Climate change adaptation (CCA) cases and lessons:

Water-Agriculture-Disaster

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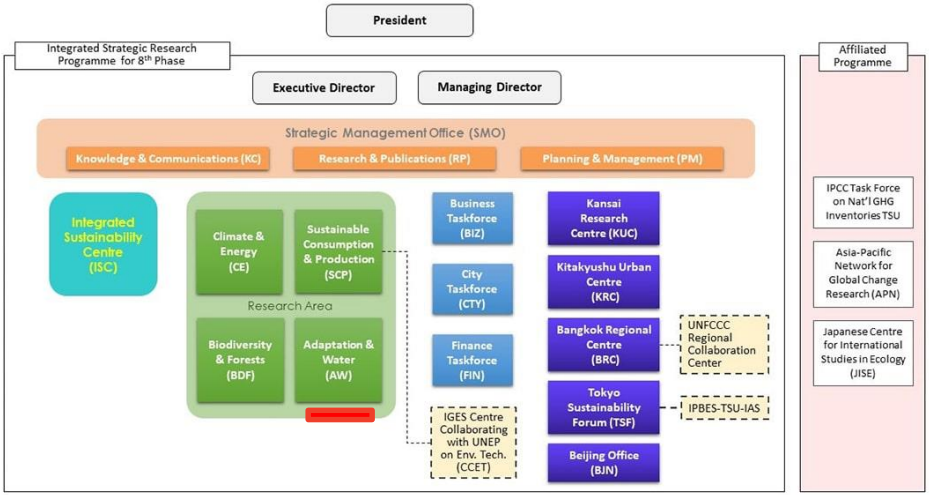
Contents

1. General background
2. Introduction to cases
3. Discussion

About IGES



- Established under an initiative of the Japanese government in 1998 with the support of Kanagawa Prefecture where IGES Headquarters is located.
- Aims to bring about a transition to ***a sustainable, resilient, shared, and inclusive Asia-Pacific region and the world.***

About myself

B.Sc. Agriculture, Institute of Agriculture and Animal Science, Tribhuvan University, Nepal

M.Sc. Agriculture Systems and Engineering, Asian Institute of Technology, Thailand

Dr.Eng. Urban and Environmental Engineering, Kyoto University, Japan

2002 2004 2007 EDUCATION

WORK EXPERIANCES

2007 – 2010: Post-Doctoral Researcher

2010 – 2017: Water Resources Specialist

2017 – 2022-->: Senior Adaptation Specialist

IGES Institute for Global Environmental Strategies

Areas of Work: climate change (adaption, mitigation, policy, capacity building), water resources, agriculture, forestry, disaster risk reduction, indigenous and local knowledge, SDGs, etc.

Skillsets: Hydrological modelling, remote sensing and GIS, water quality assessment, micro-pollutant analysis, statistical analysis, basic programming (C++,python, JavaScript etc)

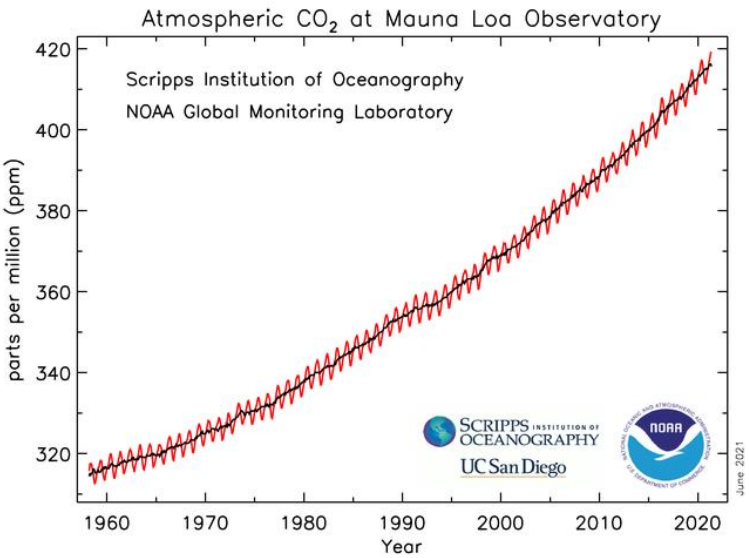
Networks: WEPA, AP-PLAT, APAN, ICIMOD-HUC, GRIPP, GEO-6, etc

More at: https://www.iges.or.jp/en/about/staff/shivakoti-binaya-raj

General Background

Climate Change or Global Warming?

