INNOVATION ROADMAP FOR CLIMATE-SMART AND DISASTER RESILIENT HEALTH SYSTEMS IN THE PHILIPPINES

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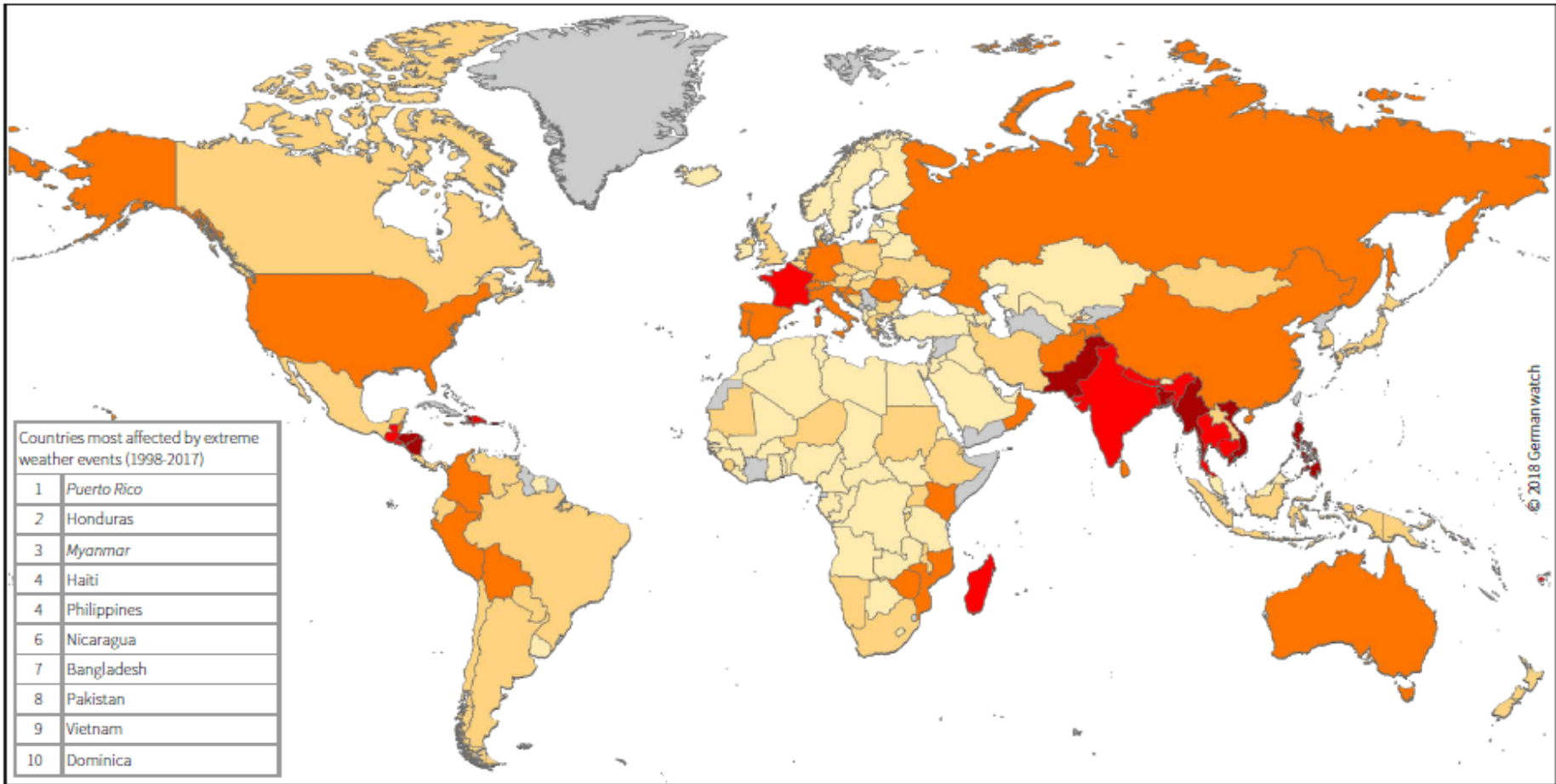Center for Engineering and Sustainable Development Research

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Countries most affected by extreme weather events (1998-2017)

1	*Puerto Rico*
2	Honduras
3	*Myanmar*
4	Haiti
4	Philippines
6	Nicaragua
7	Bangladesh
8	Pakistan
9	Vietnam
10	Dominica

