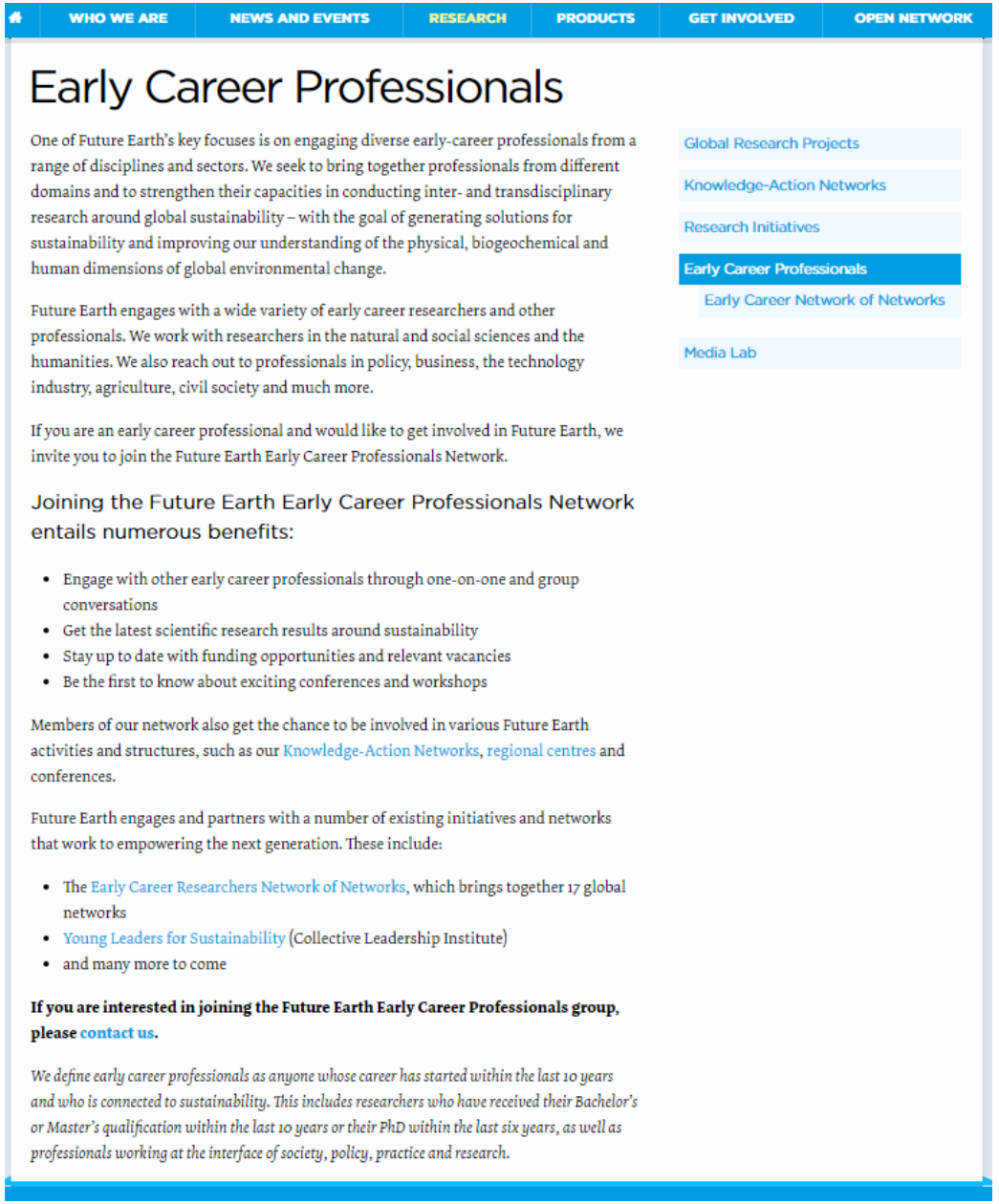
anthropocenemagazine.org



Other outreach activities (http://www.futureearth.org/)







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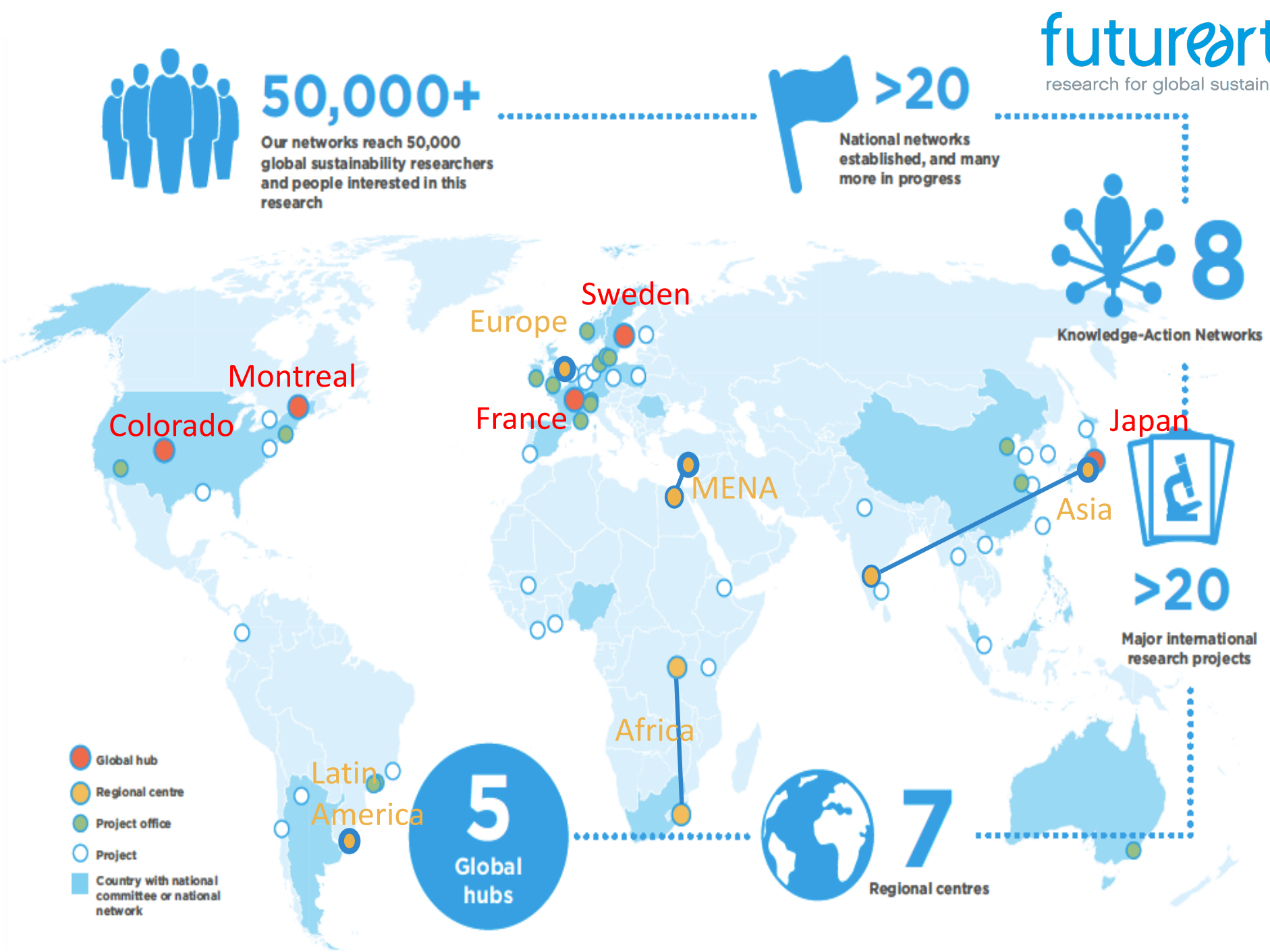
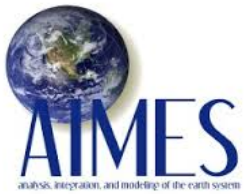


Future Earth Global Research Projects



oneHEALTH

IHOPE
Integrated History and future Of People on Earth

Programme on Ecosystem Change and Society

Knowledge-Action Networks

futureearth
research for global sustainability

ICSU Interdisciplinary Bodies

INTERNATIONAL COUNCIL FOR SCIENCE

Thematic Organizations

These bodies have been set up to address specific themes and to provide a platform to convene scientists with common interests across disciplinary borders, to plan and organize international scientific initiatives and to offer advice in a policy context. They differ from the other groupings in this section in that they that they do not plan and implement very large international research programmes nor do they carry out assessments. However, their work is critical to the larger research community.

- Integrated Research on Disaster Risk (IRDR)
- Committee on Space Research (COSPAR)
- Scientific Committee on Antarctic Research (SCAR)
- Urban Health and Wellbeing: A Systems Analysis Approach
- Scientific Committee on Oceanic Research (SCOR)
- Scientific Committee On Solar-TErrestrial Physics (SCOSTEP)

Global Environmental Change Programmes

ICSU's Global Environmental Change Programmes recognize the Earth as a complex system, regulated by physical, chemical and biological processes—and influenced, as never before, by human factors. While each Programme focuses on a particular area (e.g. biogeochemical cycles, climate change, biodiversity, and how humans impact and adapt their environments), their collaborative efforts are addressing global issues such as food, water and carbon. In 2014, the previous Global Environmental Change programmes DIVERSITAS, IGBP and IHDP merged into Future Earth.

- Future Earth: Research for Global Sustainability
- WMO-ICSU-IOC World Climate Research Programme (WCRP)

Monitoring and Observations

Global observing initiatives are critically important to policy-relevant science at national, regional and international scales. Moreover, the need to integrate data from ocean, terrestrial and climate systems is increasingly evident. ICSU's Monitoring/Observation Programmes facilitate data collection and foster the development of international standards and methodologies that support universal equitable access.

- Global Climate Observing System (GCOS)
- Global Ocean Observing System (GOOS)
- Global Terrestrial Observing System (GTOS)

Data and Information

KAN on Emergent Risks and Extreme Events

With synthetic activities
beyond their own strengths
To better contribute to the society

Cross community workshop on Extreme Events and Environments from Climate to Society (E^3S), Feb 2016, Berlin, Germany

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Extreme Events and Environments
- from climate to Society (E^3 S) -

- Home
- Project
- Members
- Conferences & Events
- Contact
- Internal

edit SideBar

Conferences and events

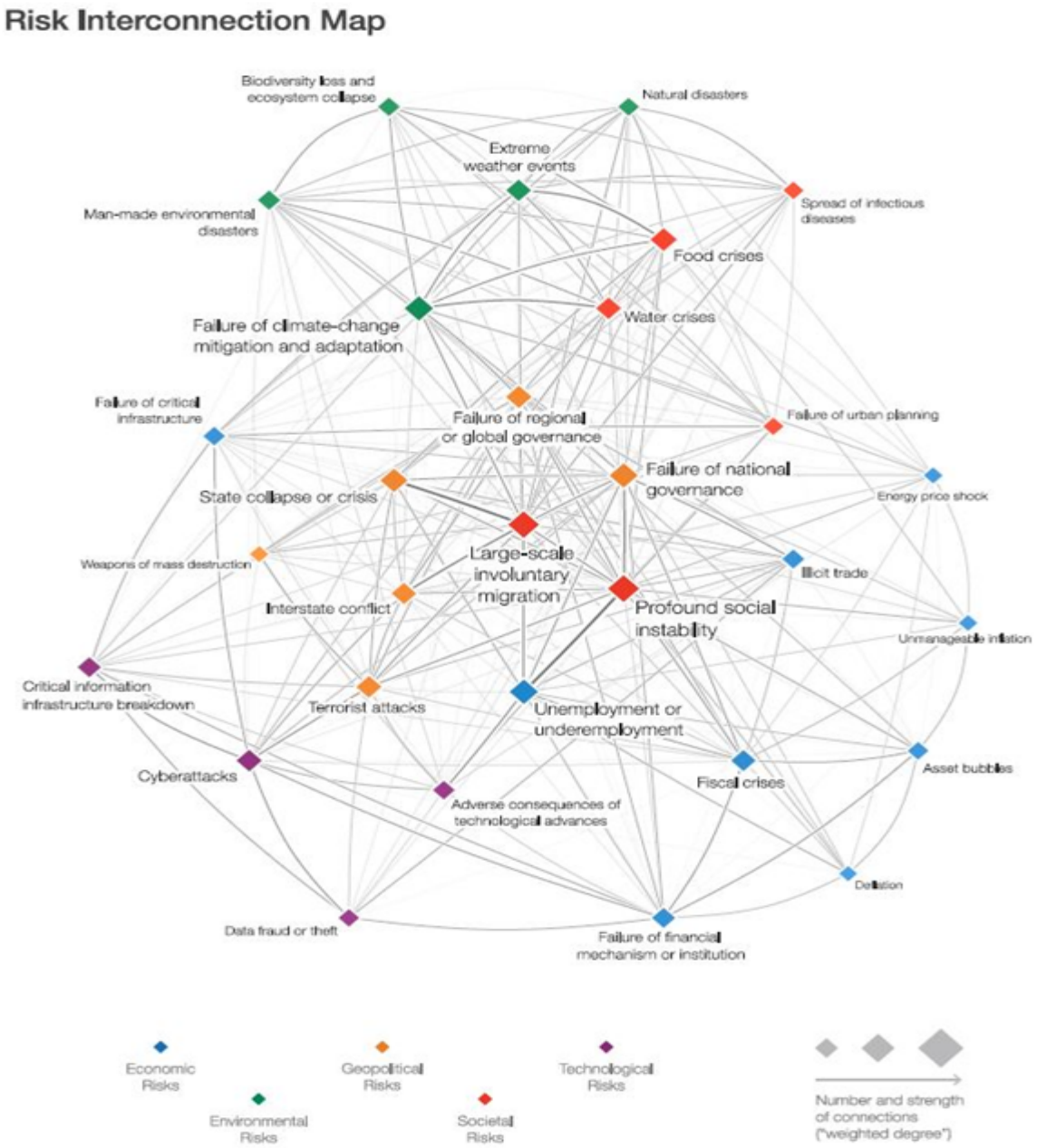
2016

Cross community workshop on Extreme Events and Environments from Climate to Society (E^3S)

Berlin, February 14th to 16th 2016 at Harnack-Haus

Agenda (download)

The goal of this cross-community/co-design workshop is to identify and elaborate the scientific questions and associated research agendas which are scientifically challenging and of high societal relevance, in line with the goals of Future Earth.
To this end we called for proposals for targeted co-design workshop sessions (call for proposals can be found here), which are organized independently of each other and happen in parallel. The workshop sessions have been selected by the E^3S steering committee.
The commitment of each session is to generate a 1-2 page document that will form the foundation of a research strategy and help to



Source: World economic forum, http://reports.weforum.org/global-risks-2017/shareable-infographics/

What is IRDR?

A decade-long research *program focused on Integrated Research on Disaster Risk*

INTERNATIONAL COUNCIL FOR SCIENCE

ISSC
international social science council

UNISDR
The United Nations Office for Disaster Risk Reduction

RADI

Mission:

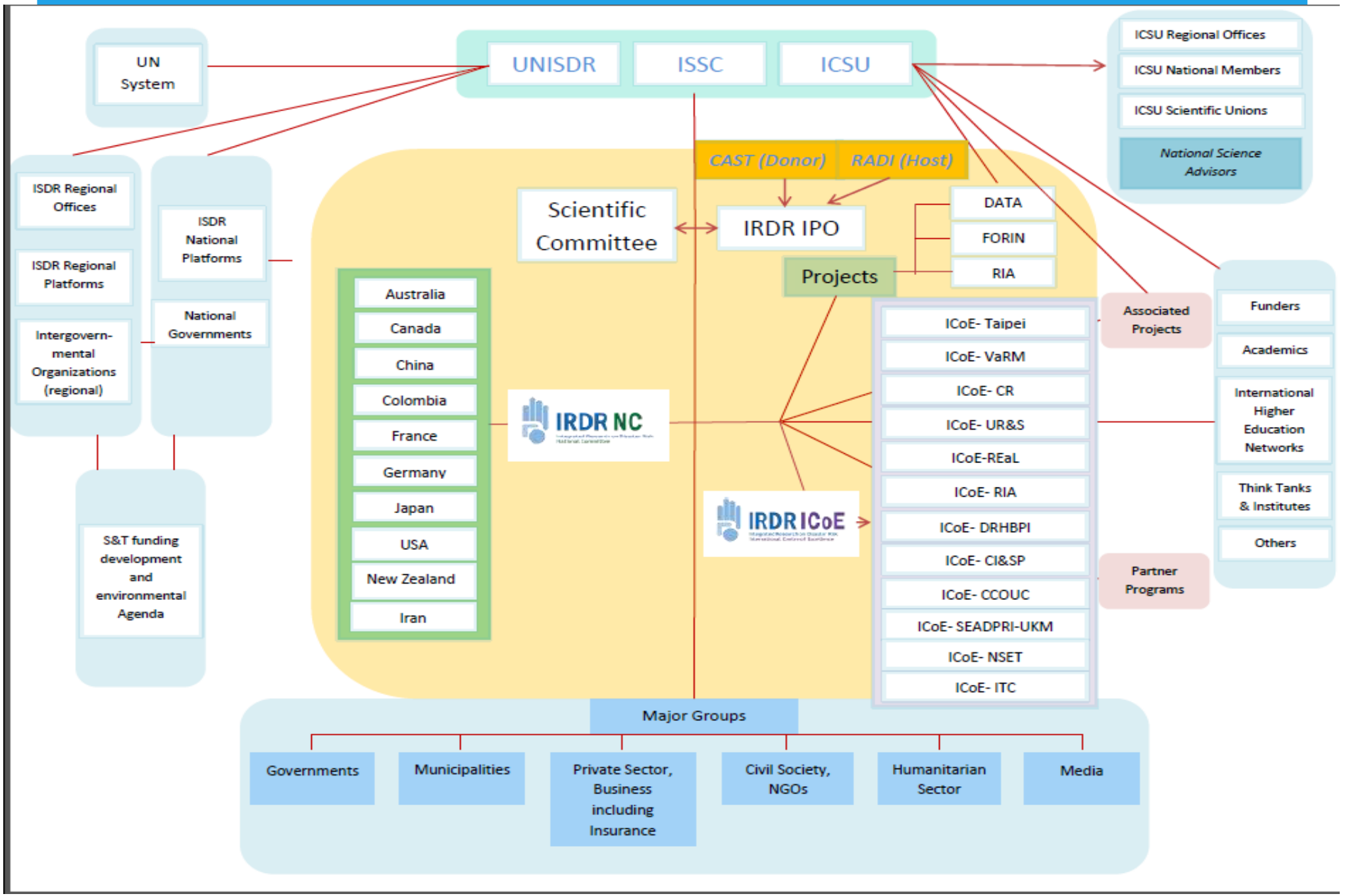
To develop trans-disciplinary, multi-sectorial alliances for:

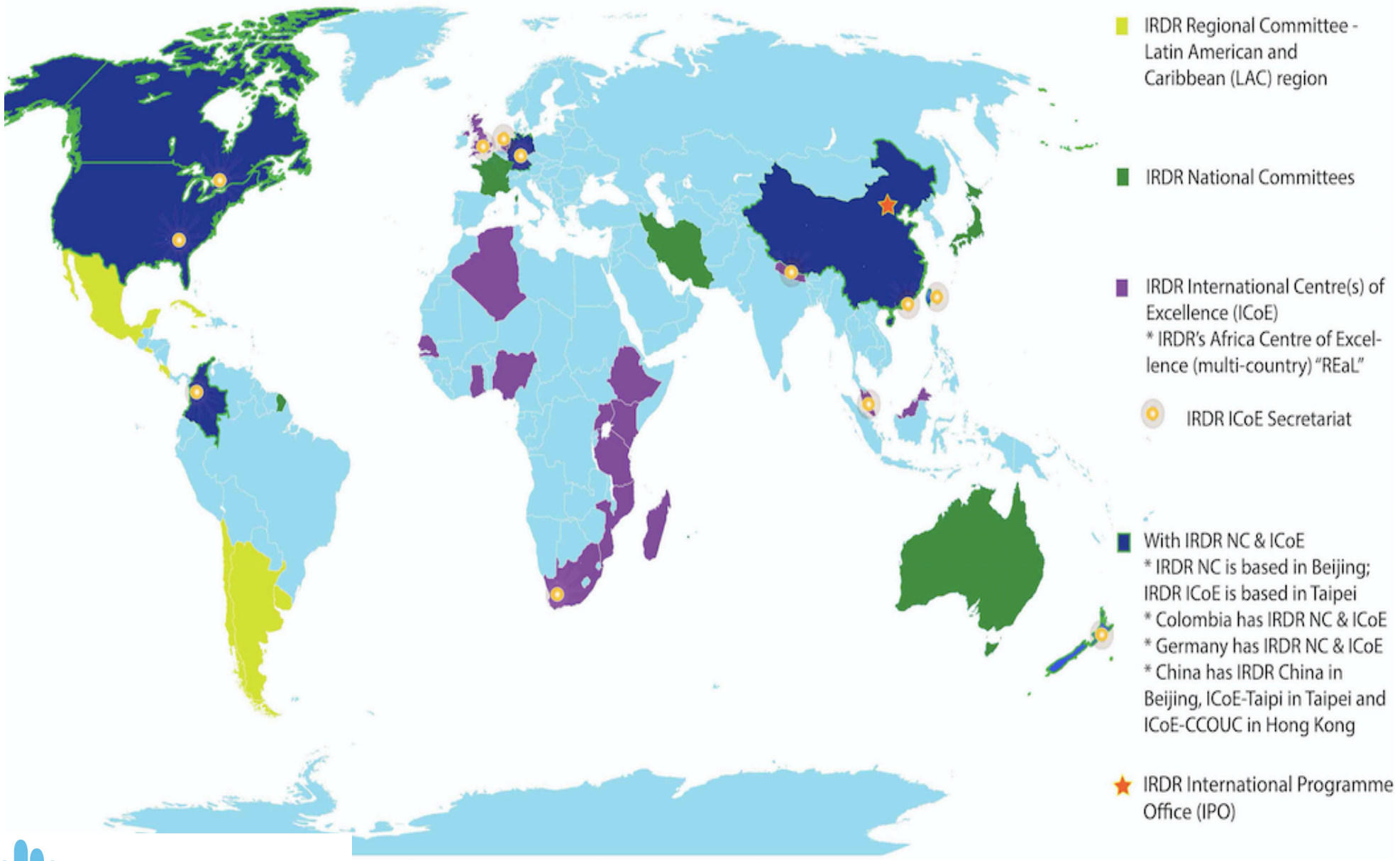
(1) in-depth, practical disaster risk reduction research studies, and

(2) the implementation of effective evidence-based disaster risk policies and practices

IRDR
Integrated Research on Disaster Risk

IRDR Structure





IRDR
Integrated Research on Disaster Risk

IRDR ICoE
Integrated Research on Disaster Risk
International Centre of Excellence

International Centre of Excellence (ICoE)

- 12 centres

Community-based Resilience, New Zealand	ICoE- CR
Risk Education and Learning, South Africa	ICoE- REaL
Risk Interpretation and Action, UK	ICoE- RIA
Capacity building, research, Taipei	ICoE- Taipei
Understanding Risk & Safety, Colombia	ICoE- UR&S
Vulnerability & Resilience Metrics, USA	ICoE- VaRM
Critical Infrastructure & Strategic Planning, Germany	ICoE- CI&SP
Disaster Resilient Homes, Buildings, and Public Infrastructure, Canada	ICoE- DRHBPI
National Society for Earthquake Technology, Nepal	ICoE- NEST
Disaster and Medical Humanitarian Response, Hong Kong	ICoE-CCOUC
Disaster Risk and Climate Extremes, Malaysia	ICoE-SEADPRI-UKM
Spatial Decision Support for Integrated Disaster Risk Reduction, the Netherlands	ICoE-SDS IDRR

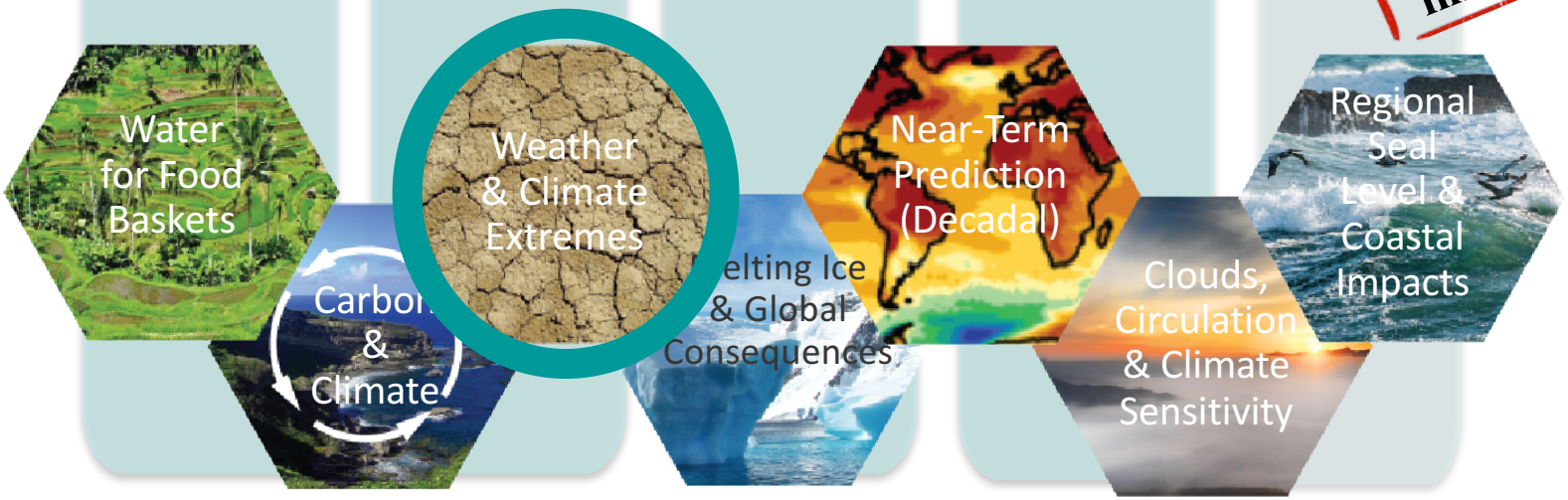
World Climate Research Programme (WCRP)

Joint Scientific Committee | **Joint Planning Staff**

Modeling Advisory Council | **Data Advisory Council**

Working Groups on: Numerical Experimentation (WGNE), Seasonal to Interannual Prediction (WGSIP), Coupled Modeling (WGCM), Regional Climate (WGRC)

focused
measurable
collaborative
innovative



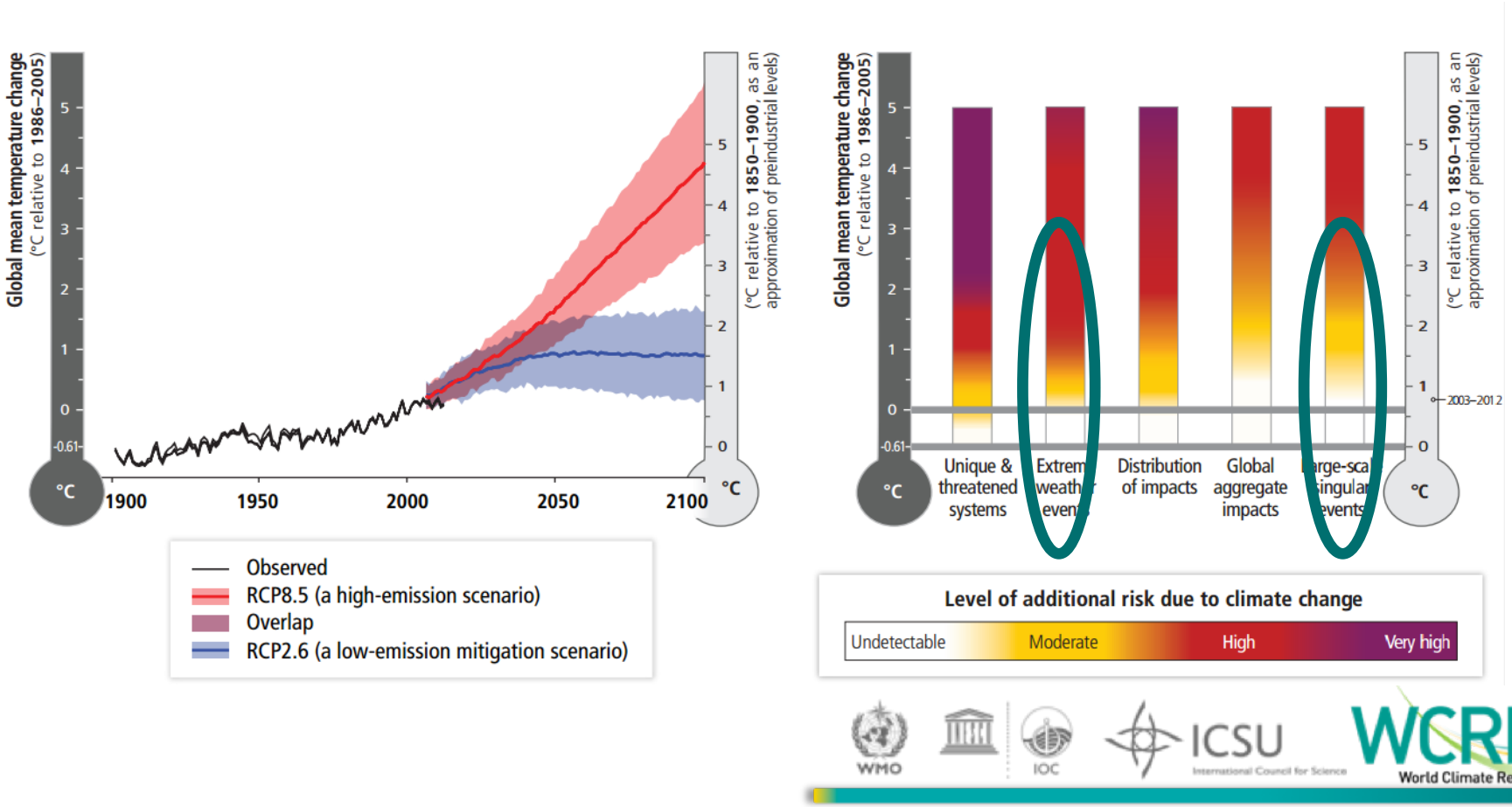
https://www.wcrp-climate.org/grand-challenges/gc-extreme-events

WMO IOC ICSU International Council for Science WCRP World Climate Research Programme

WCRP Perspective on DR3

Global environmental change will affect the likelihood of **extreme weather and climate events, which are among the key reasons for concern related to increasing global temperatures** as they can have huge and costly impacts on ecosystems, natural resources and human society. Climate change will amplify the changes in weather and climate extremes we have seen so far and **can reveal also unexpected or abrupt changes and tipping points.** These are **mediated through rapid social changes** including urbanization, lifestyle, land use and socio-economic inequality.

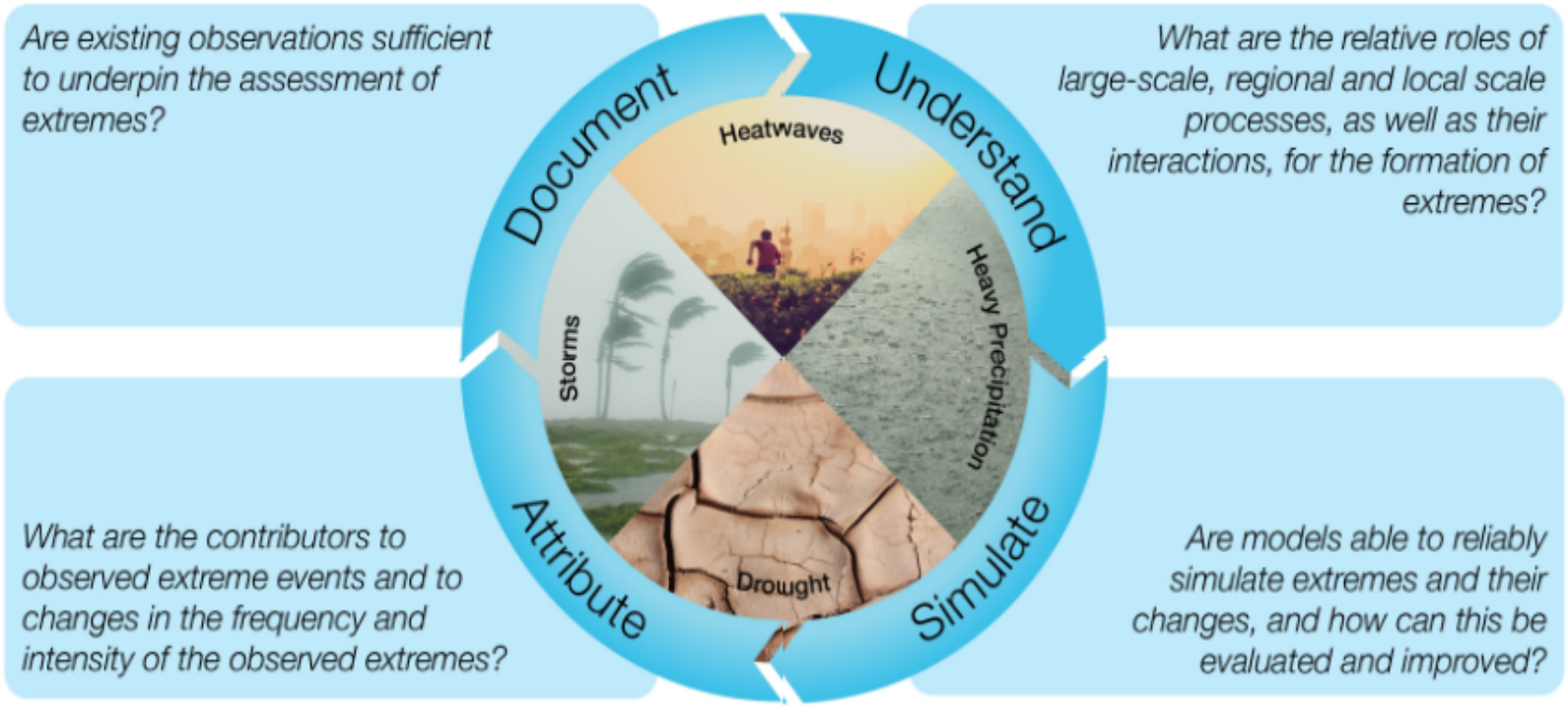
Climate-related risks associated with key reasons for concern (IPCC 2014)



WMO IOC ICSU International Council for Science WCRP World Climate Research Programme

WCRP Perspective on DR3

Grand Challenge on Weather and Climate Extremes



Focus on research <u>across temporal and spatial scales</u>:
From global to regional and covering past, present, near-term and long-term future

WMO IOC ICSU International Council for Science WCRP World Climate Research Programme

Towards Extreme Events and Disaster Risk Reduction KAN initiative

Markus Reichstein, Fumiko Kasuga & Thorsten Kiefer *(Future Earth),* Mark Pelling (IRDR), Jana Sillmann *(WCRP),* Dorothea Frank & Miguel Mahecha *(Future Earth E³S)*

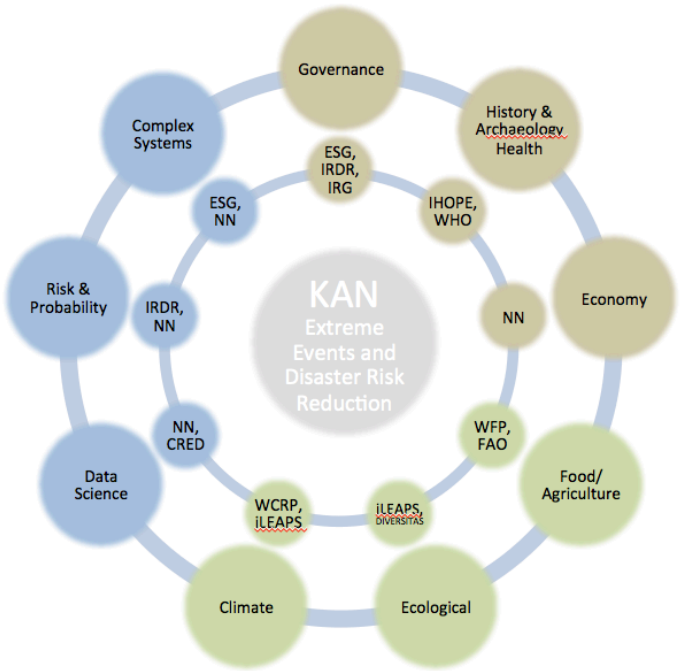
Background: 2016: E³S cross-community co-design workshop