Where are we standing?



Increasing @ ~2 ppm CO2/year

Annual emission:

>55.3 GtCO2e/year in 2018 (a major portion absorbed by Oceans)

Remaining budget:

<600GtCO2e (1.5°C by 2100 scenario from 2018)

Planned emissions:

50% more fossil fuels planned by 2030 (not consistent with a 2°C or 1.5°C pathways).

Climate change is a global scale community property dilemma in which atmosphere is being treated as an open sewer

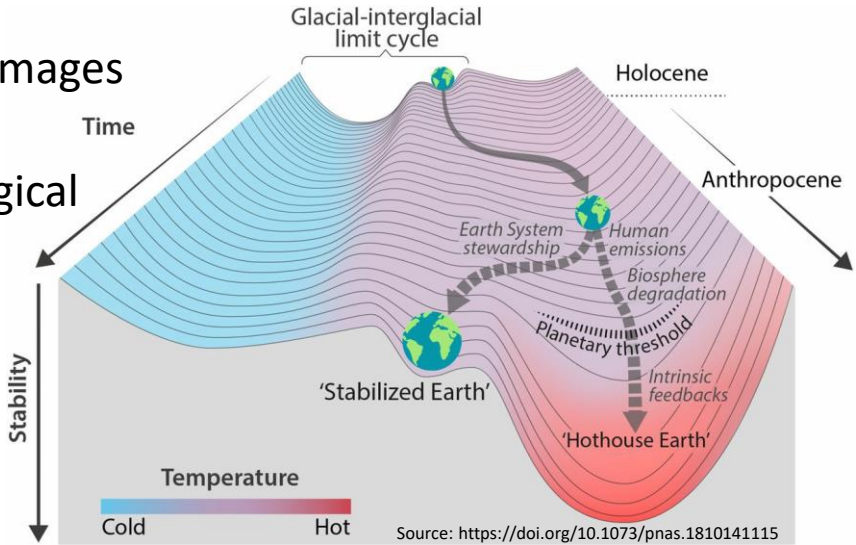
Consequences?

- Irreversible losses of polar ice-caps, glaciers, sea level rises

- Land/Oceans biodiversity/ecosystem damages

- Extreme hydrometeorological hazards

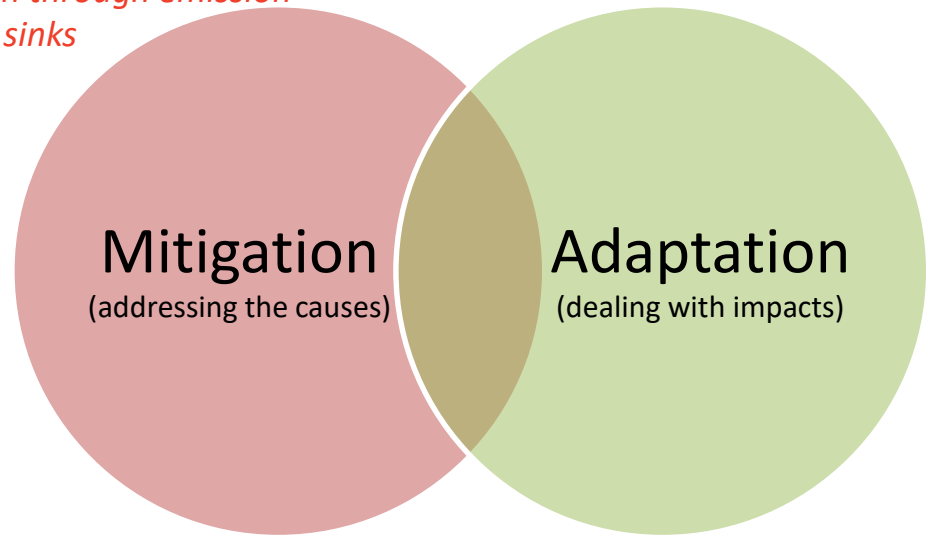
- Compound/cascading risks



- Uncertainty on what is lying ahead in the near future

Two dimensions of climate change actions

Limiting atmospheric GHG concentration through emission reduction or sinks



The process of adjustment to actual or expected climate impacts and (short-term) opportunities