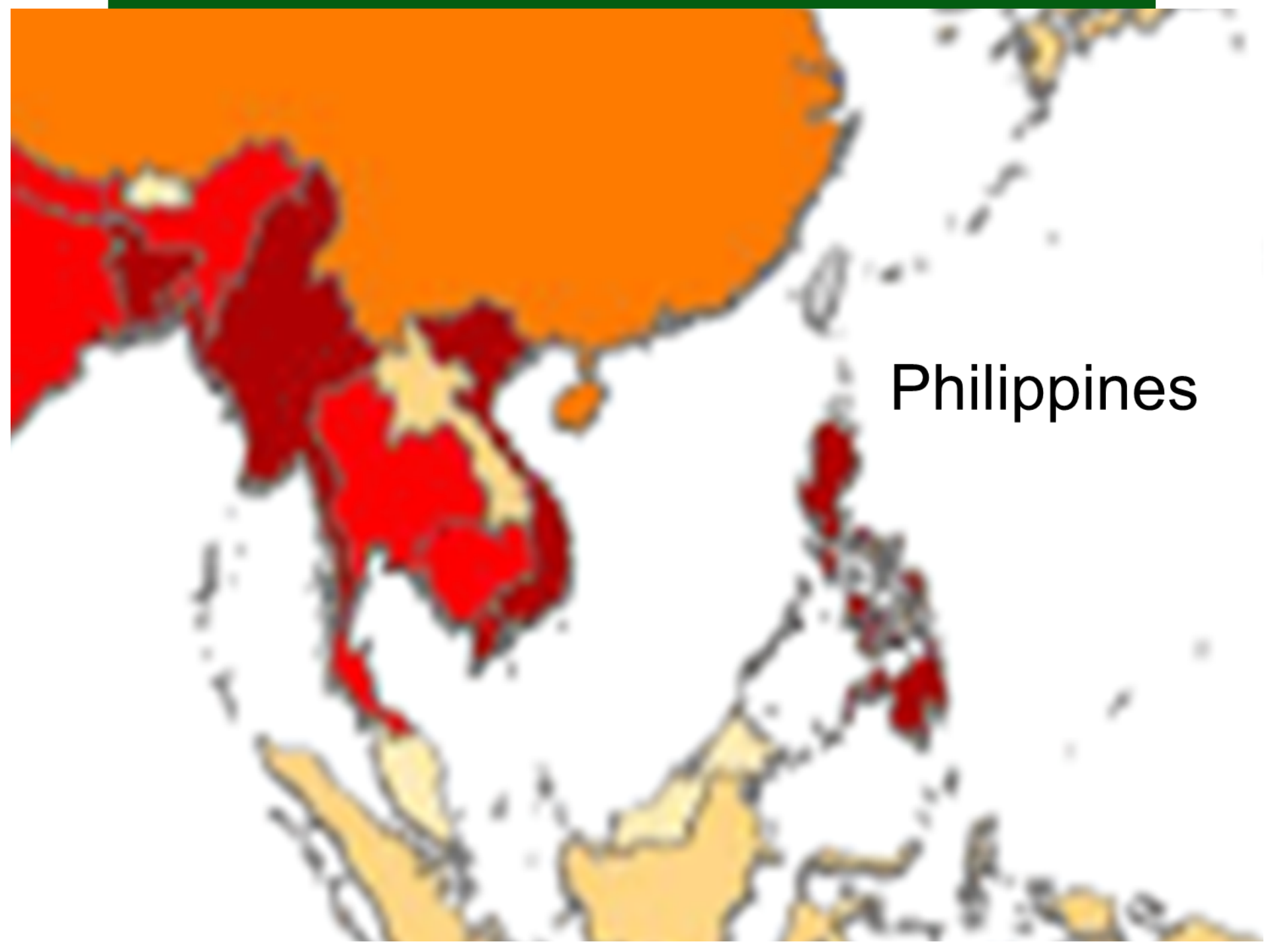*Italics: Countries where more than 90% of the losses or deaths occurred in one year or event*

Climate Risk Index: Ranking 1998 - 2017 █ 1- 10 █ 11 - 20 █ 21 - 50 ░ 51 - 100 ░ >100 ░ No data

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Philippines

A Healthy and Resilient Society

Long-term Developmental Goals

By 2040, Philippines will be:
- A prosperous, predominantly middle-class society where no one is poor;
- A healthy and resilient society;
- A smart and innovative society, and
- A high trust society.

Source: http://2040.neda.gov.ph/

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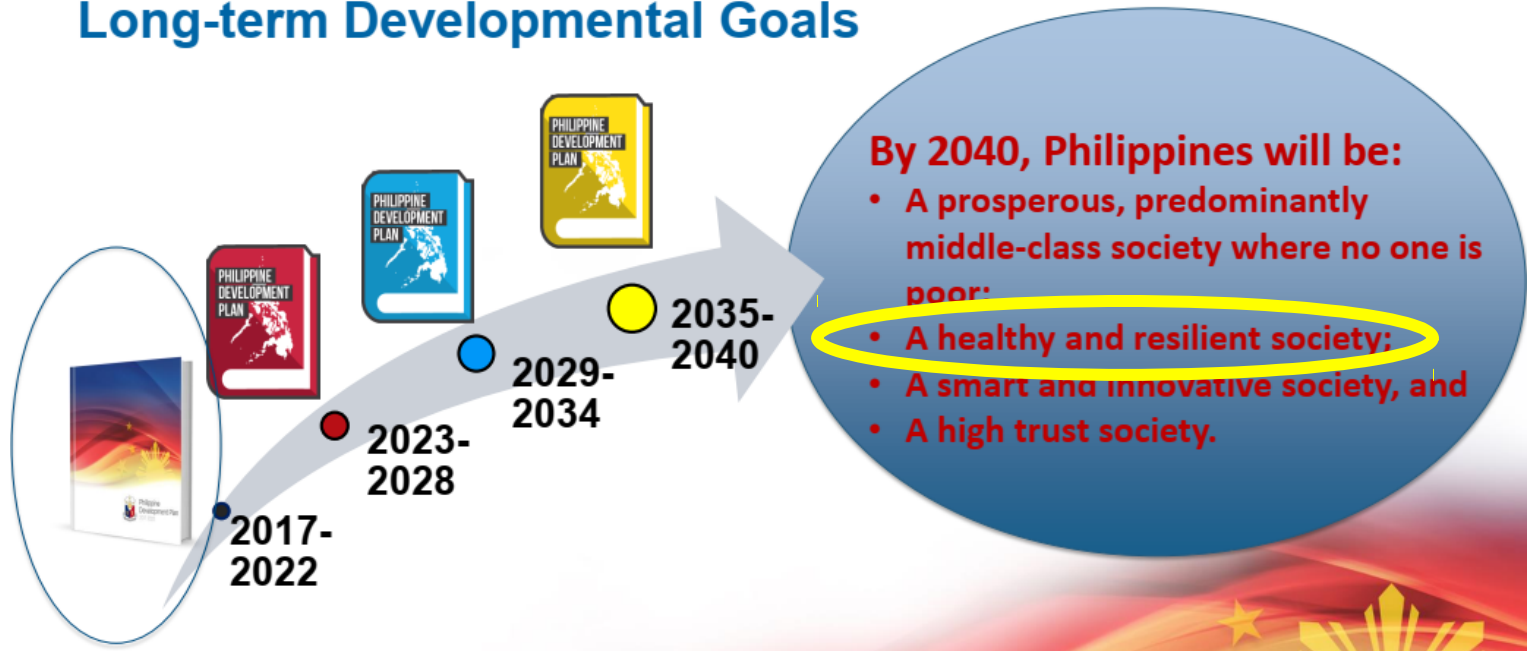
Big picture...