1. Towards society-relevant metrics for climate extremes and their impacts
2. How to project climate extremes that really matter? – A transdisciplinary approach for new narratives of climate extreme impacts in the Future Earth context
3. Adaptive capacity of coupled socio-ecological systems to absorb climate extremes
4. Impact of hydrological and marine extreme events on coastal systems. Adaptation strategies and community resilience
5. Integrated Governance of Disaster Risk and Financial Uncertainties for Sustainable Development
6. Detecting, understanding and responding to extreme events: Towards a multi-dimensional "U3" data-and-knowledge base

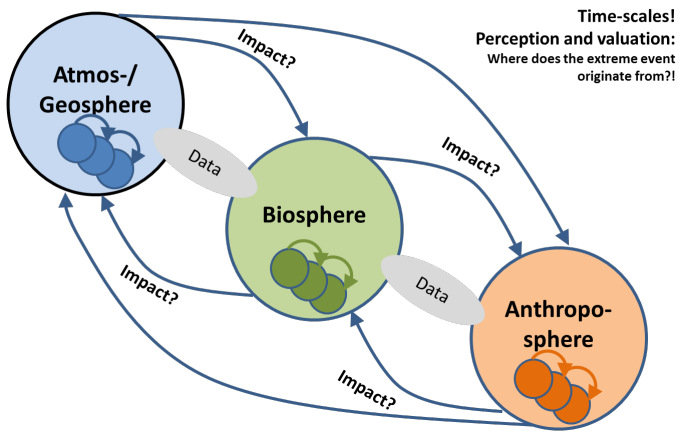
Present: Objectives of KAN co-proposed by Future Earth, WCRP, IRDR

- To build a global partnership and network of science excellence across disciplines to accelerate integration and synthesis for ground breaking and solution oriented research for disaster risk reduction and its governance under global environmental and societal change
- To jointly identify priorities and support complementarity of research on systemic risk including the interaction of climate-change induced extreme events and other disasters
- To explore and enhance the role of science as an active participant in transformation to sustainability and resilience through systematic research, facilitation and convening roles among diverse science communities and in collaboration with stakeholders

Extreme events Disaster Risk Reduction KAN – proposed aspects



System-cascading effects of extreme events



Major Working principles proposed to the Belmont Forum

- Provide an open platform for scientific communities
- Define scientific focus with being added value
- Engage with societal actors from local/national/international levels
- Stimulate groundbreaking and solution-oriented scientific research
- Follow a common risk framing and terminology across science and practice
- Address systemic, complex and cascading risk to contribute to the Sendai Framework on DRR, UNFCCC, Sustainable Development Goals
- Support informed decision-making and societies seeking to transform

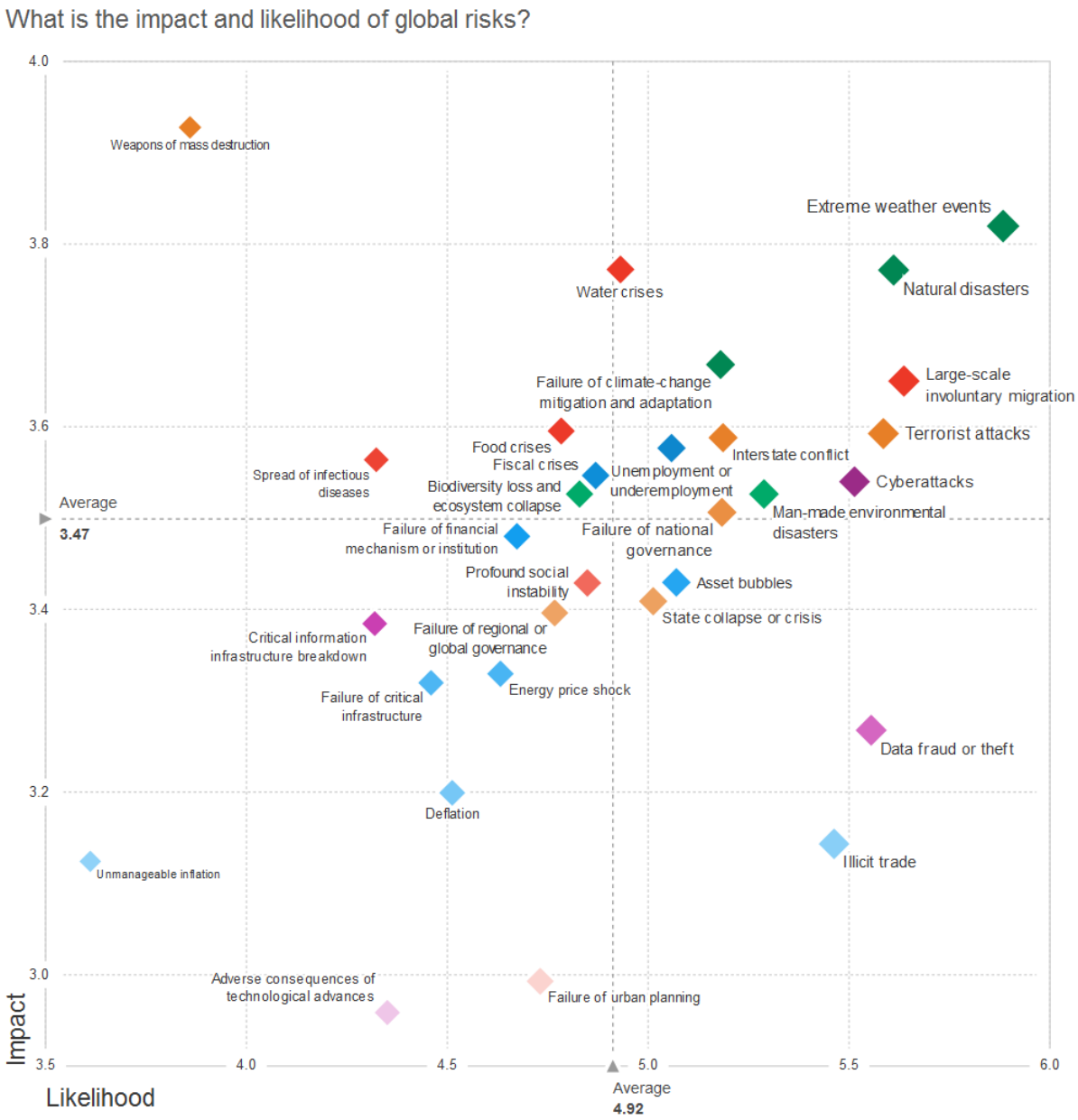
Strength in collaboration

By collaborating through the KAN, the programmes can

- Cover wide range of scientific expertise and identify and fill the gaps
- Provide integrative synthesis capacity across disciplines
- Jointly engage and contribute to international stakeholders
- Share experiences and methodologies in research and stakeholder engagement and resources
- Share funding opportunities
- Collaborate in capacity building

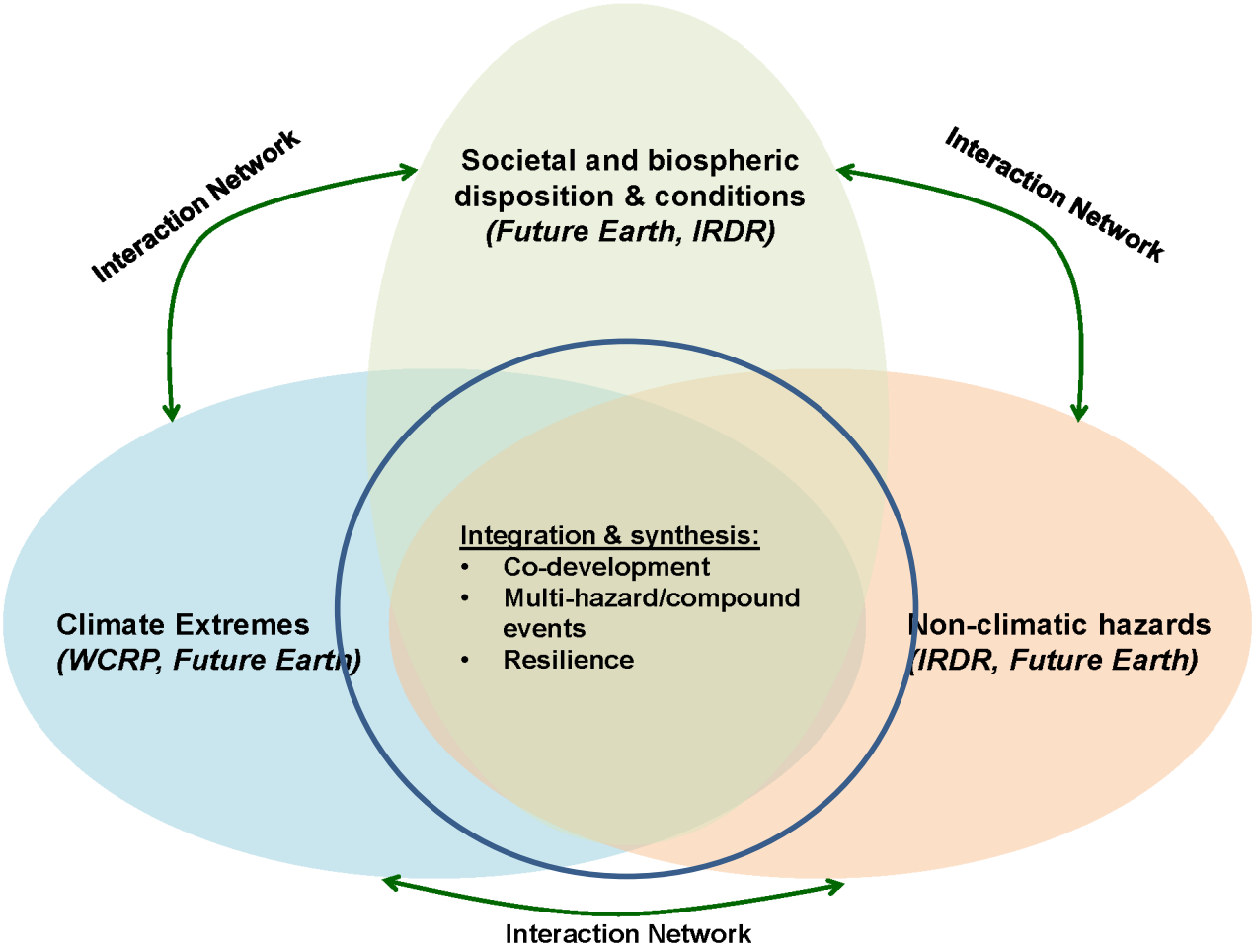
Key question examples (from KAN Document):

- What are the expected most serious potential impacts that might be caused by extreme events in the future across different sectors?
- What are the largest obstacles to overcome across and between sectors (lack of knowledge, lack of governance, etc.) in order to find and establish sustainable and just solutions?
- What are meaningful indices to describe and quantify extremes, their impacts and transitions to more sustainable and just development pathways?
- What are the most important measures to achieve resilience and transformation of development pathways?
- What kind of data needs urgent attention in order to better identify the factors and mechanisms that determine the location, intensity, and frequency of various extremes?
- How can science, research, teaching and learning be best positioned to support more resilient and sustainable development pathways?
- How to incorporate knowledge into decision-making tools and wider governance contexts to better deal with global systemic risks with unintended consequences?



Knowledge-Action Network (KAN) on Emergent Risks and Extreme Events

- Reducing Disaster Risks under Environmental Change -



行政法人 國家災害防救科技中心
National Science and Technology Center for Disaster Reduction

Smart Preparedness and Capacity Building for Enhancing Regional Disaster Resilience

- information, scenario, big data and PPP

Wei-Sen Li

Secretary General

National Science and Technology Center for Disaster Reduction (NCDR)

Belmont Forum, Scoping meeting CRA, "Disaster Risk, Reduction and Resilience – DR3"

5 – 7 June 2017, Florence, Italy

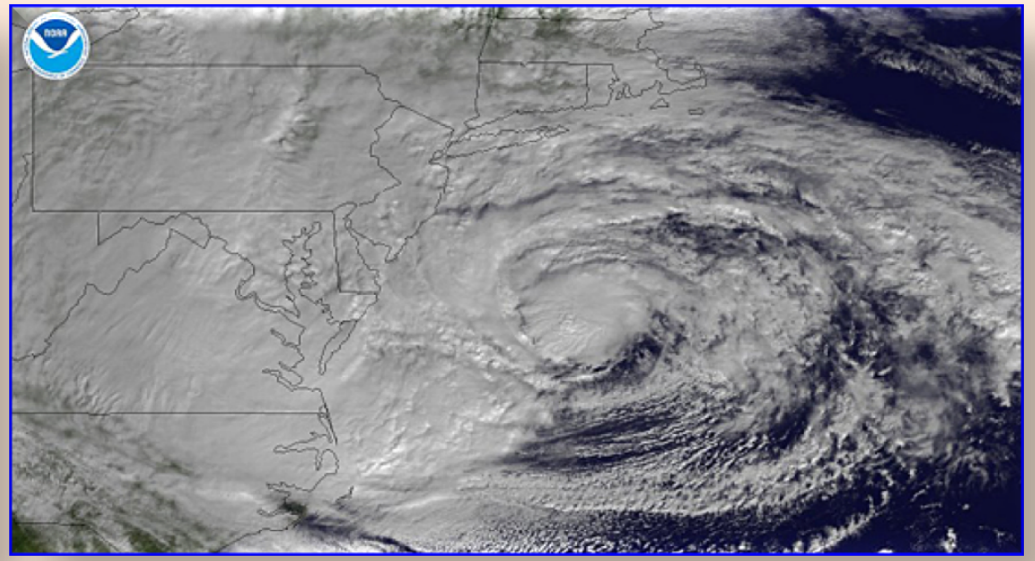
Observations of "New normal" and its impacts - "unprecedented" becomes "normal"

- **"New normal" could be found "increasing trends" in**
  - Intensity of rainfall
  - Strength of typhoons
  - Occurrence of extreme weather events (floods, droughts)
- **The adverse impacts would be amplified by**
  - Rapid and **unplanned urbanization**
  - Increasing population
  - Poor land use
  - Climate change
  - Vulnerable **global supply chain**
  - Economic activities exposed to natural hazards

Global and regional trend – "New Normal"
2015 APEC in the Philippines

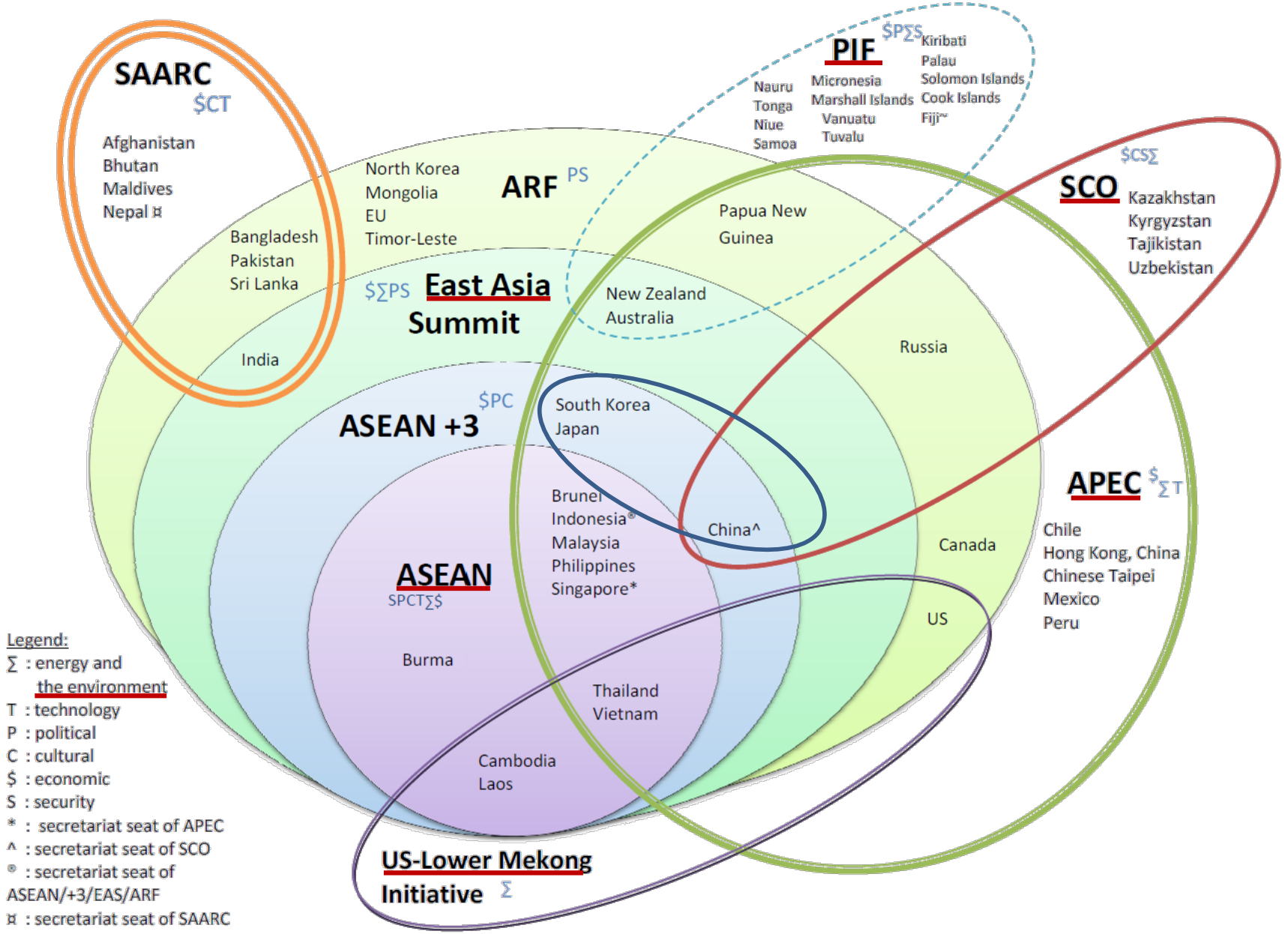
- How science, technology and research address "new normal"?
- How policy and capacity building are designed for disaster risk reduction and policy making?
- How can science, technology and research be applied to facilitate DRR collaboration between and among countries, the private sector, and international organizations?