Key challenges to adaptation

1. Understanding signals
2. Assess vulnerability
3. Prioritization
4. Longitudinal planning
5. Implementation
6. Monitoring

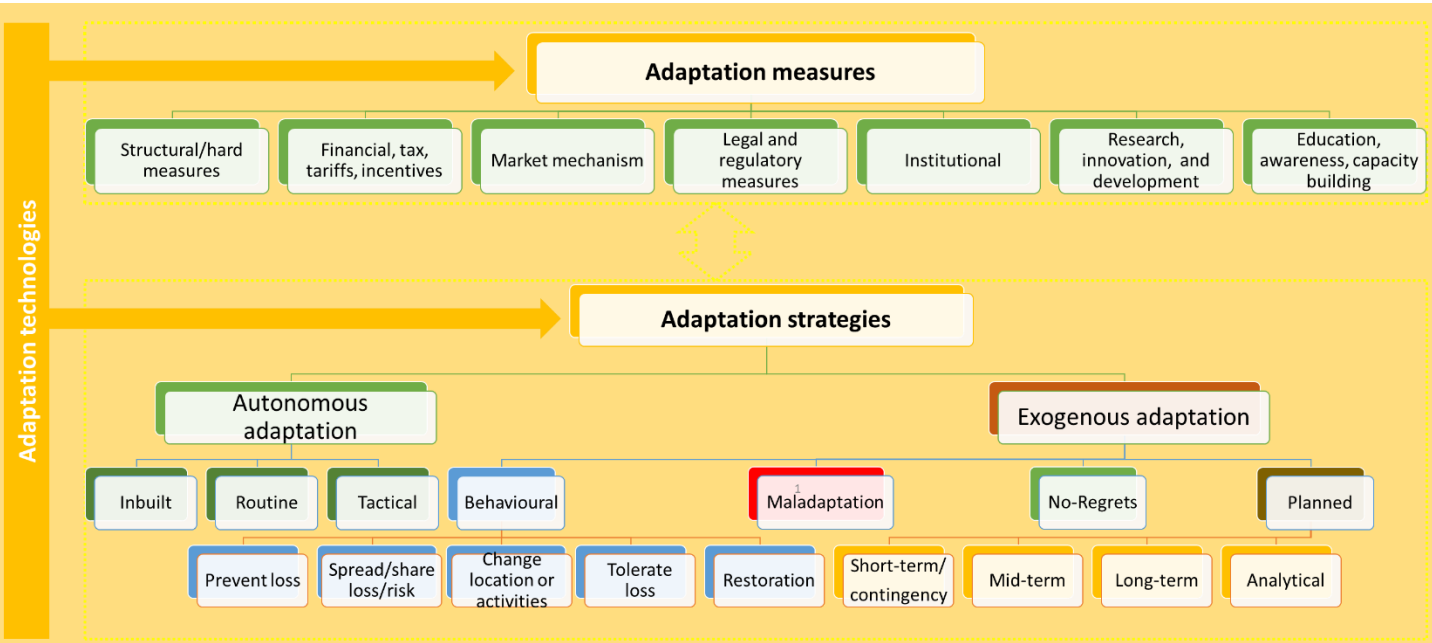
Technical barriers

Financial barriers

Institutional barriers