Planetary Health

Safeguarding both human health and the natural systems that underpin it

Source: Planetary Health Alliance

What is the problem….

"Climate change is reshaping public health and is the defining issue for the 21st century… "

Dr. Margaret Chan, WHO Director-General, COP21, Paris, Dec 2015

"Climate change is the biggest global health threat of the 21st century …"

THE LANCET

"Climate change is the biggest global health threat of the 21st century."

WHO, 2015
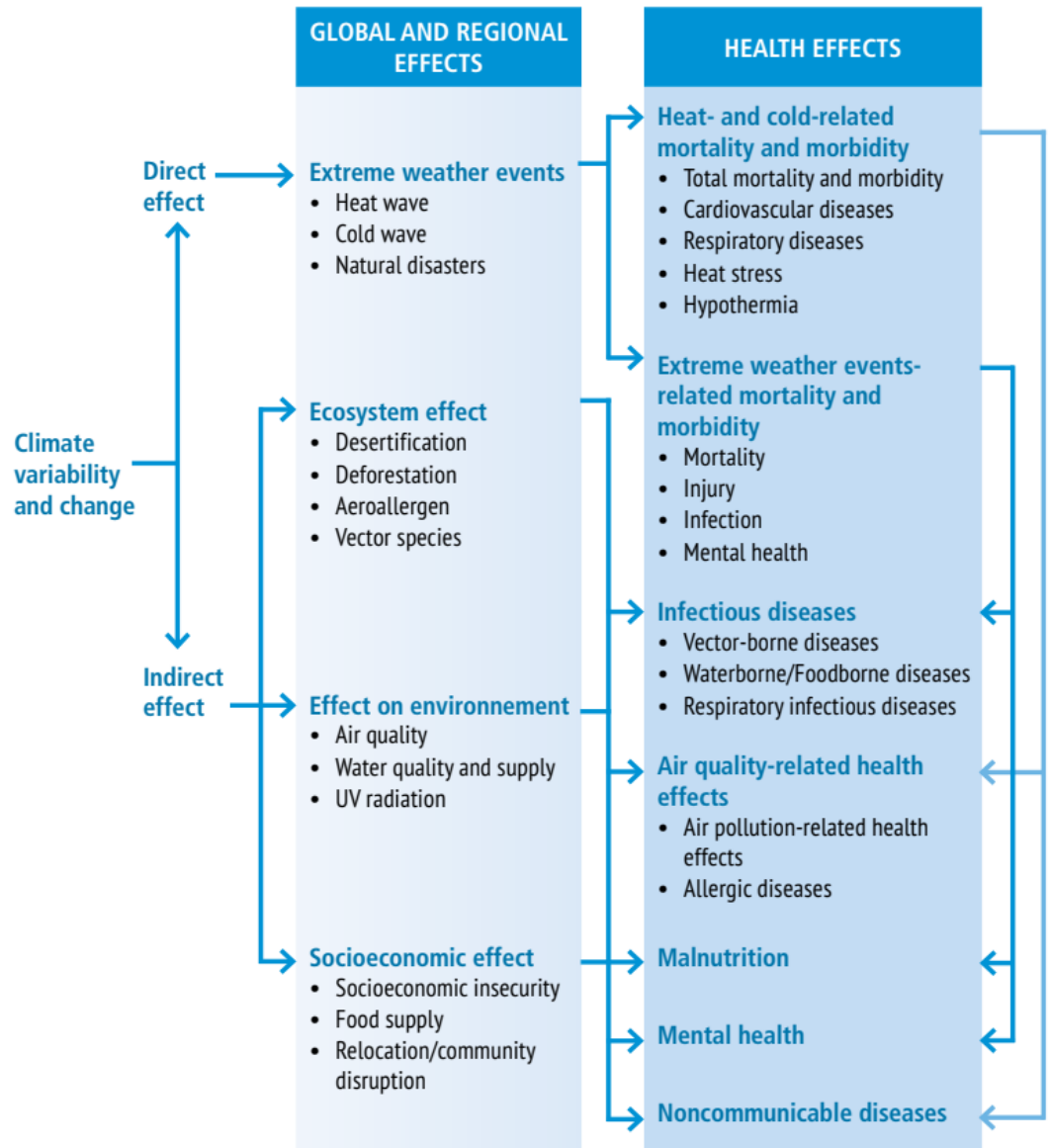
ASEAN Multi-Hazard Risk Landscape