Home elevation after Superstorm Sandy in New Jersey

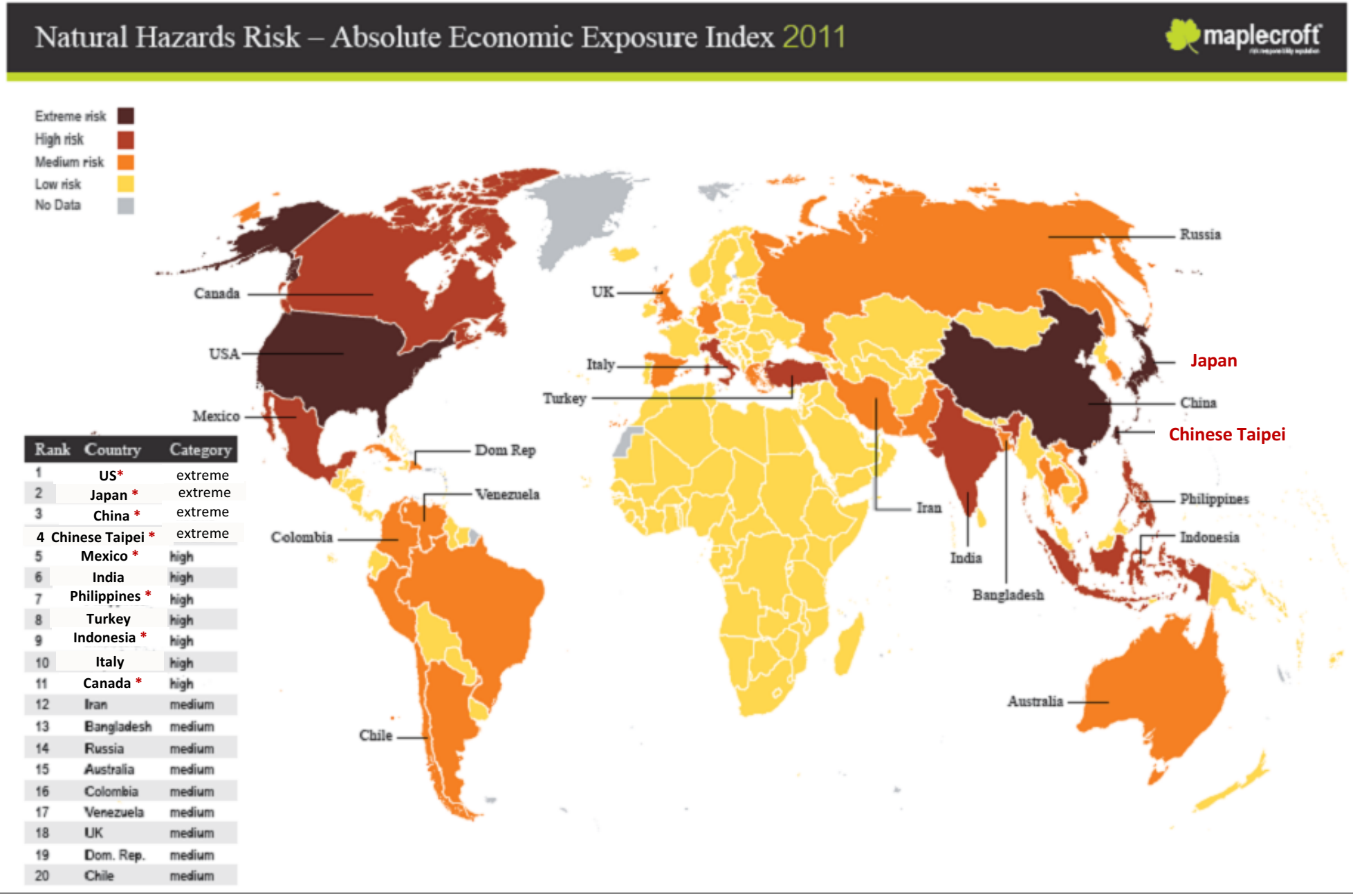


"new normal"

Regional mechanisms on DRR, other than scientific communities



“The extreme” of Absolute Economic Exposure published by Maplecroft in 2011



Rank	Country	Category
1	US*	extreme
2	Japan *	extreme
3	China *	extreme
4	Chinese Taipei *	extreme
5	Mexico *	high
6	India	high
7	Philippines *	high
8	Turkey	high
9	Indonesia *	high
10	Italy	high
11	Canada *	high
12	Iran	medium
13	Bangladesh	medium
14	Russia	medium
15	Australia	medium
16	Colombia	medium
17	Venezuela	medium
18	UK	medium
19	Dom. Rep.	medium
20	Chile	medium

Issue 1: Scenario-based information for exercise and evaluation

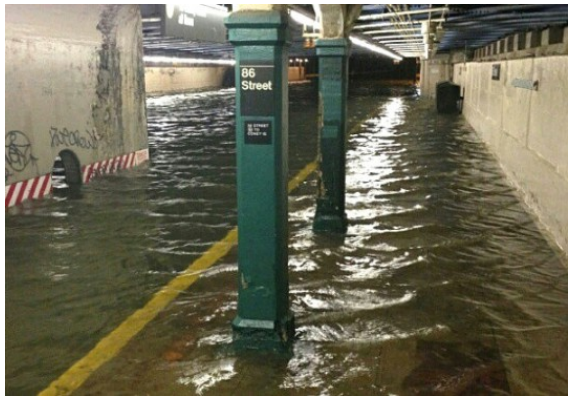
Hurricane Katrina

Typhoon Morakot

Great East Japan Eq

- **Cases of large-scale compound disasters in recent years (Black-Swam Event)**
  - 2005 Hurricane Katrina, 2009 Typhoon Morakot, 2011 the Great Tohoku Kanto Earthquake and Tsunami
  - How to make them **"gray"**
- **Problems founds**
  - 1) "Unprecedented and complicated" impacts, 2) continuously developing situations, 3) simultaneous urgent demands, 4) challenges to engineering-based measures, 5) lacks of information integration….
- **Demands for disaster risk information**
  - Scenarios tools for **planning and drills**
  - Information system for providing **situation awareness**
  - **quick-relief demands** after large-scale compound disasters
  - Study of **evolutional characteristics** of compound disasters

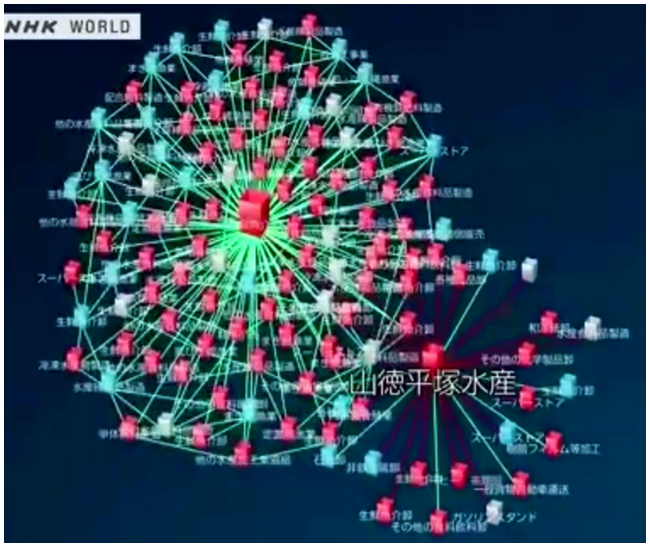
Issue 2: Climate change adaptation strategies with disaster risk reduction



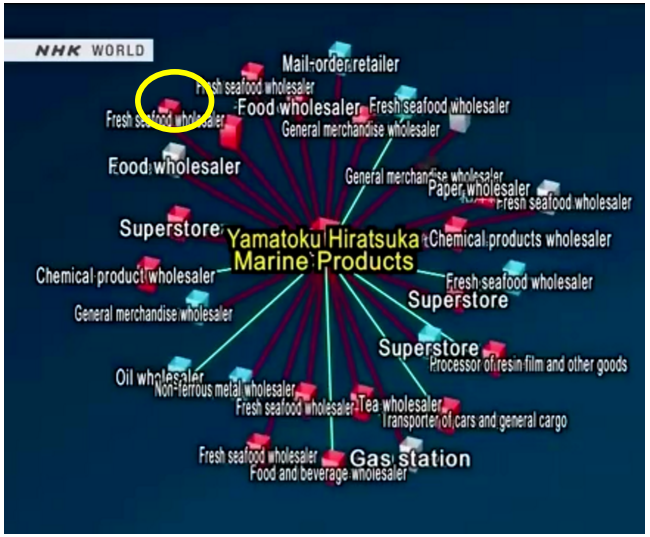
Extreme events

- **Challenges of climate-change-related disasters**
  - Direct impacts: *1)* Higher temperature; *2)* Sea level rise; *3)* Rainfall distribution change; *4)* More extreme rainfall events; *5)* Typhoon and storm surge
  - **Evolving impacts**: *1)* Slope land disasters; *2)* distribution of water resource; *3)* investment on new development projects…..
  - **Change rules and practices to do business**
- **Demands for develop CCA and DRR**
  - To define **"non-regret"** measures to fit requests from both
  - Risk map to identify potential risks based on impacts by hazards like flood, slope land, land subsidence, vulnerability of costal areas

Issue 3: Comprehensive vulnerability assessment



NHKDisaster Big Data
- Key to recovery



- **Overlapping of hazard map and business operation on exposure to identify "hot spots"**
  - Considered social factors: *1)* population density and structure, *2)* education and income, *3)* economic activities, *4)* past events and perception, *5)* social support, *6)* insurance ….

Problems founds due to social development

- *1)* Rapid urbanization, *2)* land use management, *3)* aging society, *4)* vulnerability of indigenous tribes, *5)* tools for risk communication, *6)* disaster resilience at community level ….

Products to be delivered

- **Network of doing business**
- Models for loss estimation
- Establishment of Social-economic Vulnerability Index

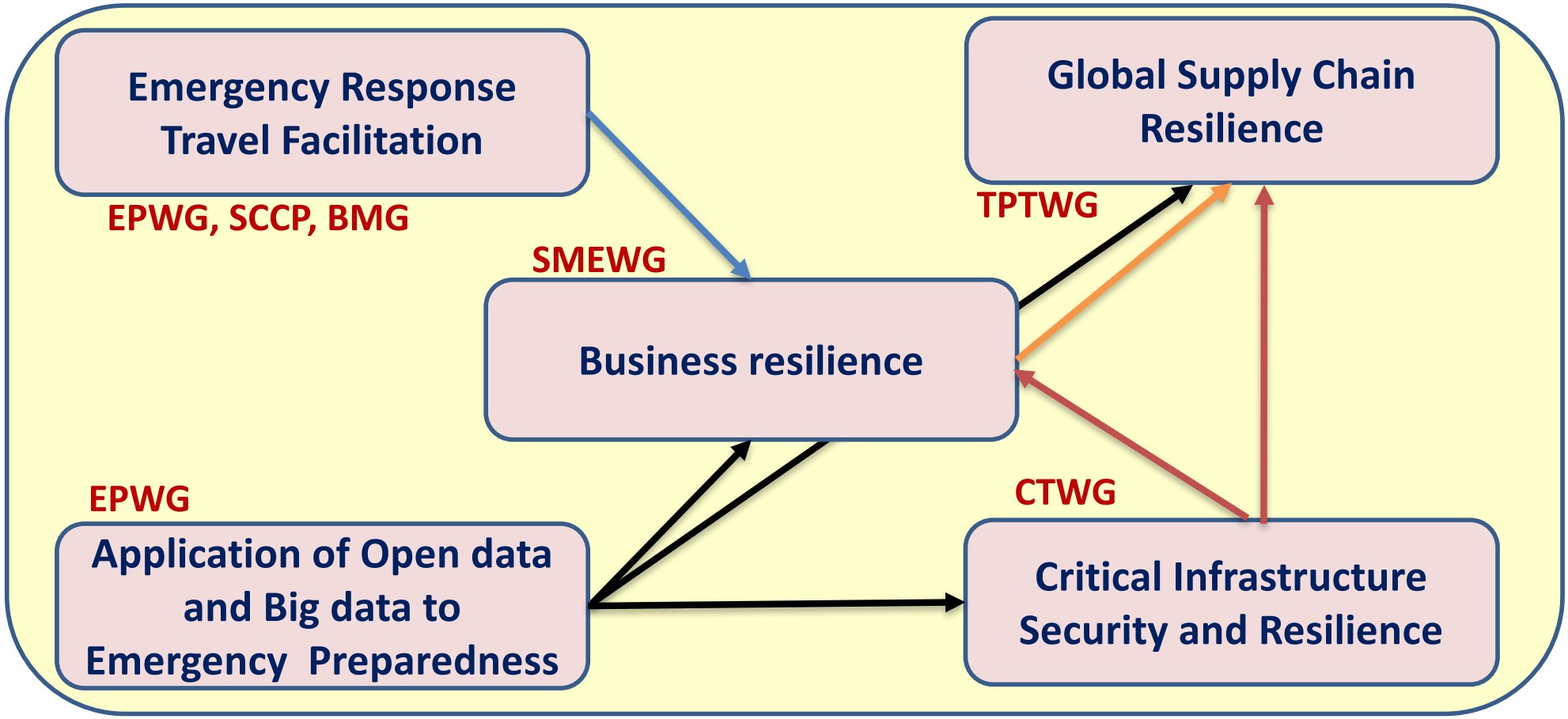
Issue 4: Critical infrastructure protection under threats from natural hazards

Typhoon Aere, 2004

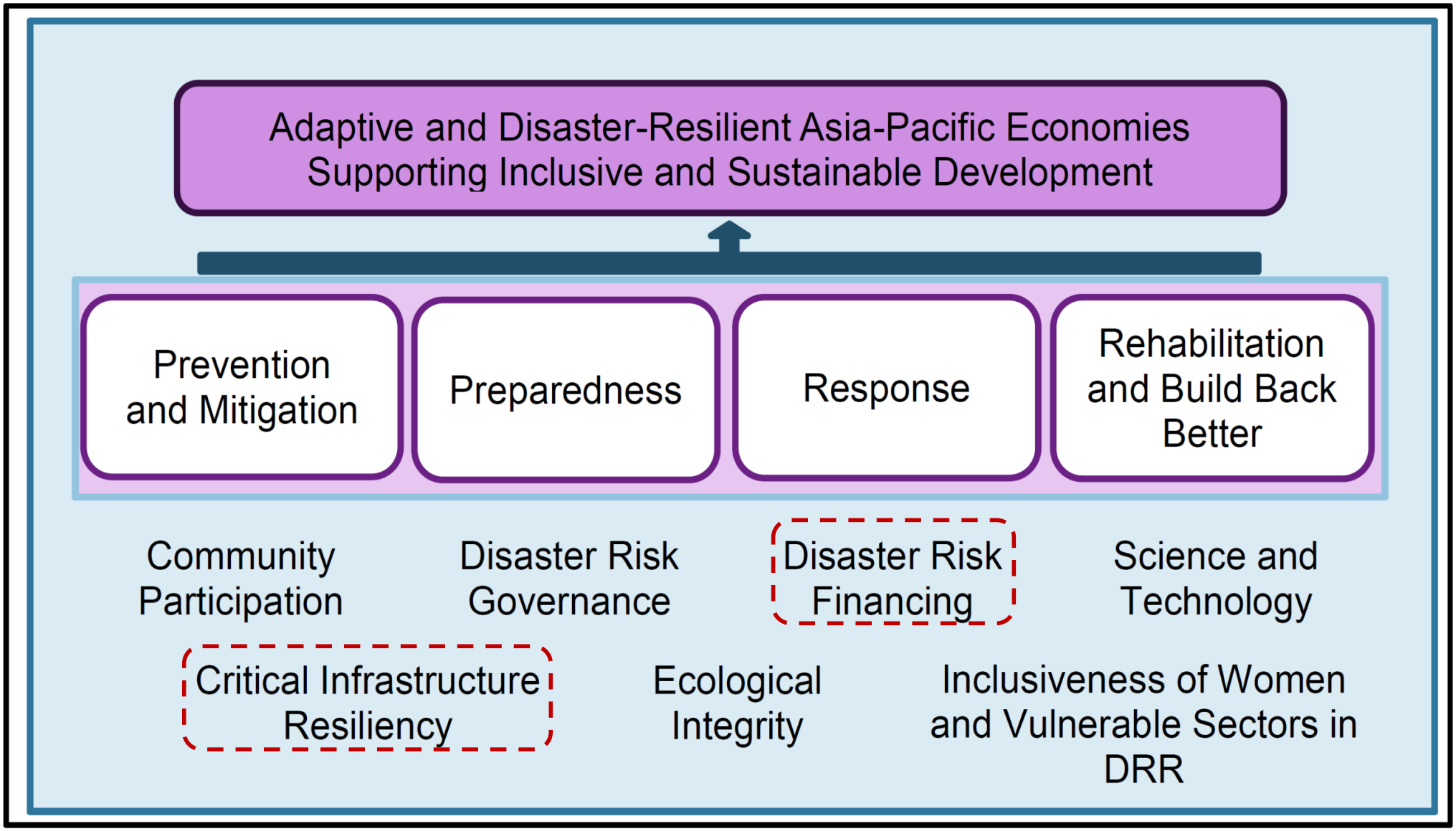
Chi-Chi Earthquake, 1999

- **Threats**
  - CI is lifeline system to maintain daily life
- **Problems founds due to CI's failures**
  - Security issue
  - **Government and business operation continuity**
  - Basic civil protection
  - Direct impacts to people's livelihood.
- **Current developments for improving critical infrastructure protection**
  - Failure modes to individual hazards by risk assessment
  - Impact evaluation of system(s) failure
  - Status indicators for **monitoring system satiability**