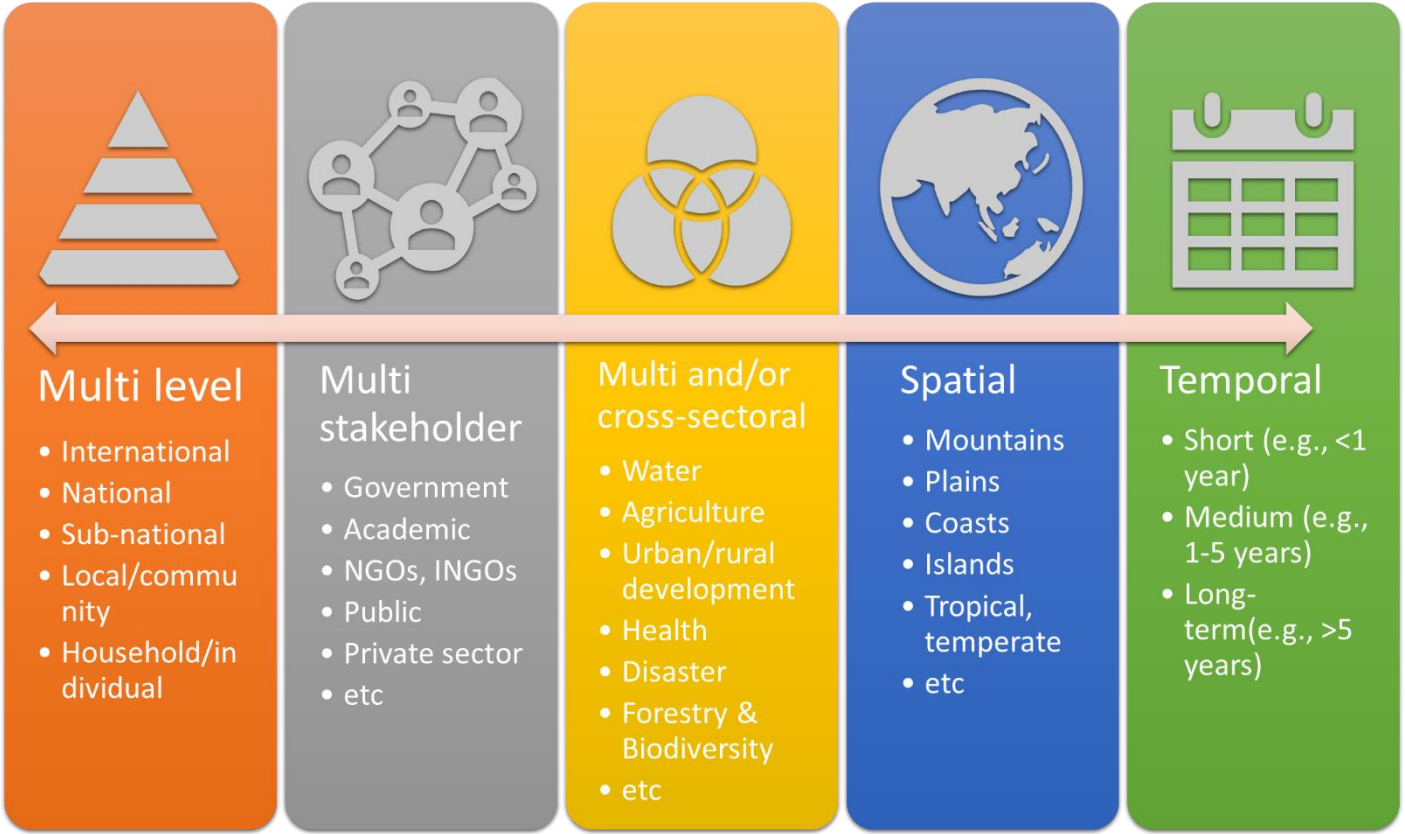
Multi-level capacity building needs

Multitude of measures/strategies

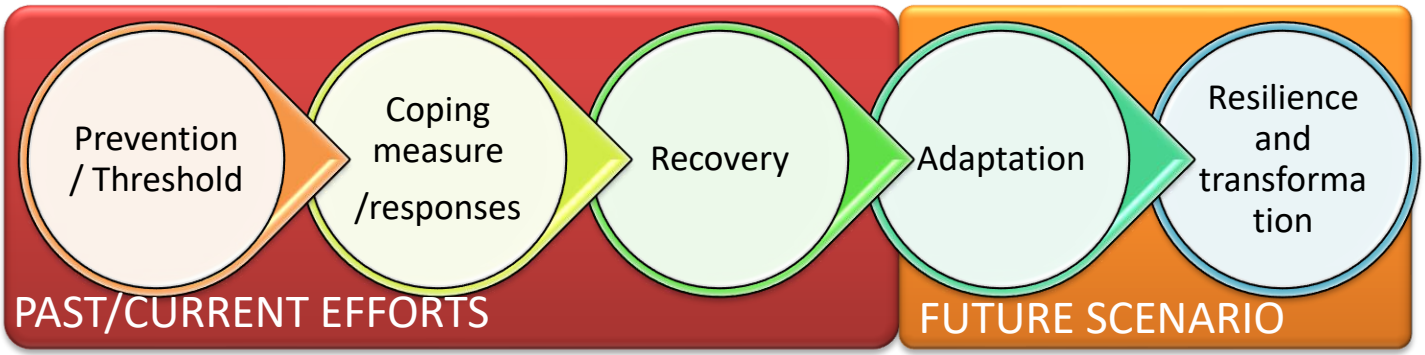


Source: based on IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptation, 1994