COPING CAPACITY

VULNERABILITY

MULTI-HAZARD EXPOSURE

MULTI-HAZARD RISK

INDONESIA · PHILIPPINES · MYANMAR · VIET NAM · CAMBODIA · LAO PDR · THAILAND · MALAYSIA · BRUNEI DARUSSALAM · SINGAPORE
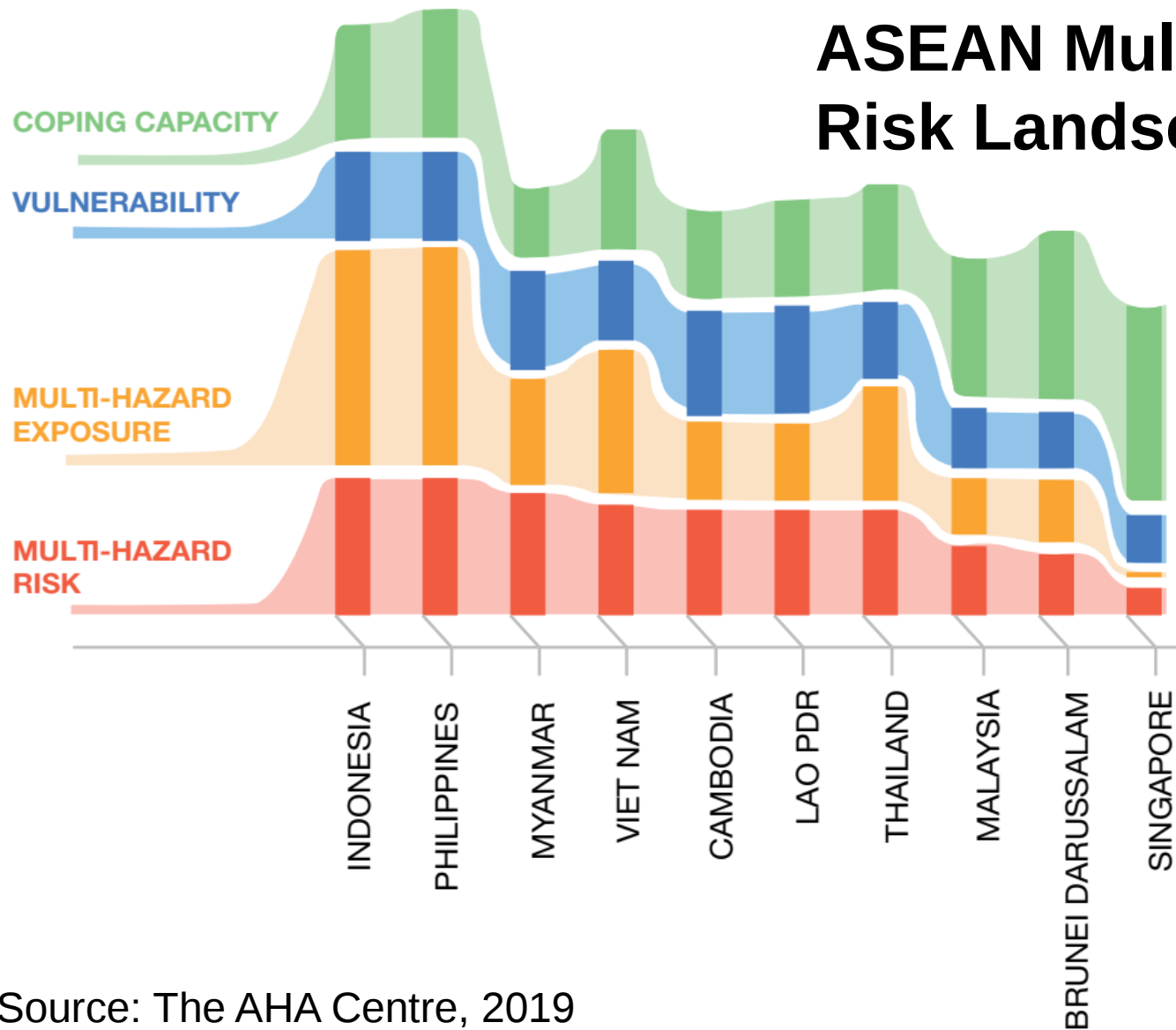
Source: The AHA Centre, 2019

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Health is a key outcome measure of resilience and sustainability.

(UNCCS, 2017)