Further comprehensive collaboration on business resilience through regional synergy



APEC Disaster Risk Reduction Framework - endorsed in Oct. 2015



Innovations by making use of data and information to make stakeholders connected

learned lessons actions after Typhoon Marokot in 2009

Too much or too little information at emergency operations

- Channels to acquire useful information – multiple sources
- System of systems to integrate information – demand-oriented

Lack of common operating picture to coordinate actions

- Potential risk maps for planning – real time video + GIS info.
- Situation maps for operation – decisive operations

When and how to make timely operations

- Well-organized teams – evidence-based decisions
- Digital emergency preparedness – information sharing

Smart preparedness on open data and big data

- **Information intelligence**
  - Data Organizing
  - Data Analyzing
  - Data warehousing
  - Data Presenting
  - “Extract”, “Transform” and “Load”
- **Use to big or open data**
  - Data archives
  - Cloud system
  - Data format
  - Exchange protocols
  - Official sites or social media
- **Basic type of data sets**
  - Physical vulnerabilities
  - Social vulnerabilities
  - Historical events
  - Numerical models
  - Observations
- **Inclusive stakeholders**
  - Governments
  - Research institutes
  - NGOs, NPOs
  - Media, social media
  - Citizens, netizens

The major challenges

- **In order to apply "Big data and Open data" for better and smarter emergency preparedness, the major challenges to overcome**

1. **Volume**: overwhelming amount of data sets, how to identify relationship for integration, especially social media and press
2. **Velocity**: during urgent moments, pop-up situations and information could hamper decision making, through the Internet and smart devices
3. **Varity**: different and diverse data sets are required to delivered information or maps by request, before during and after disasters
4. **Verification**: duplications or rumors from difference sources need rules and synergy to focus real issues, to trace and clarify rumors

Integration of big data sets based on demand

- **Source of Data**
  - produced, updated and maintained by **20 more regulating governmental agencies**
  - Number of big data set: **over 120**
  - Major four categories of data sets: fundamentals, monitoring, modeling and situation
- **Mechanism of data sharing and maintenance**
  - “Clouds”
  - Service-Oriented Architecture
- **Major challenges to overcome**
  - Mutual trust
  - Afraid of “openness”

Solutions

- Build up loyal partnership
- Top-down determination

How NCDR applies science and technology for disaster risk reduction and management

Ministry of Sceince and Technology

Propose topics

Supervise
Provide operation funds

NCDR

Since 2003

100 full-time staff
- Natural science
- Social science
- Engineering
- Emergency management
- Business management

Major services
- S&T transfer
- S&T innovation
- Knowledge base
- Data base
- International collaboration

Major products
- Applied and inter-disciplinary research
- Policy of DRR for central and local government
- Information integration
- Emergency operation (not search and rescue)
- Identification of urgent needs and long-term demands
- Integration of potential risk maps

Partners and key stakeholders

Public sector
- **Central government**
  - Ministries and agencies
- **Local Government**
  - Municipalities and townships

Private sector
- Universities, research institutes
- **NGOs, NPOs**
- **Communities**

International outreach
- IRDR, ICoE Taipei
- ADRC, NIED, DPRI (JP)
- PDC (US)
- ADPC (TH)
- NDMI (KR)
- APEC EPWG

Aggregating big data for open data–

"Cross-cutting Synergy" , "Information sharing", "Actionable"

- Collect 200 big data sets from 20 agencies
- Categories: basic, monitoring, models and historical

- Adopt advanced model to process for early warning

- Produce common operating pictures under decision supporting system

Integration

Data
Live data
Monitor
History

Database
Basic
Monitor
Disaster
GIS

Value-added

Information
Who,
what,
when,
where,
how

Services

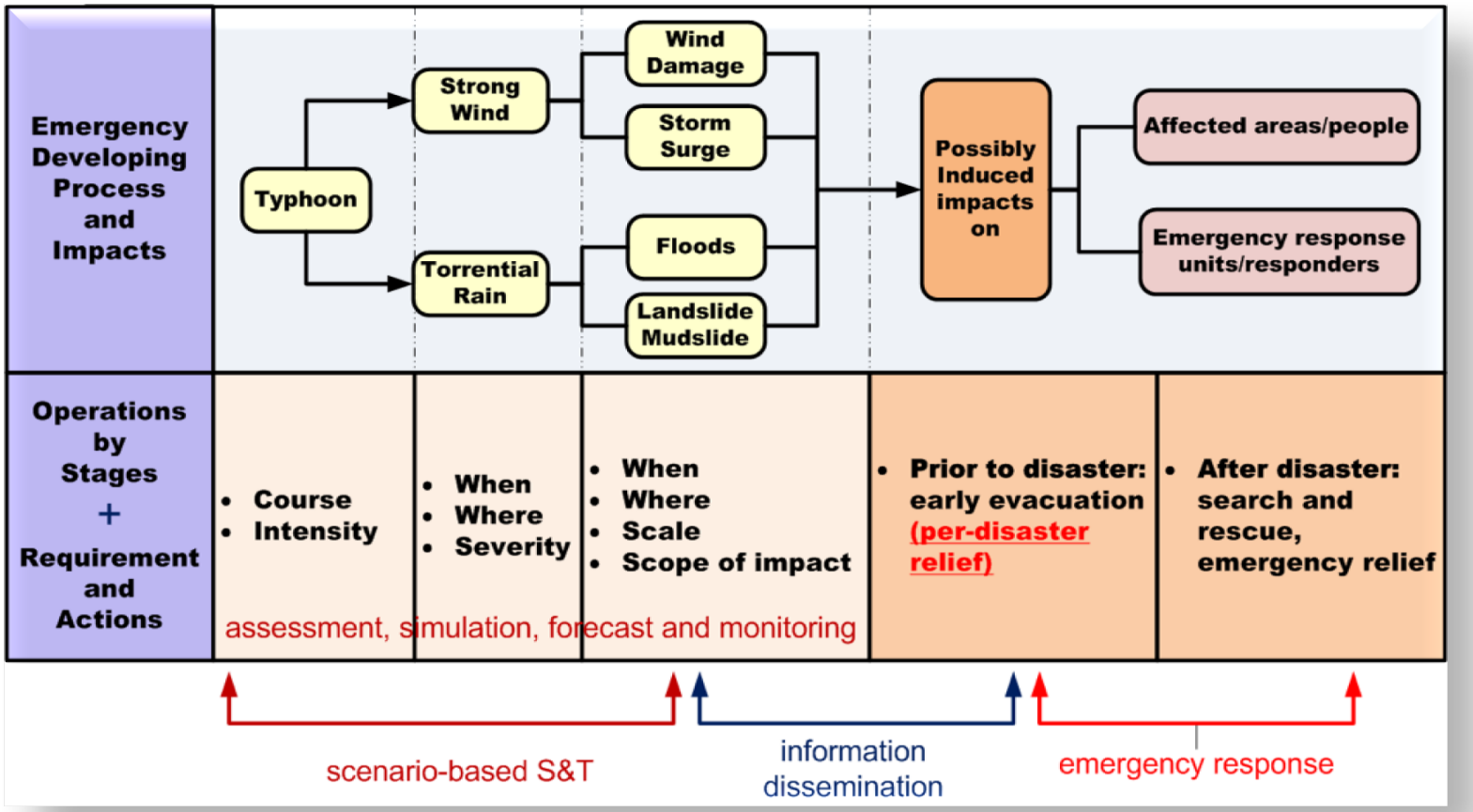
Actions
Evacuation,
Deployment,
Responses,
……..

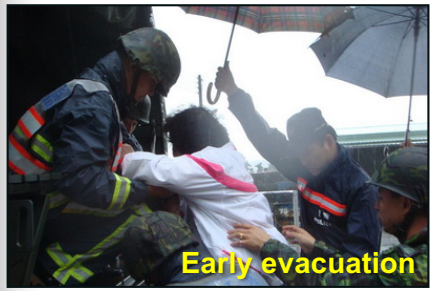
Information Platform for Disaster Management

Portal to access information	Registration	Authorization	Information Exchange service
	Categorization	Integration	
Maintenance operations			

Using science and technology during typhoon emergency operation

Teamwork and dialogues among scientists, emergency responders and decision makers





Scientific outputs

Cross-cutting synergies

In-time operations

NCDR works with public and private sector – from top decision makers to communities

Decision supports

- Information integration
- Common operating picture

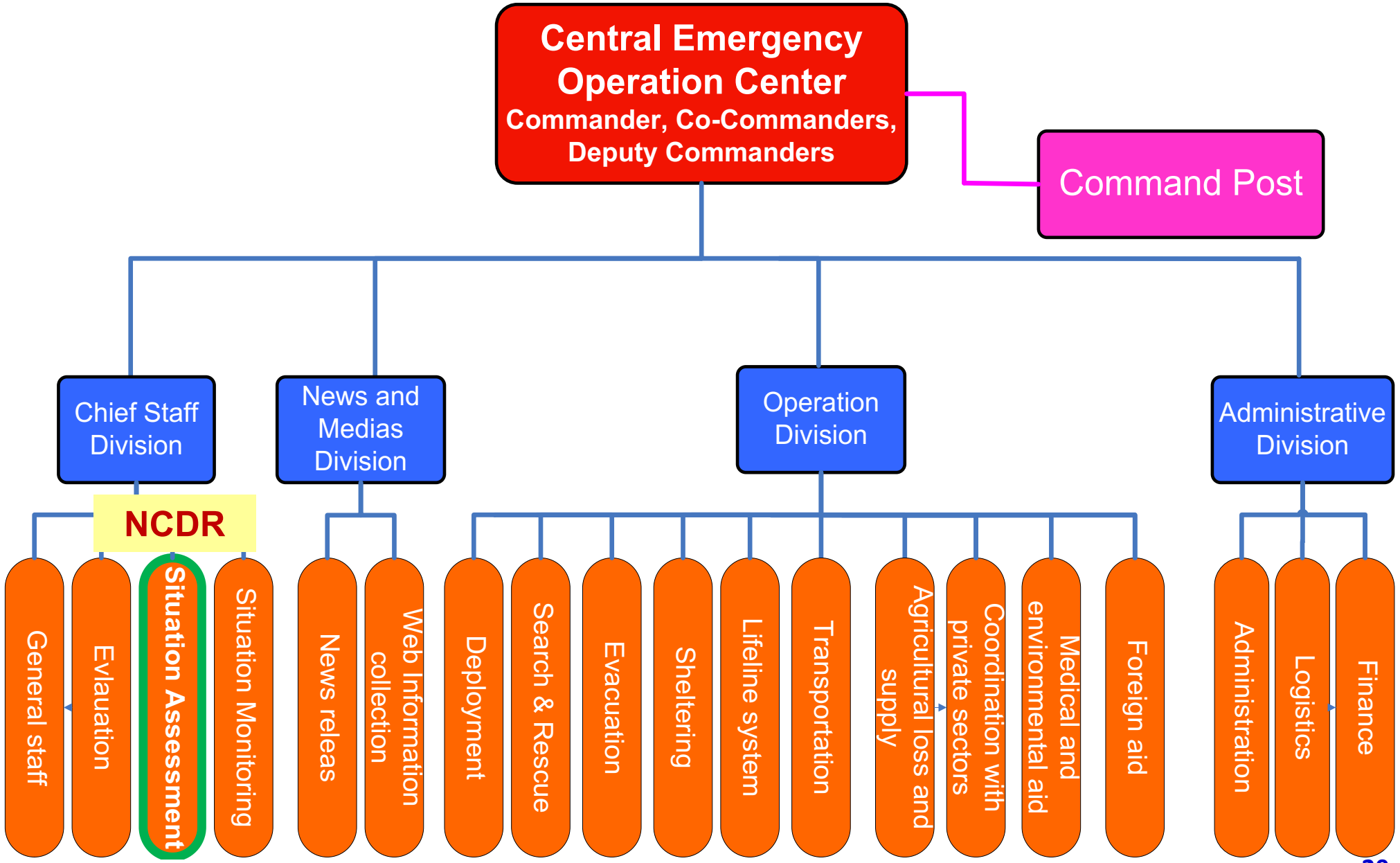
Practical implementations

- Knowledge transfer to co-work on hazard map
- Table top exercise to raise leadership

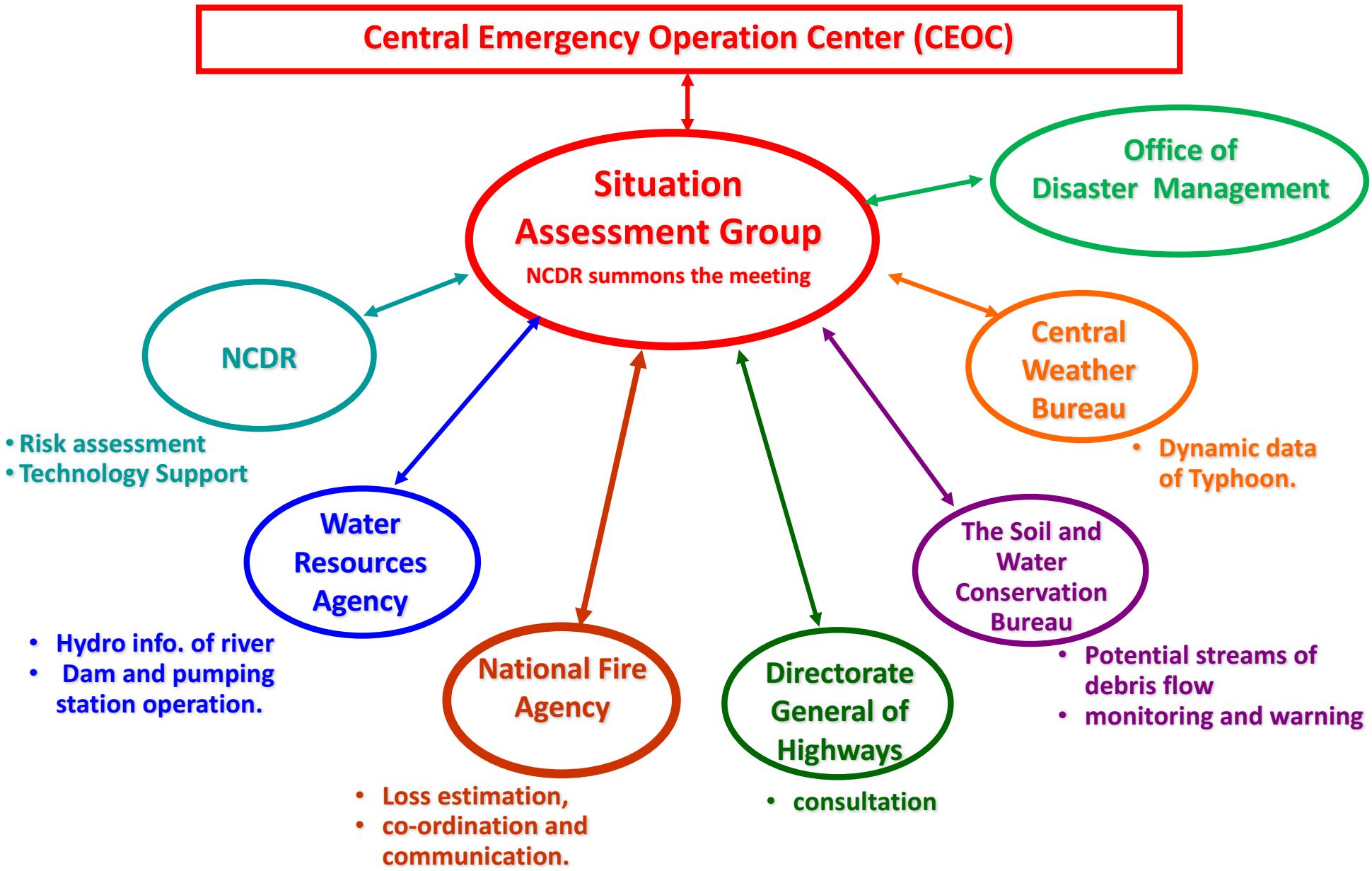
Evidence-based operation

Understanding disaster risk

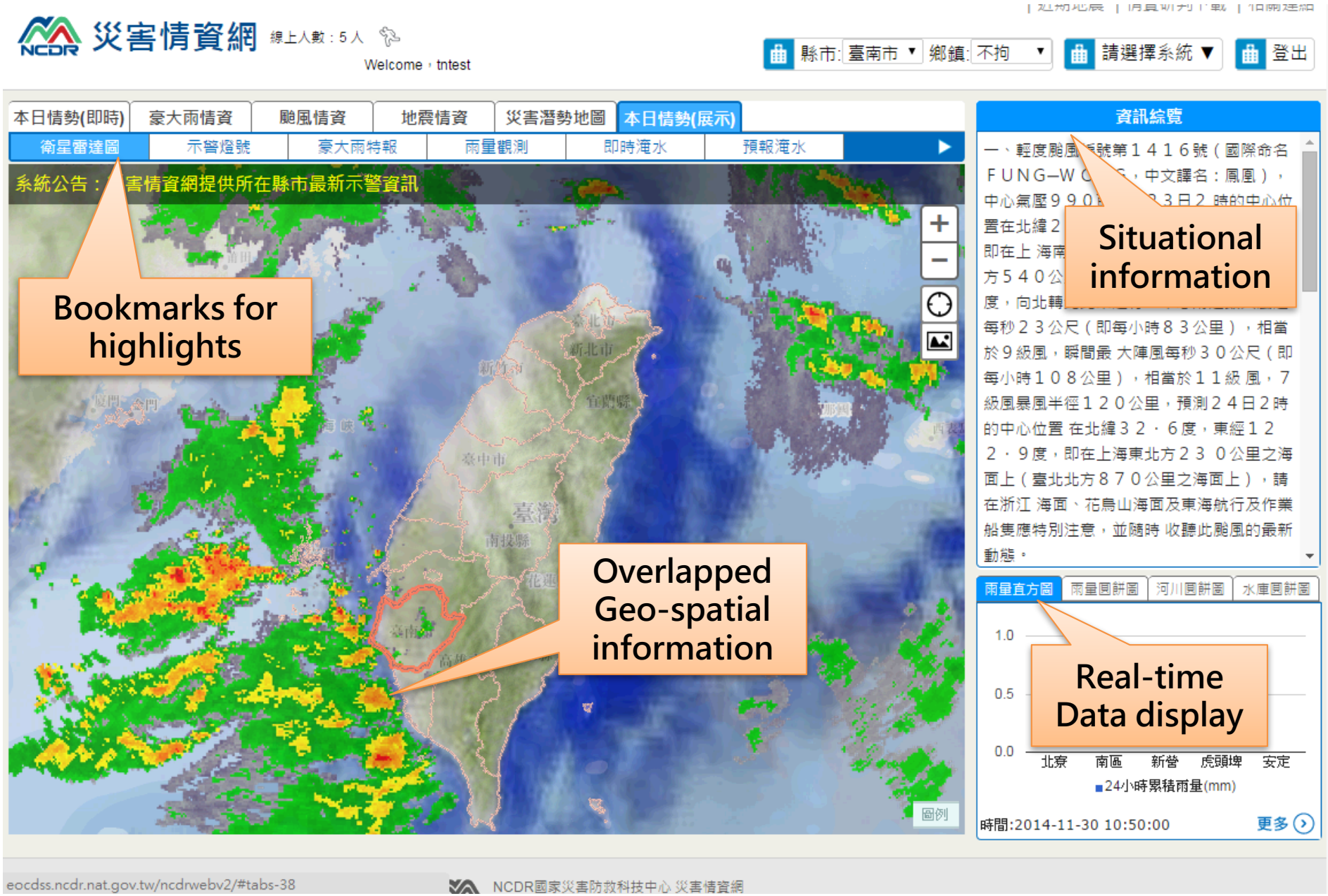
One of the key role: Helping emergency operarion