CCA is a multi-dimensional process



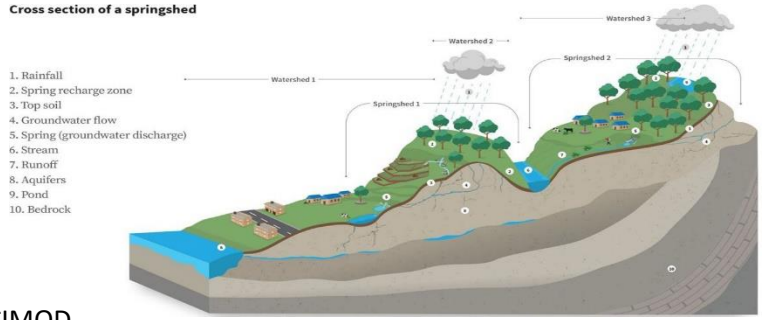
Adaptation/Resilience building spectrum



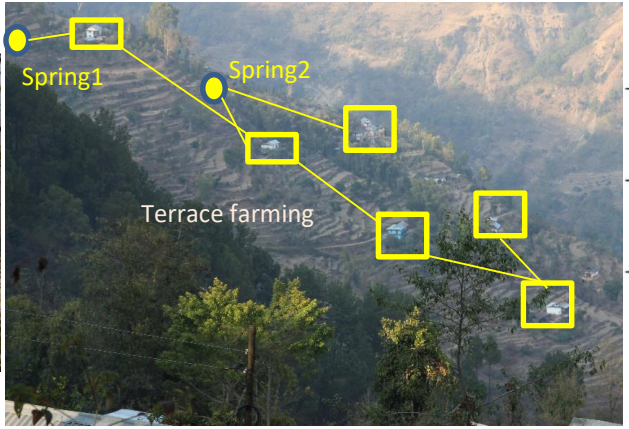
Based on: Rutger de Graaf-van Dinther's Climate Resilient Urban Areas

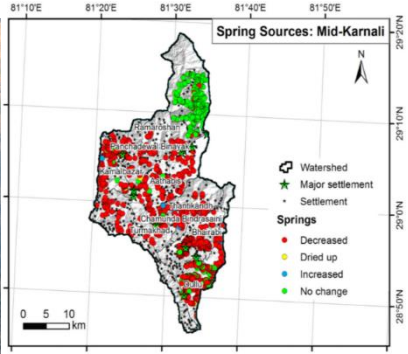
Cases

Case 1: Coping with water scarcity due to drying of springs across mountain landscapes in Himalayas



Source: ICIMOD





Source: Adhikari et al. 2021

Location specific coping strategies

Digging along terrace contour. Could pose risk of landslide during rainy season

Plastic pond (covered by a high density plastic)

Community drinking water storage (household could store the supplied water in tanks and use for irrigation)

Community water supply (people come for water collection)

Water storage made of concrete

Similar kind of storage tanks are used in Thalland, Laos, Myanmar, Cambodia villages