The Sustainable Development Goals provide the basis to ensure that actions **to increase health resilience to climate change** take place within a comprehensive and **integrative approach to development**.
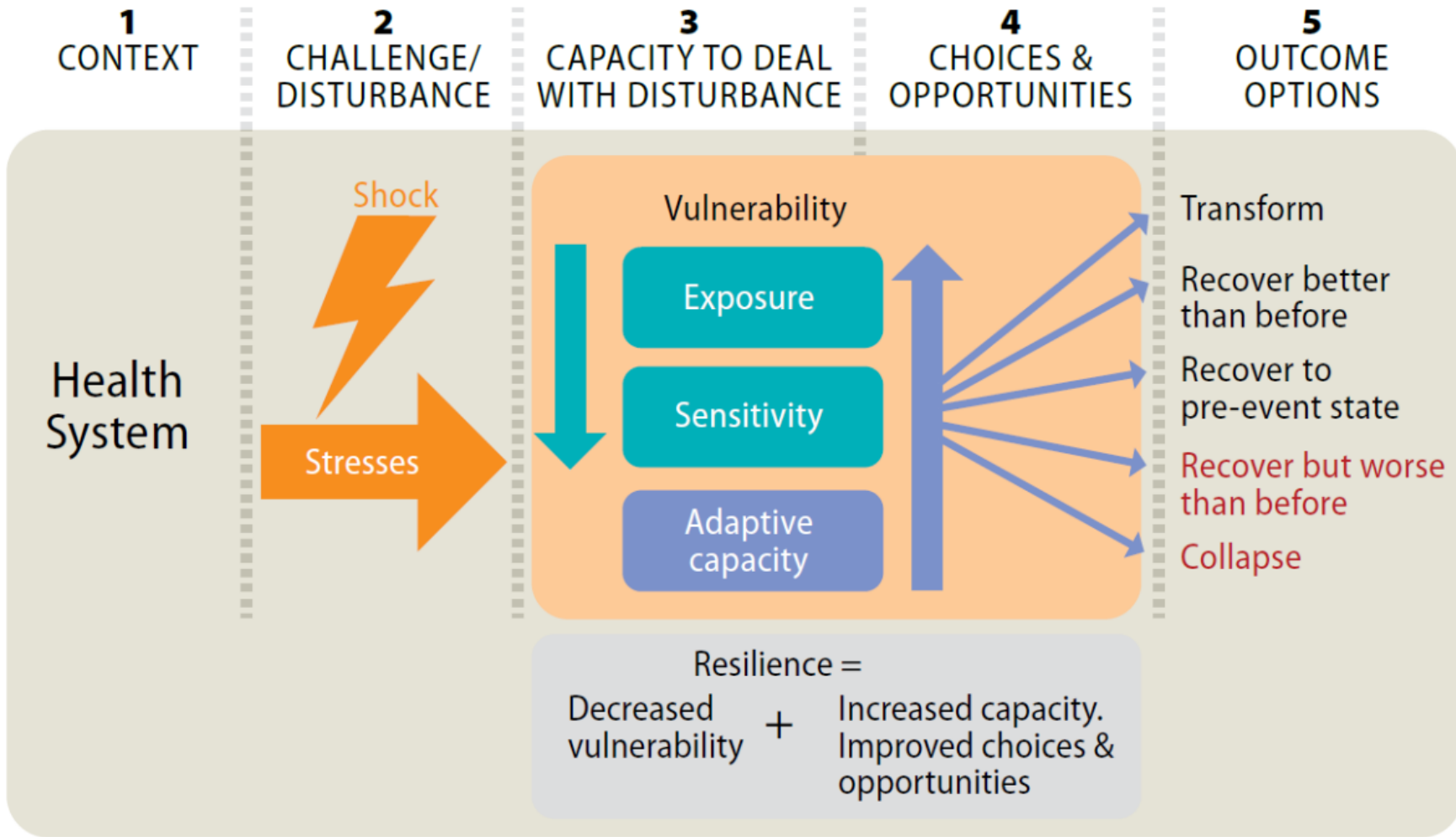
(WHO, 2016)

A Need for Research Framework

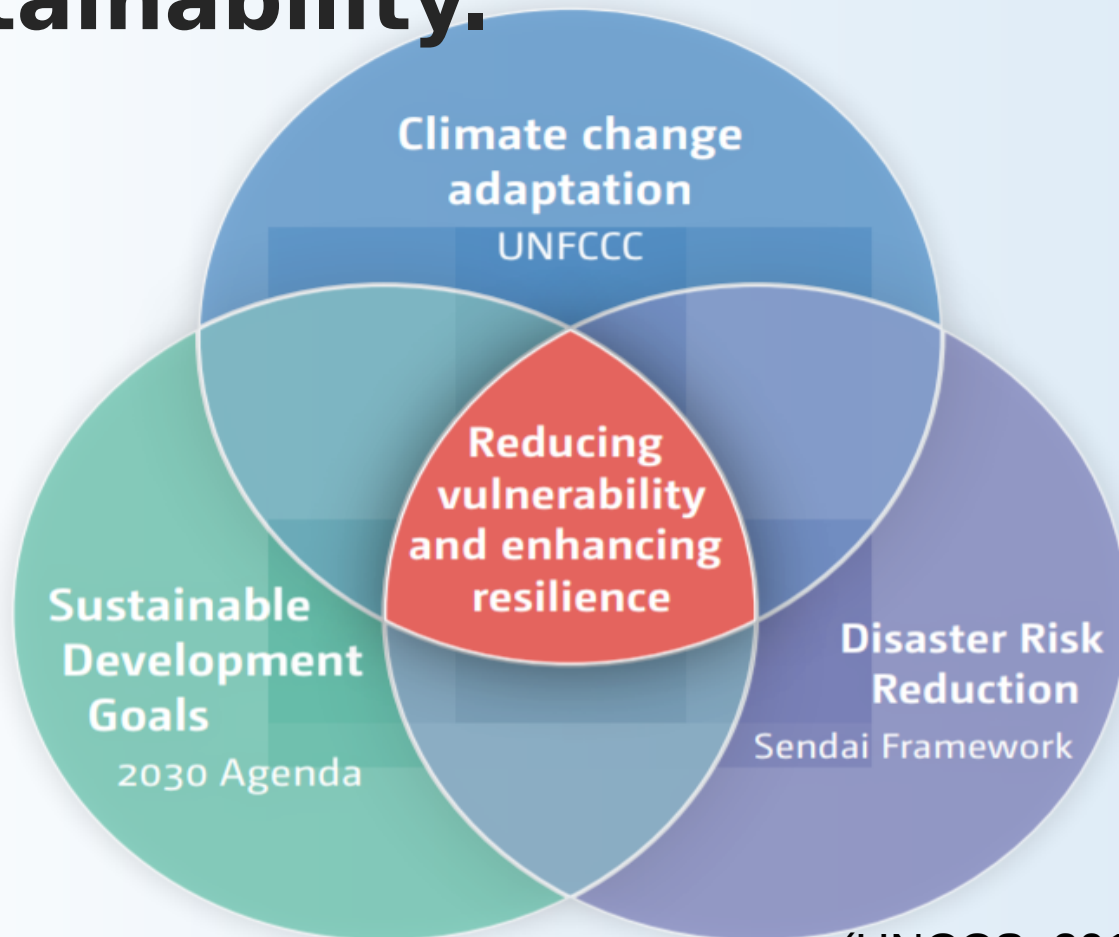- A conceptual framework to denote the representation of concepts that can aid in the design and development of research programmes that can be translated to practice and policy actions aimed at building health resiliency and health systems resilience.