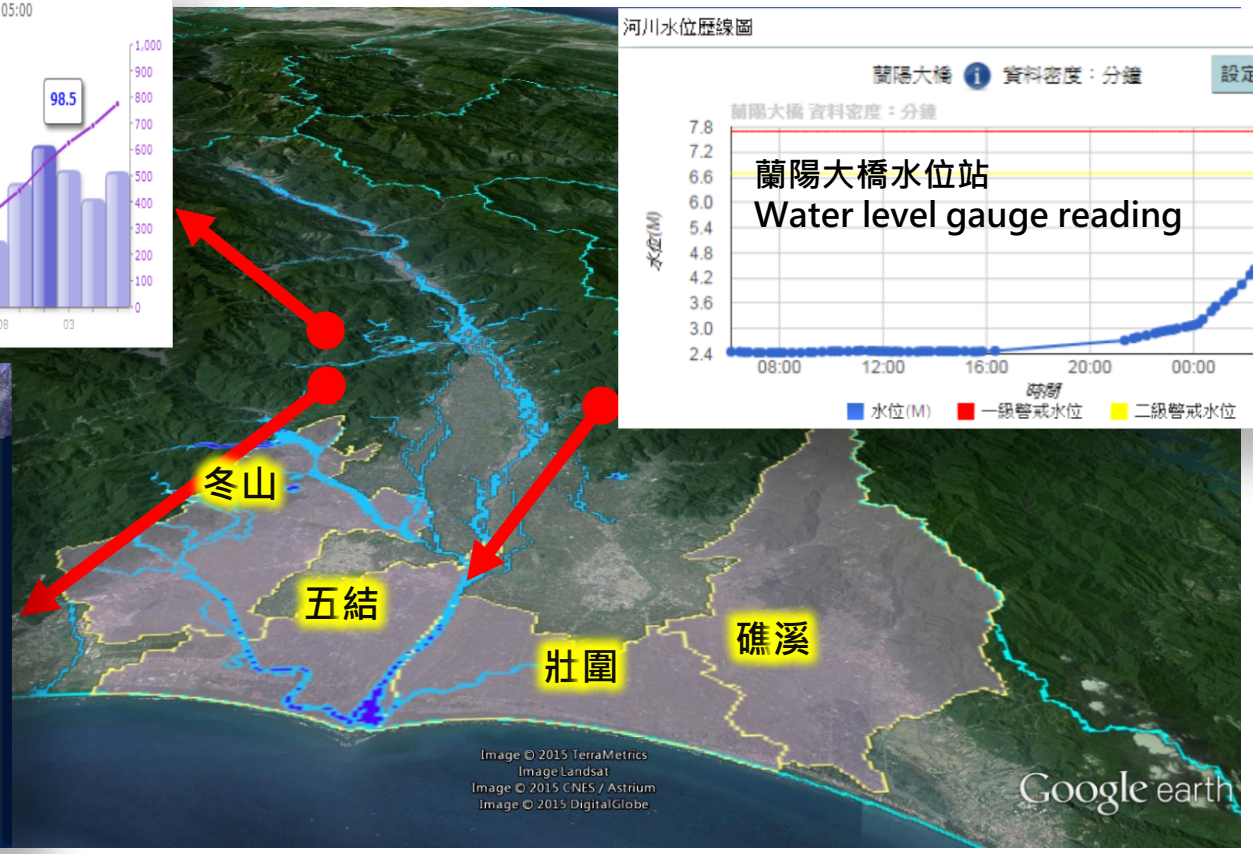
Operation of the CEOC Assessment Group (Typhoon)



Common Operating Picture through Web-GIS platform to bridge information gap at local level



Situation report about flood risk potential
- to identify location, situation and estimation



1. Numerical simulation of floods along a river basin
2. Real-time data of gauges to monitor developing situation
3. CCTV video to visualize understanding

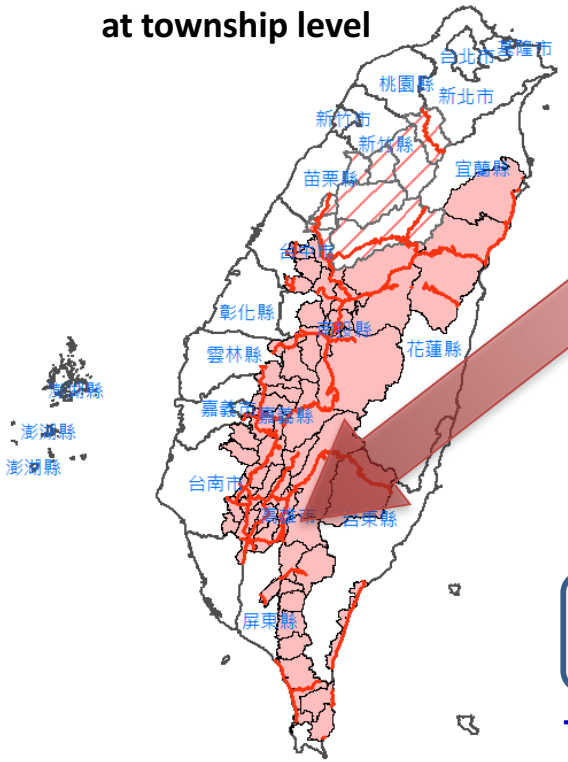
Evidence-based emergency operation
– To decide timing to conduct early evacuation

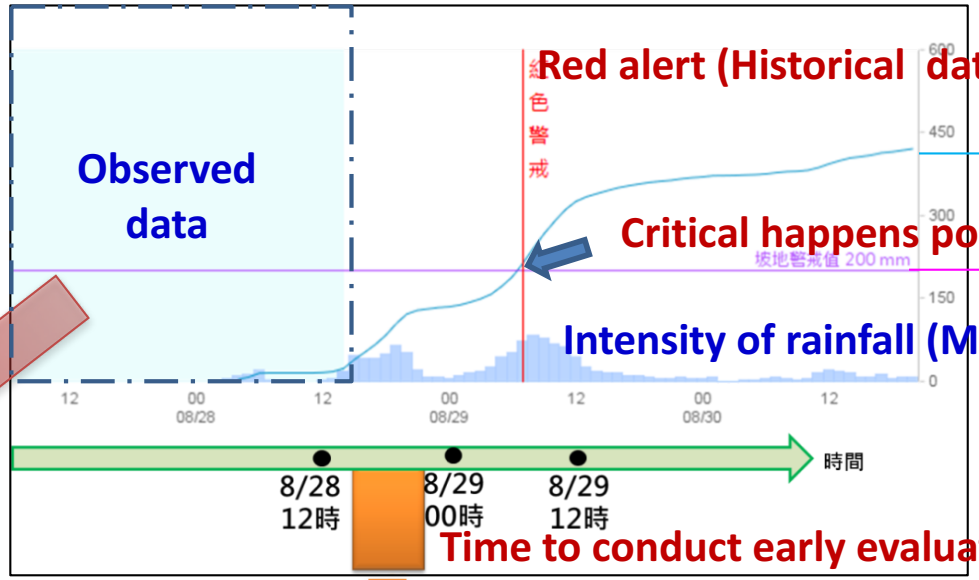
The ideal criteria to conduct early evacuations

1. **Day time: less danger to evacuees and emergency responders**
2. **Arranged transportation: to provide convenience**

Threshold value of debris flow
200 mm accumulated rainfall in 24hrs

Potential Risk Map of debris flow at township level





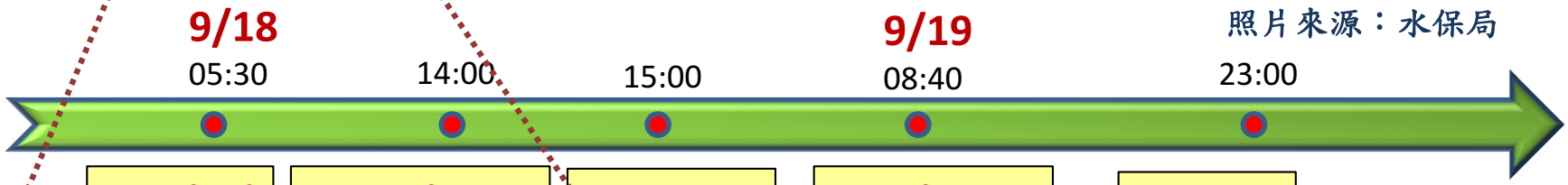
Typhoon Kong-Rey in 2013

Historical data	Observed data	Numerical models	Take Action!
Threshold value	Current situation	Forecast and nowcast	Decision maker Local residents

Case of successful early evacuation based on S& T

during Typhoon Fanapi , in Lai-Yi village, Sep. 2010

照片來源：水保局



32 hours ahead

Open Data Platform for Disaster Information (Common Alerting Protocol format)

Develop disaster information open data platform
(https://alerts.ncdr.nat.gov.tw)

Combine 14 kinds of alerts from DGPA, CWB, SWCB, WRA, THB, TRA, THSRC and etc.

Released a total of 14 categories of instant supporting information

Public-private partnership on enhancing information coverage (with Google

- Initiation of Open Data in 2013, through Google Crisis Map and Google Public Alerts to disseminate typhoon warning messages.

  Typhoon Soulik (7/10-14) : number of system access about **1.3 million**

- In 2014, the total number of accessing Google services is around **14 million**
- In 2015, the total number of accessing Google services is around **16 million**
- In 2016, the total number of accessing Google services is around **19 million**

Google Public Alerts
Location-based

Google Crisis Map
Easy-to-use

Structural diagram of PWS in Taiwan

Government Agency | Alert delivery | Broadcasting | Applications

Common Alerting Protocol (CAP)

CMAS / EAS-CAP

Types of warnings

- Big thunder storm Earthquake
- Debris flow
- Dam discharge
- Pandemics Int'l outbreak
- Road closure
- Attack incident
- Suspension of office and school

CAP messages

CAP messages

Cell Broadcast Entity

Alert Aggregator

Alert Gateway

XML API

Cell Broadcast Center

Internet Gateway

Google

APP developers

Automatic devices

D Interface

CMSP Gateway

CMSP Network Infrastructure

C Interface

Five 4G mobile service provides (15.2 m users)

2014 ~ 2015

2015 ~ 2017

Policy-framework for large-scale earthquake

Enhancement on old building
- Structural safety

1. Seismic retrofitting

Citizens' safety and support
- Evacuation and sheltering

2. Early warning & alarm
3. Massive demands

Functional continuity
- government and business

3. Business continuity plan and management

Scientific supports

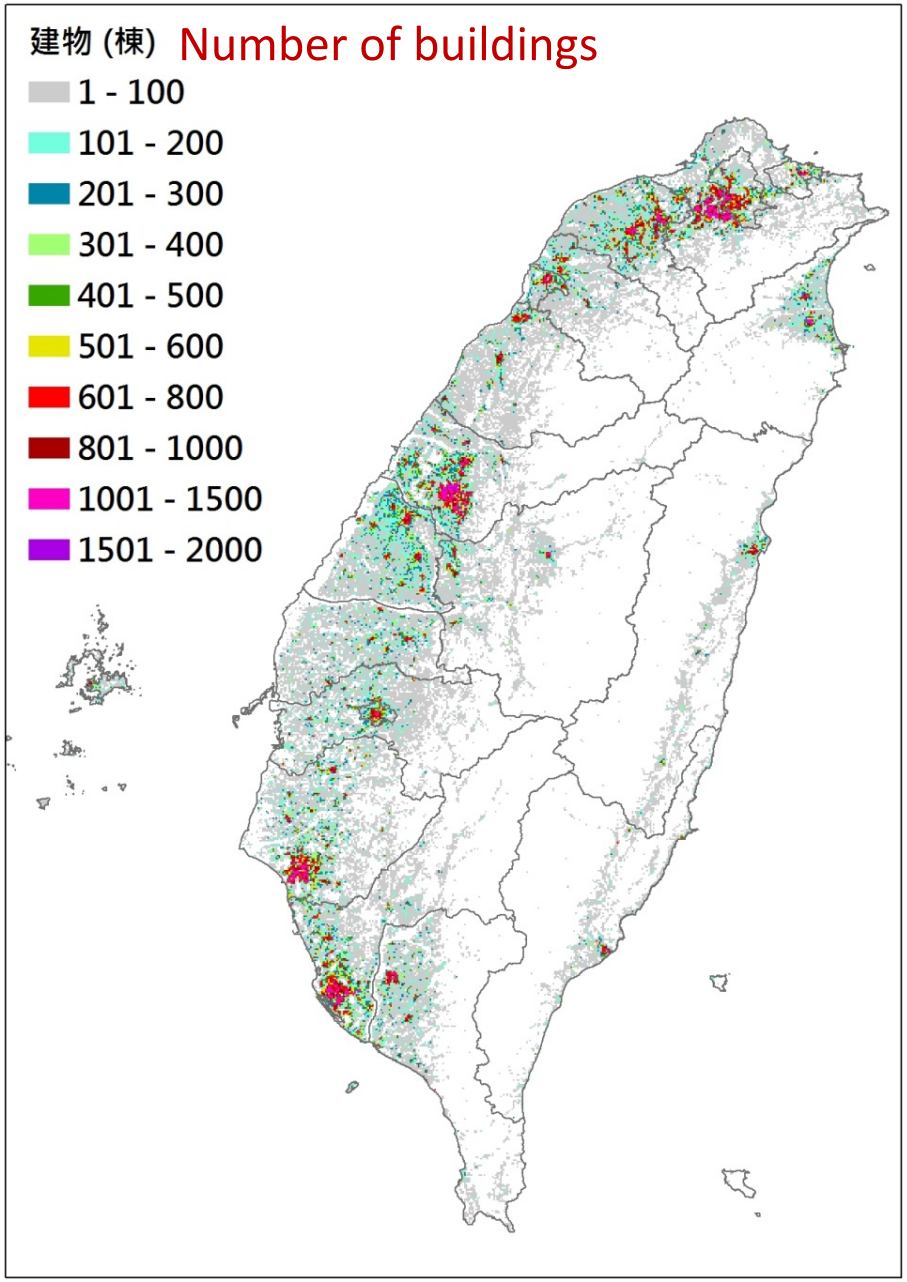
4. Scenarios and impact assessment

Practical implementation

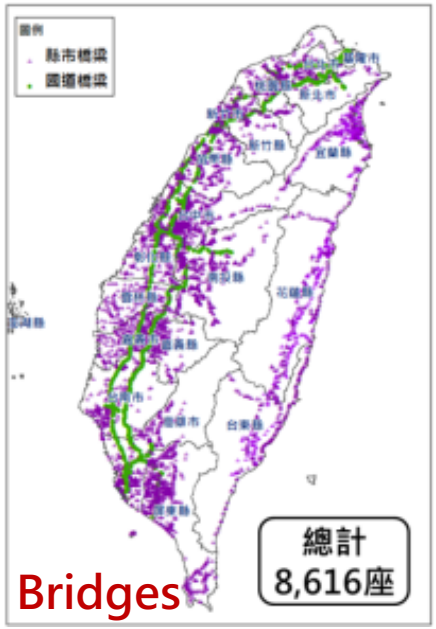
5. Perception, drill & promotions

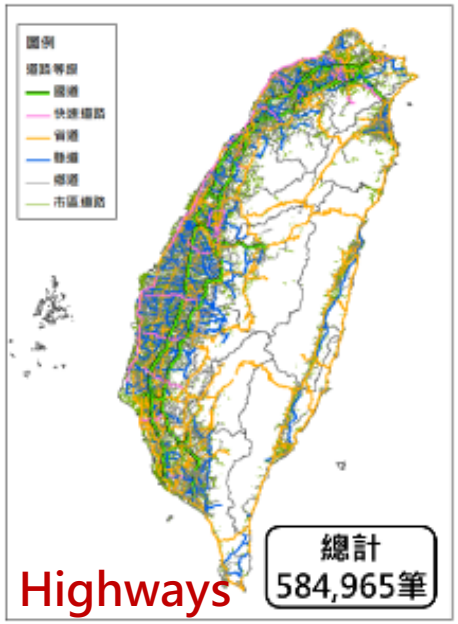
Adopting “Grid Method” to estimate impacts

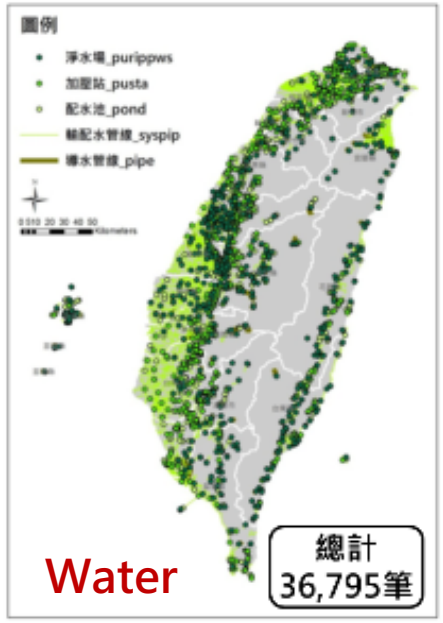
- **Basic datasets for risk and damage assessment**
  - Tax data of houses or building
  - Census data of population and residency
  - Pipeline networks of water, power and natural gas
  - Information of bridges and highway
  - ……
- **Grid size:**
  - 500m x 500m geo-spatial grids as resolution