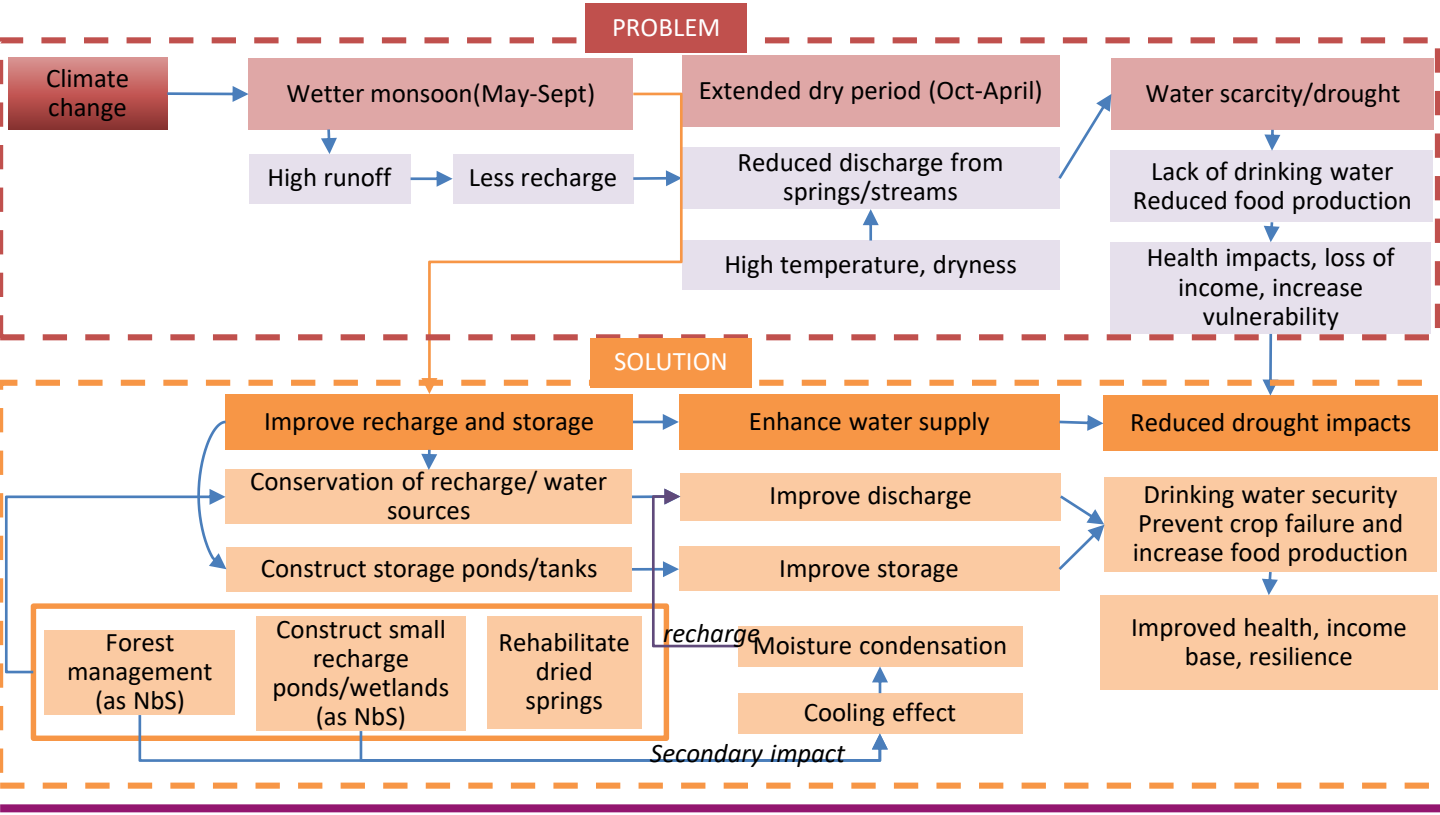
Private water storage

Location specific coping strategies: snow harvesting

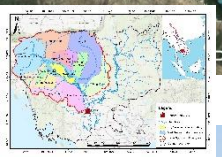
Source: Dhan Bahadur Kathayat, Agriculture Extension Officer, Karnali Province, Nepal

Case 1: Lessons

Coping strategies are incomplete without a comprehensive adaptation strategy



Case 2: Coping by floating villages/communities due to changing hydrodynamics of Tonle Sap Lake



Climate change impacts

Cascade of upstream dams

Fluctuation in Hydrodynamics

Wind, high tides

Inadequate flood pulse

Damages to floating houses

Increased community vulnerability

Competition for fishing

Lower fish catch

Longer fishing distance and cost

Decrease in income

Case 2: Lessons

- Coping measures has their limit (limits to adaptation)
- How to diversify livelihood options, other than, low income fishing
- Migration or resettlement
- Community fish refuge ponds
- Promote eco-tourism

Case 3: Coping to landslide risks in Phukoune, Lao PDR

Case 3: Lessons

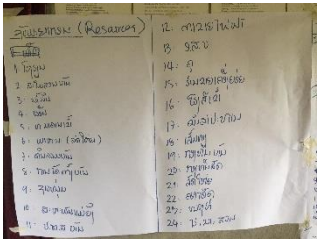
- Coping measures are largely determined by available options rather than ideal scenarios
- Lack of information and poor decision making capacity about the risk scenario are barrier for adaptation
- Extreme events like 2018 rainfall could hit harder exposing latent vulnerabilities
- Community based approaches for disaster risk management could save lives and property