- A conceptual framework that can be used as a tool for capturing, visualizing, and organizing connections among key factors in a complex system

- A conceptual framework that can be used to encourage systems thinking which can be used as communication and research planning tool.

Taxonomies of conceptual framework

Taxonomy of conceptual frameworks and their forms.

Taxonomy of frameworks	Form
LEVEL 1: Structural frameworks	Relatively simple pictorial representation or description of the system under consideration and its important domains.
LEVEL 2: Relational frameworks	Chain- or web-like structures of the key variables within the system and the way these interrelate through logical or functional links
LEVEL 3: Operational models	Detailed operational model of the system under consideration, as a basis for analysis.

(Knol et al. 2010) "Assessment of complex environmental health problems: Framing the structures and structuring the frameworks" Science of Total Environment

Drivers → **Pressures** → **State** → **Vulnerability** → Impact/**Effect**

Distal pathway

Proximal pathway

Health **Resiliency** and **Systems Resilience** co-benefits

Drivers

Climatic-related
- Fossil fuel use
- Climate variability

Socio-economic
- Unsustainable economic development
- Economic inequality
- Population dynamics

Socio-political
- Weak Governance
- Social injustice
- Poorly planned urbanization

Pressures

Ecological Pressure
- Hydro-meteorological
- Natural climate pattern

Natural Hazards
- Climatic
- Non-climatic

NATECH/Tech Hazards

Emerging Threat

Human behavior

State

Natural Environment
Ecosystem services

Level of pollution

Disaster Event
- Slow-onset
- Fast-onset
- Occupational

Human, Built Environment

Vulnerability

Exposure
- Direct
- Indirect

Sensitivity
Human condition
Environmental

Resilience capacity

Impact/**Effect**
- Injuries
- Heat-related disease
- Respiratory and cardiovascular disease
- Mental health and social well-being
- Water-borne disease
- Vector-borne disease
- Foodborne disease
- Nutrition-related health problem
- Emerging disease burden

Health
- Physical/Physio
- Psycho/mental
- Psychosocial
- Planetary

Resilience
- Individual
- Community
- Population
- Infrastructure
- Socio-ecological

Resilience Dividend

Disaster prevention and preparedness | Disaster risk reduction | Crisis management | Post-disaster recovery

| Mitigating Measures/Policies | Adaptive Measures/Policies | Emergency response | Build Back Better (3R) |

Responsive (Plan of) **Actions**

Understand Current and Projected Climate Health Risks

2006

2080

Highest percentage affected by Malaria in India

Source: Bhattacharya S, Sharma C, Dhiman R, Mitra A. Climate change and malaria in India. Current Science. 2006;90(3):369-375.
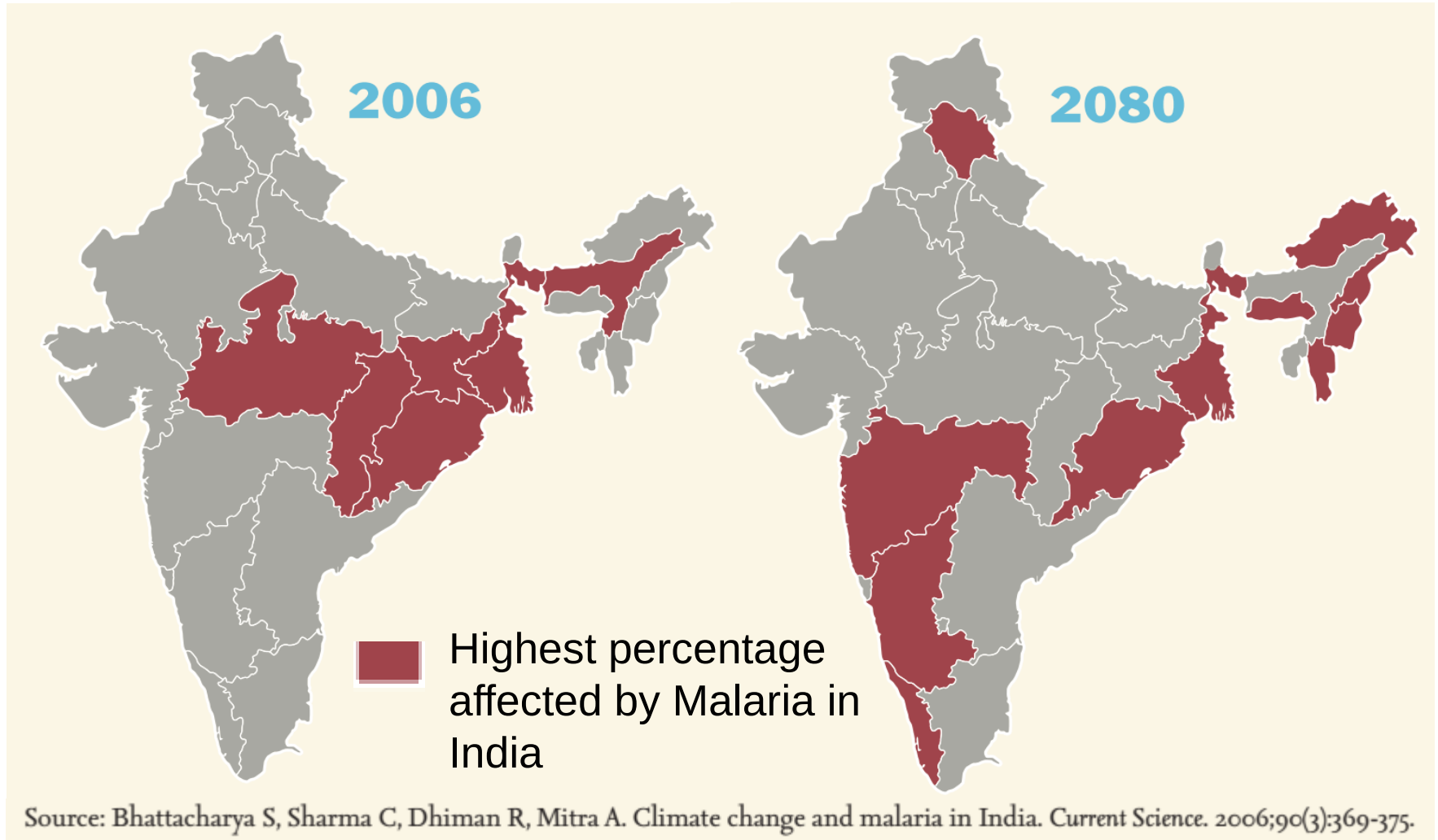
# Operational models to develop indicators