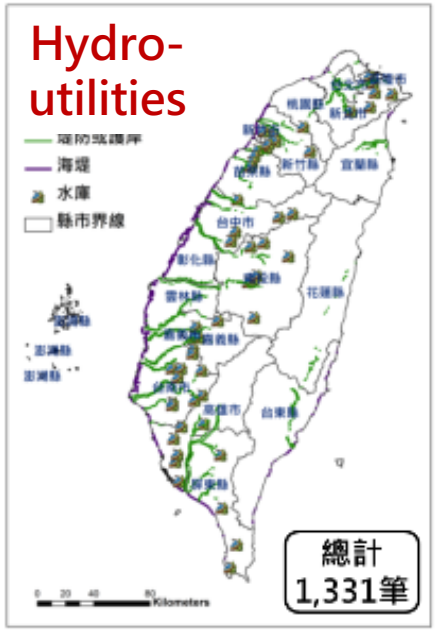


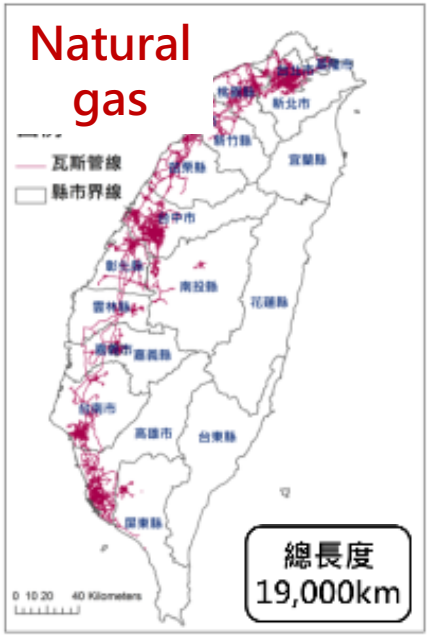
Geo-spatial distribution maps of lifeline systems

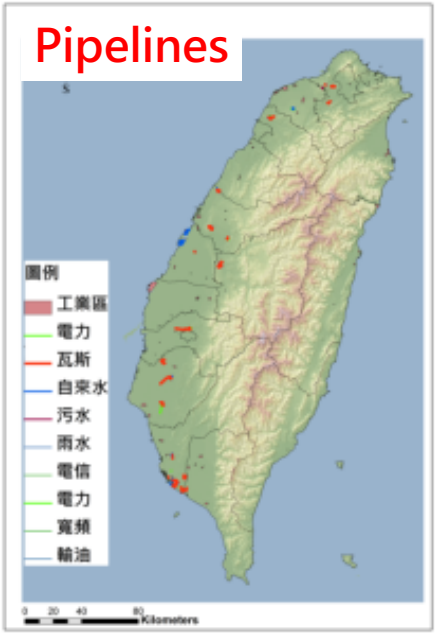




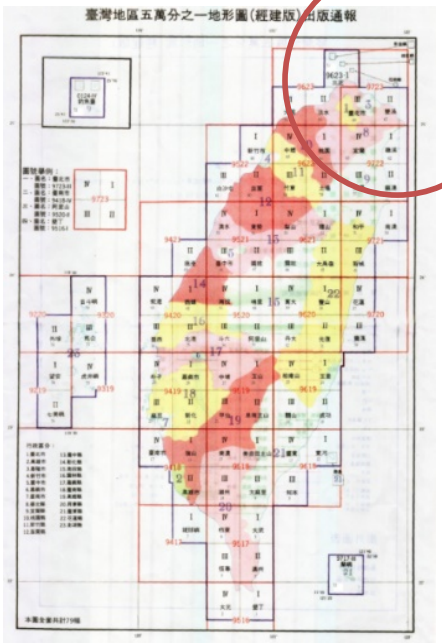


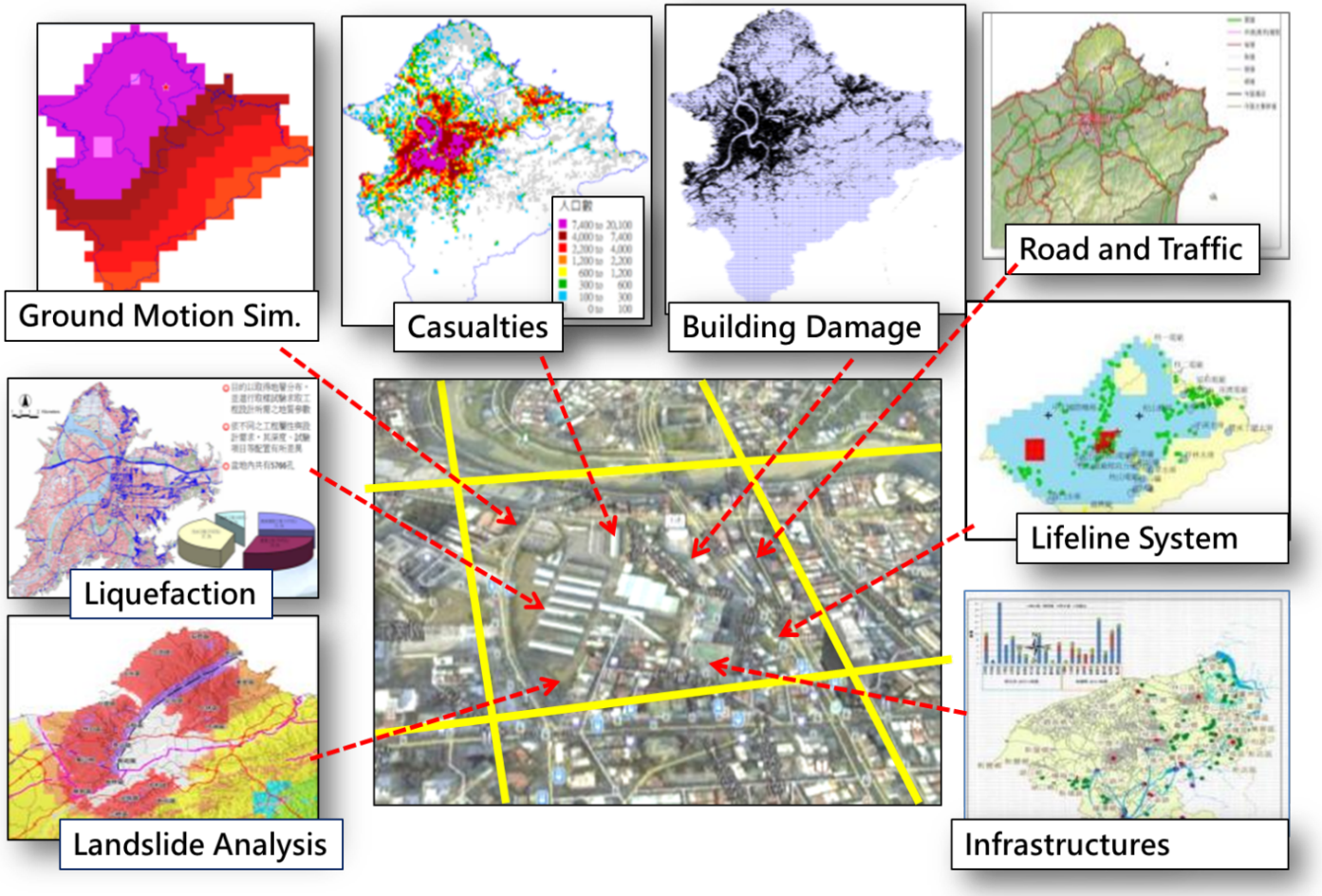






Geospatial meshed Data



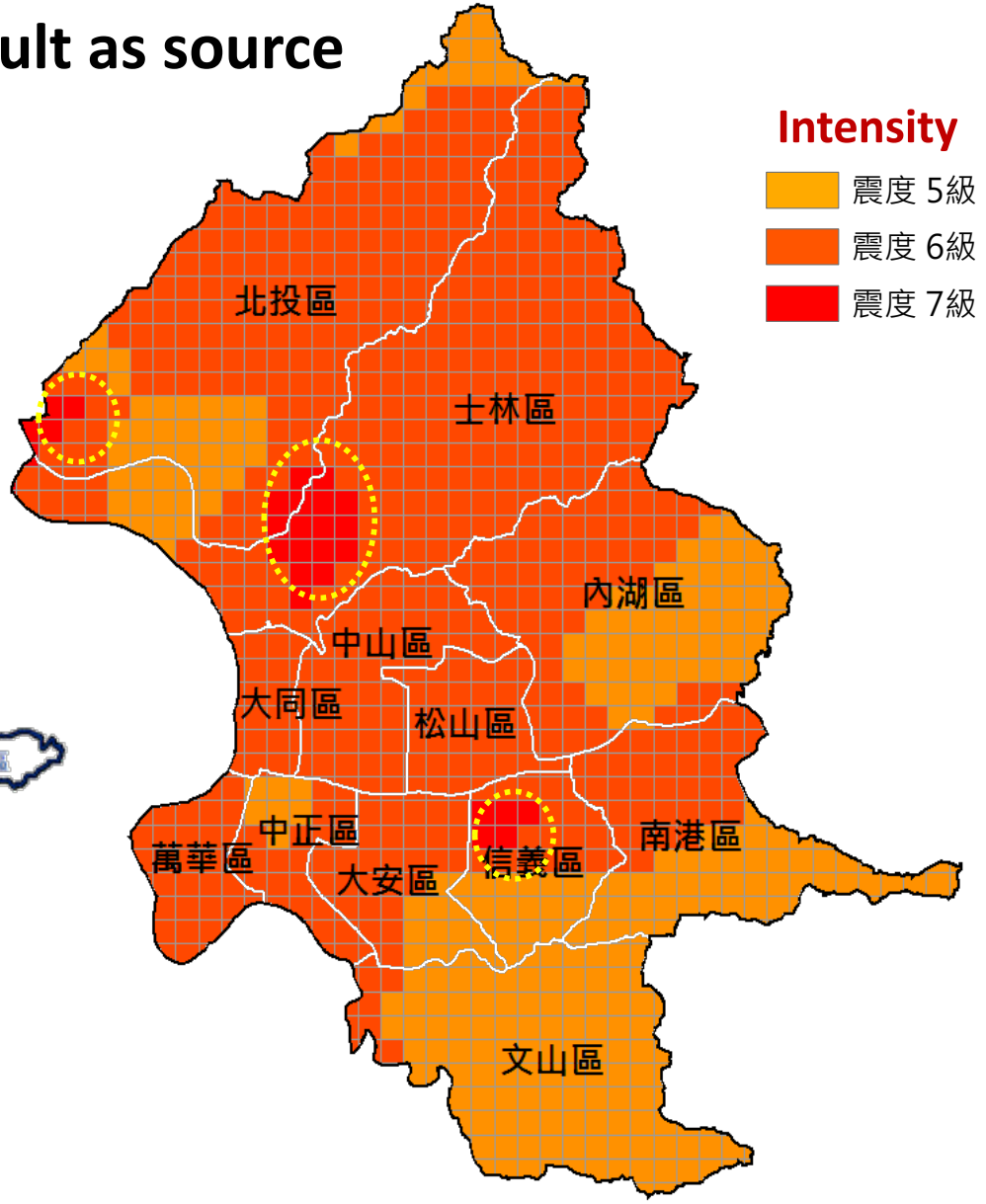


500m x 500m Meshed Map Sheet

Number of Meshes :13,2712

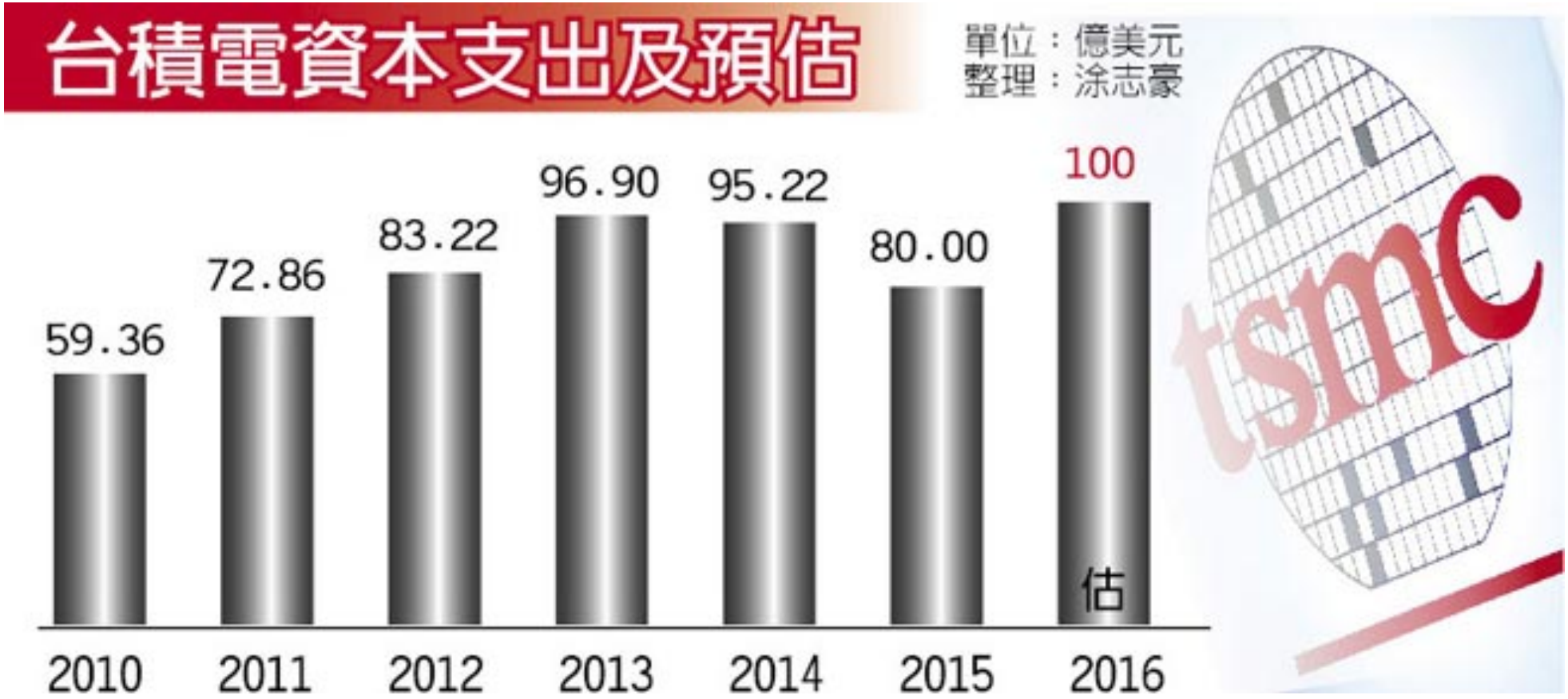
Earthquake scenarios to Taipei city

- **Scenario: selecting a specific fault as source**
  - Full dislocation of Shanchiao Fault
  - Magnitude 6.3
  - Focal depth 10km