Article

Indicators for Tracking European Vulnerabilities to the Risks of Infectious Disease Transmission due to Climate Change

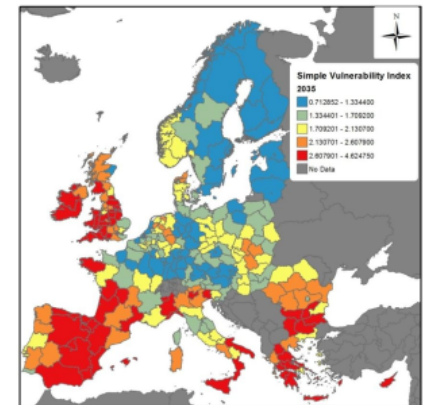Jonathan E. Suk [1], Kristie L. Ebi [2], David Vose [3], Willy Wint [4], Neil Alexander [4], Koen Mintiens [5] and Jan C. Semenza [1],*

The vulnerability index (*VI)* for an EU Member State region r in year t was defined a

$$VI_{t,r} = \left(\frac{\Delta T_{t,r}}{\overline{\Delta T_t}} + \frac{\Delta P_{t,r}}{\overline{\Delta P_t}} \right) NRAC_r$$

. Vulnerability Index projected for 2035: (a) Impact Index; (b)Vulnerability Index.
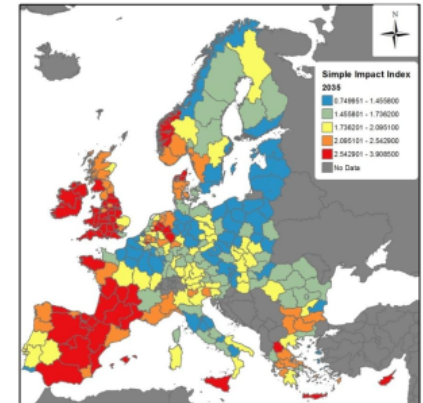
(a)

(b)

National Unified Health Research Agenda 2017-2022

Health resiliency

To improve the ability of the country's health system to be resilient with respect to emerging global and domestic threats

Strategic action plans toward a climate-smart and disaster-resilient health systems

❑ **Establish research programme and consortium/research network**

❑ **Establish sector baseline and identified vulnerable communities, catalogue of best practices, lessons learned and related publications**

❑ **Increase pool of technical people on health systems resilience research (MS, MA, PhD and others)**

❑ **Increase research utilization in a form of products, evidence-based guidelines/policies and increased number of scientific publications**

❑ **Upgrade capacities/capabilities of communities, institutions and health care facilities through science-informed public health interventions**

❑ **Enhance community resilience through science-informed public health interventions**

Health Systems Resilience through STI-based solutions

- **S&T Support for strengthening the health information systems**

- **S&T Support for developing climate resilient and sustainable technology and infrastructure**

- **S&T Support for effective and efficient service delivery**

- **S&T Capacity for health workforce, financing, leadership and governance**

Health Systems Resilience ROADMAP 2018-2023

Climate-smart and disaster-resilient health systems

2023

Enhance community resilience through science-informed public health interventions

2022

Upgrade capacities/capabilities of communities, institutions and health care facilities

S&T Support for Effective and Efficient Service Delivery

S&T Capacity for Health Workforce, Financing, Leadership and Governance

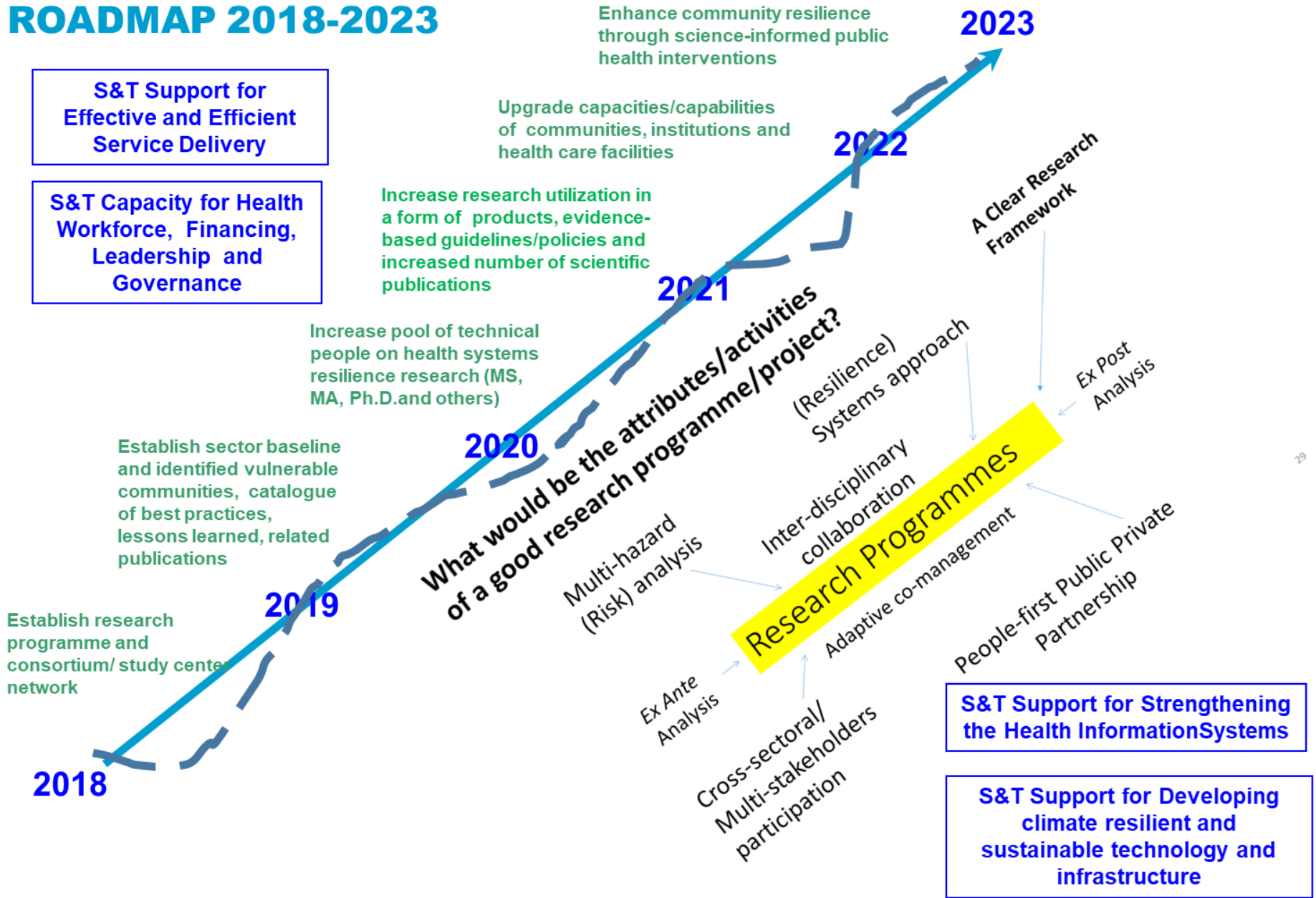Increase research utilization in a form of products, evidence-based guidelines/policies and increased number of scientific publications

A Clear Research Framework

2021

Increase pool of technical people on health systems resilience research (MS, MA, Ph.D.and others)

(Resilience) Systems approach

Ex Post Analysis

2020

What would be the attributes/activities of a good research programme/project?

Inter-disciplinary collaboration

Establish sector baseline and identified vulnerable communities, catalogue of best practices, lessons learned, related publications

Multi-hazard (Risk) analysis

Research Programmes

Adaptive co-management

People-first Public Private Partnership

2019

Establish research programme and consortium/ study center network

Ex Ante Analysis

Cross-sectoral/ Multi-stakeholders participation

S&T Support for Strengthening the Health InformationSystems

2018

S&T Support for Developing climate resilient and sustainable technology and infrastructure

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Concluding remarks

- A systems resilience-thinking approach can help policy makers in addressing the risks confronting health systems in the context of climate change adaptation and disaster risk reduction.

- Researchers and policy makers should work together to proactively design and adopt measures to build resilience of health systems.

Thank you for listening.

- For comments and suggerstions, please e-mail

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"…**Health system resilience** can be defined as the capacity of **health actors**, **institutions**, and **populations** to prepare for and effectively respond to crises; maintain core functions when a crisis hits; and, informed by lessons learned during the crisis, reorganize if conditions require it.

Health systems are resilient if they protect human life and produce good health outcomes for all during a crisis and in its aftermath. Resilient health systems **can also deliver everyday benefits and positive health outcomes**. This double benefit—improved performance in both bad times and good—is what has been called "**the resilience dividend**"…**Health-care systems** are **complex adaptive systems** and **resilience** is **an emergent property** of the health system as a whole rather than a single dimension…" (Kruk et al.,The Lancet, 2015)

Source: https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(15)60755-3/fulltext

STI Road Map on health systems resilience…a living document.

Conceptual Framework
"What are we talking about?"

State-of-the-art review
"Where are we today?"

"Amvision"/Goal
"Where do we want to be in 5/10/20 years?"

Strategic Action Plan
"What do we need to do to bridge the GAP"

Research Utilization

Research Agenda

Research Programmes

STI Solutions (PCHRD)

C1. Health Information Systems

C2. Climate-resilient and sustainable technologies and infrastructure

C3. Service Delivery

Evidence-based Policy (DOH)

C4. Other Priority Areas: Leadership Governance, Health Workforce and Financing

DOST STI Framework of Action

KRA1. Observation and monitoring networks
KRA2. Technologies for monitoring
KRA3. Modelling and simulation

KRA4. Hazards, vulnerability, risk and systems resilience assessment

KRA5. Warning and risk communication

KRA6. Technologies for disaster risk reduction and management
KRA7. Technologies for climate change adaptation and mitigation

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- B.S. ChE (UPLB) and M.S. Ch.E (UPD)
- D.Eng. Socio-environmental Engineering (Hokkaido University, Japan)
- JSPS Research Fellow (Hokkaido University, Tokyo Institute of Technology, Japan)
- **90+** publications, h-index = **13** (Scopus)
- Recipient of multiple awards from **NAST, NRCP, CHED,** and **JCI**
- Member, **OYSI, JAAP, PAASE, PIChE, PAMANA, ATTARS, NRCP**
- Associate Editor for Engineering, Philippine Journal of Materials Science and Nanotechnology
- Founding Head, Geopolymer and Advanced Materials Engineering Research for Sustainability (G.A.M.E.R.S) Lab