Capital-intensive investment

- **Practice of TSMC, unit: USD 100 million**

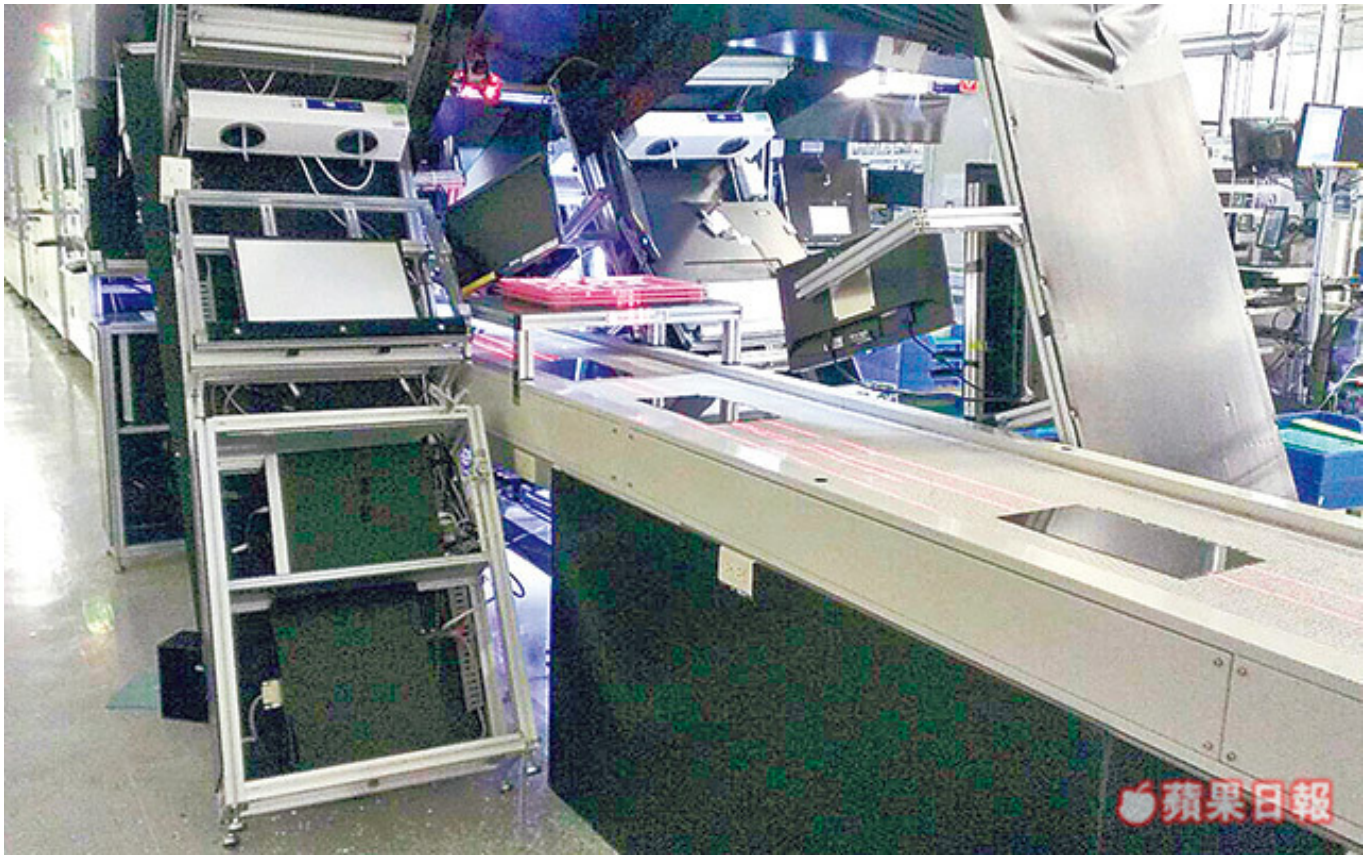


- **Too big to fail**
- **For 2017, still over USD 10b**

Expected or non-expected damages to production lines after 2016 quake

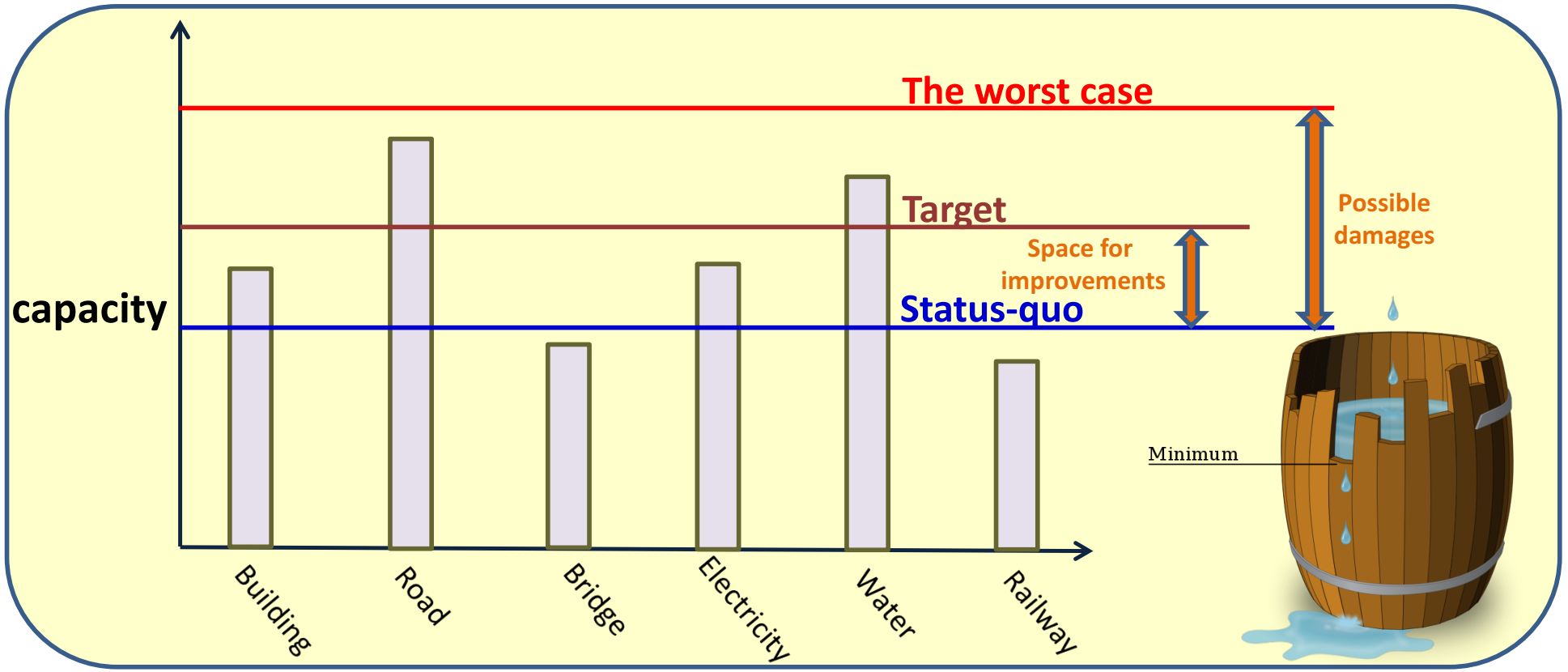
Fallen pipelines

Damaged assembly line

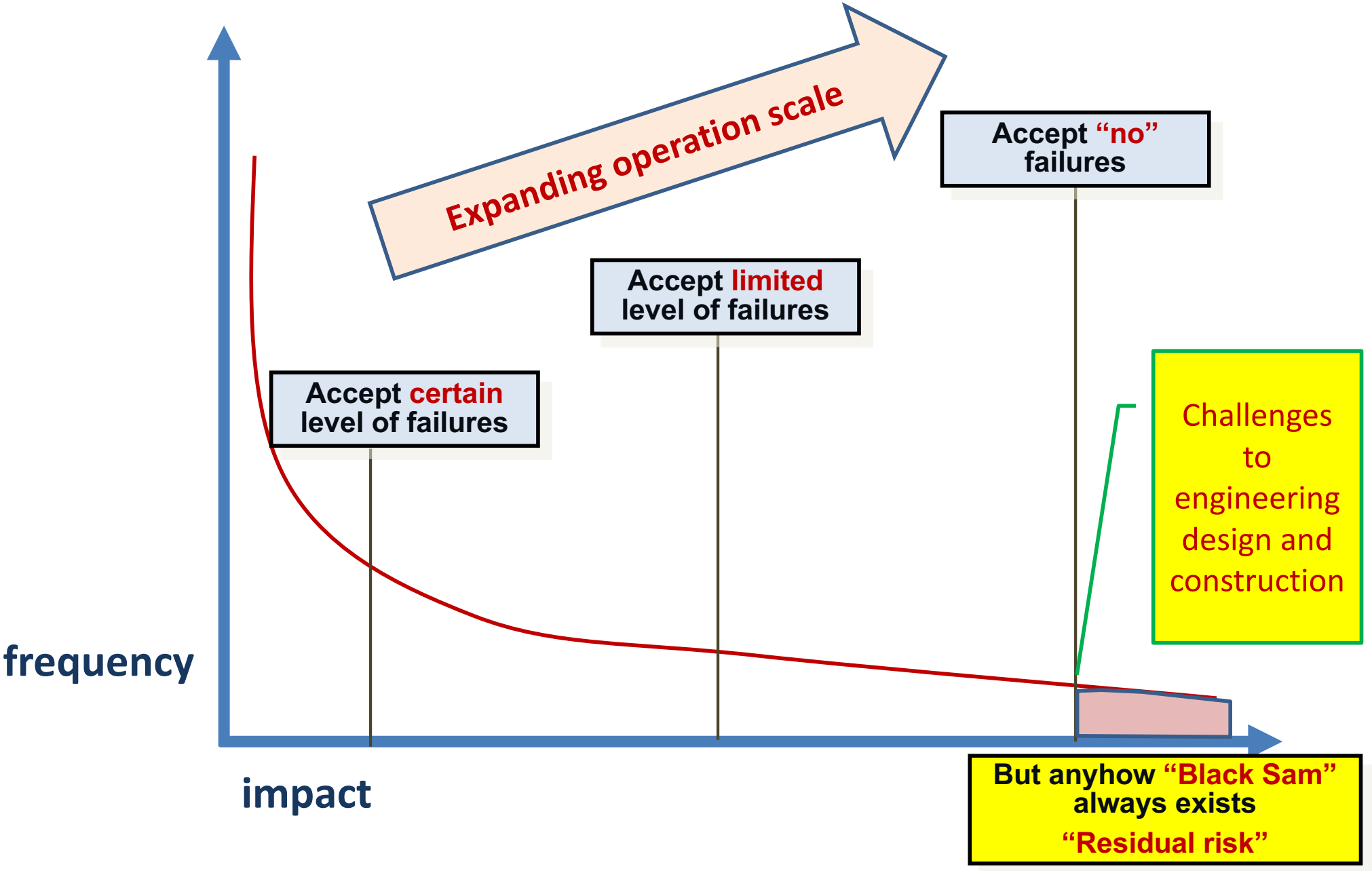


Concept of "the weakest link" - theory of barrel

- **Impact analysis through different "ground shaking levels"**
  - **Performance-based evaluations** through "scenarios"
  - **The worst case**: to estimate extreme damages
  - **Target**: to promise a defense level for improving
  - **Status-quo**: to identify current capacity



Characteristics of risks for different scale of business – allowance of failure and interruption



Roles and functions of S&T to reduce loss - From science to decision making

Scientific Prediction	Rea-time Monitoring	In-time Operation	Key elements to succeed
• Provide forecasting based on scientific models • Tool for pre-disaster deployment • Reference for decision support • Limited by technology development	• Provide updated data based on gauges • Tool for pinpointing blind areas by forecast • Reference for revising decision support • Limited by number, location, transmission	• Provide reaction based on well-defined plan • Tool for saving more time before it's too late • Reference for allocating emergency support • Limited by determination of all-leve administrators	An integration of • Natural science • Social science • Engineering • ICT, Social media • Emergency management • Multiple key stakeholders • Public-private partnership • Emerging technologies • .....

Directions to work together on DRR (1/2)
- through regional capacity building

1. Case studies on evidence-based disaster risk reduction

- To study policies and implementations on applying science and technology for DRR through finding gaps and needs
- Possible topics : individual nation plans in science development, land-use planning, early warning, risk maps, etc.

2. Build back better- trend & policy on post-disaster recovery

- To understand required and necessary elements for short-term, mid-term and long-term recovery
- Possible topics : reviews on large disasters, reconstructions plan, economy revitalization, livelihood restoration, etc.

3. Leadership and decision making on disaster management

- To learn skills and the best practices for leading a team at times of policy making, emergency response or on-field operations
- Possible topics: risk communication, crisis management, principles of emergency operation, ICT & GIS tools of decision support, etc.

Directions to work together on DRR (2/2)
- through regional capacity building

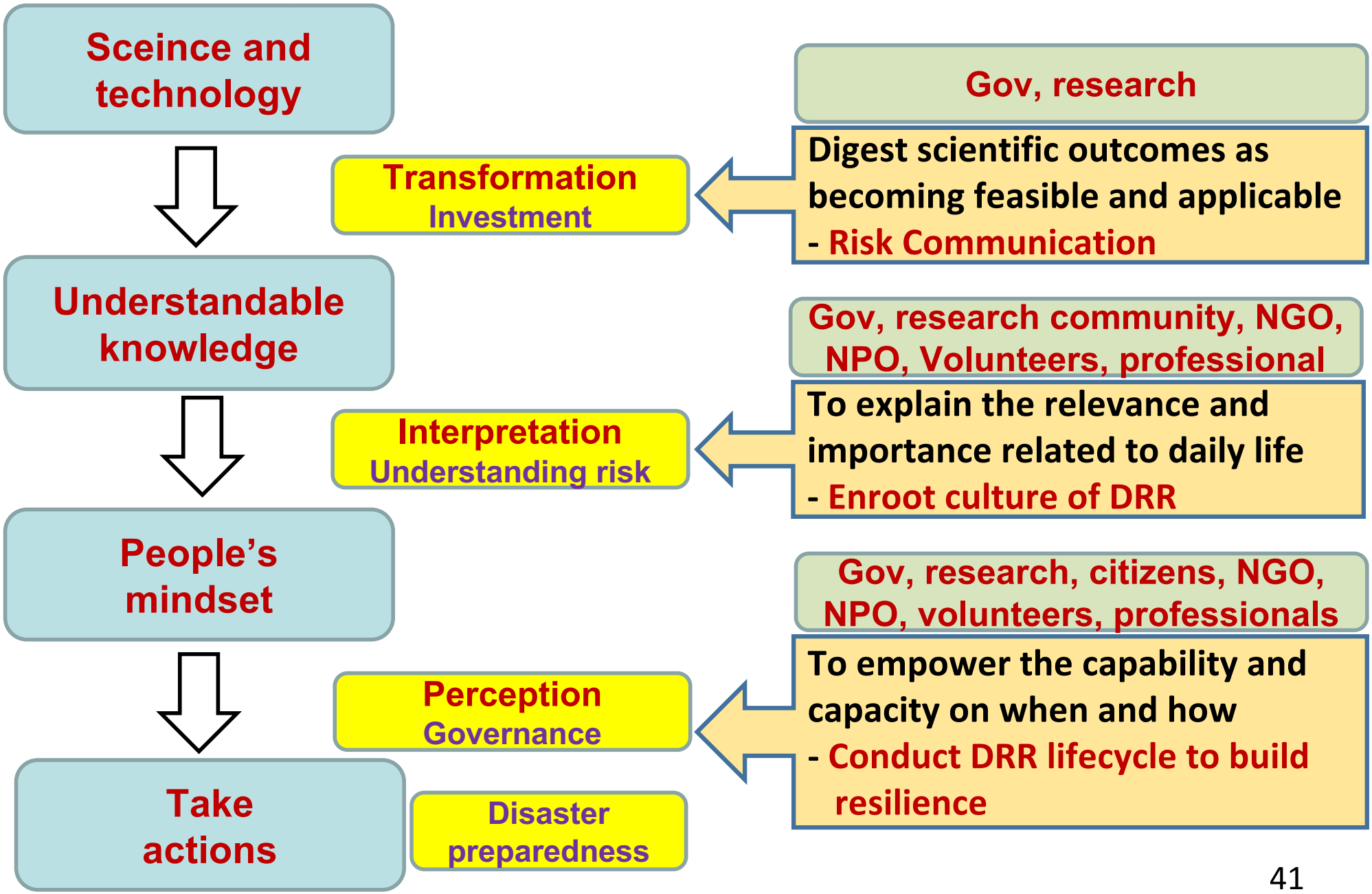
4. Role of NGO, NPO & business by public-private partnership

- To explore contributions on DRR by private sector and policy to engage them at different phases of disaster management.
- Possible topics : community-based disaster risk management, business continuity plan, risk perfection, etc.

5. Regional and global mechanisms and resources for DRR

- To understand frameworks, trend, policy guidelines, operations, projects, and funding agency at regional and global levels
- Possible topics : UN organizations, APEC, ASEAN, GFDRR, ICSU, the Sendai Framework for Disaster Risk Reduction etc.

Evolving processes on DRR
- stakeholders, actions, implementations



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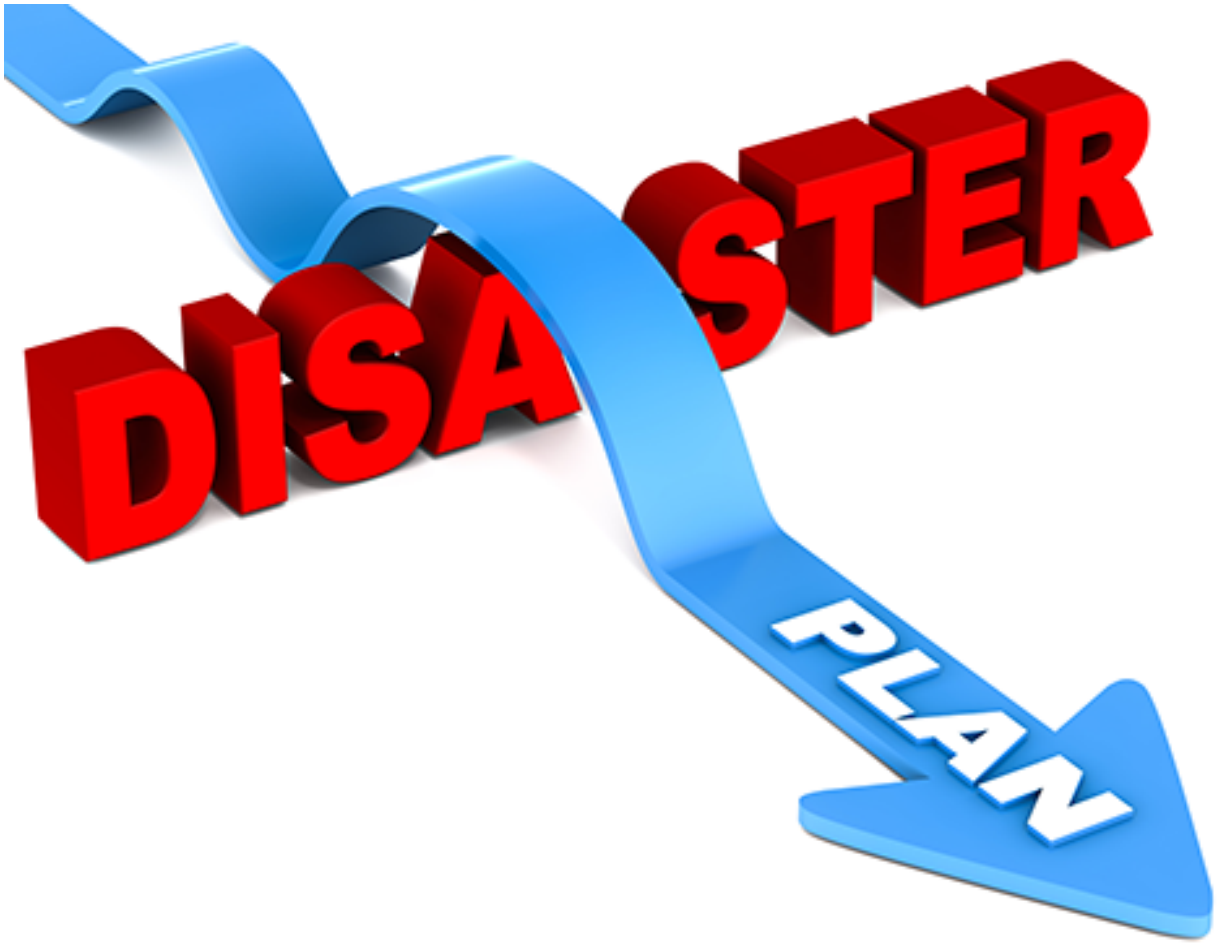

http://www.cxc-ltd.com/management-services/business-continuity