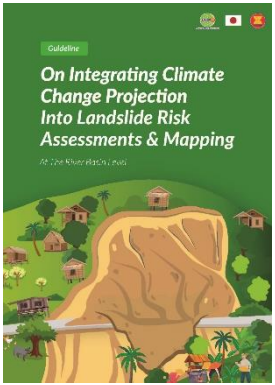
Case 4: Living with floods in Bago, Myanmar

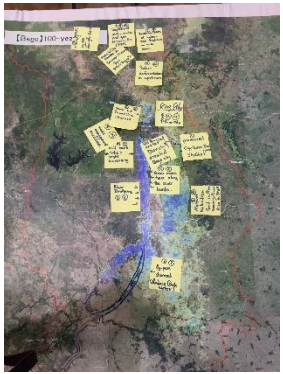
Case 4: Lessons

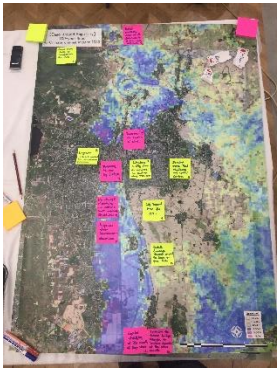
- In frequently flooded areas, people are following a lifestyle that is in sync with flood
- Damages are not always human casualties, but more of social and economic types
- Recent extreme events are challenging the existing coping strategies or co-existence with flood
- Community based approaches for flood risk management could save lives and property

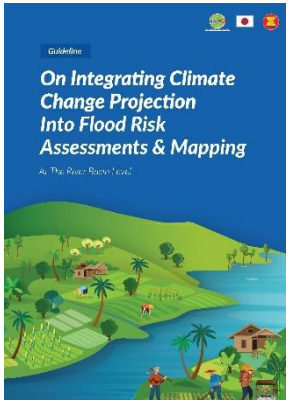
Case 5: Participatory flood and landslide risk mapping











Case 5: Lessons

- Additional preparedness is necessary to deal with extreme disasters caused by climate change
- For that improving decision making capacity is essential
- Participatory approaches provide 'learning-by-doing' opportunities for capacity building

Case 6: Hanging fertigation as an adaptation to flood

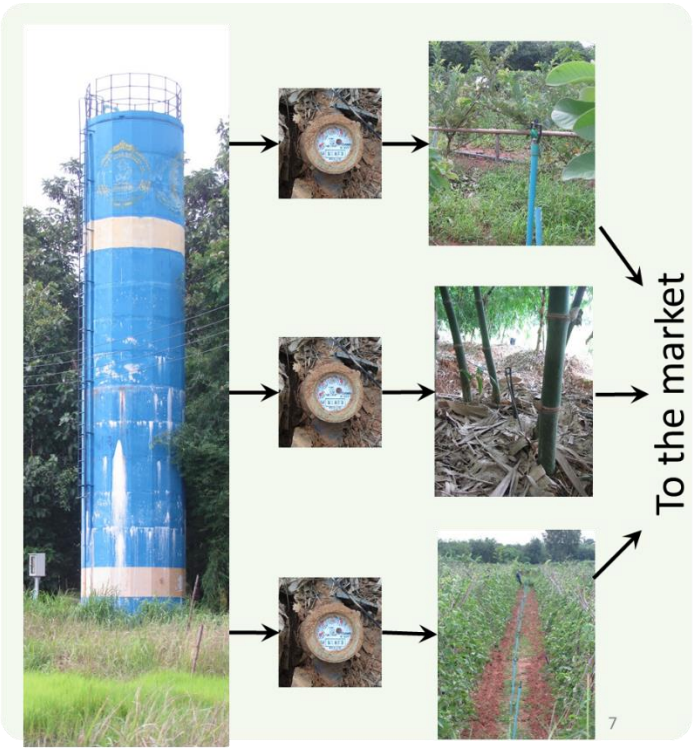
Vegetables are grown in a bag with soil media that is hung to a pole so that the crops remain unaffected during the period of inundation

The technique is also water efficient as it employs fertigation by drips connected to each bag

The technique has been found to advantageous to control pest infestation, extend harvesting period, better exposure to sunlight and higher yield.

Case 7: Introducing groundwater irrigation as a part of resilience building: Andra Pradesh(India)

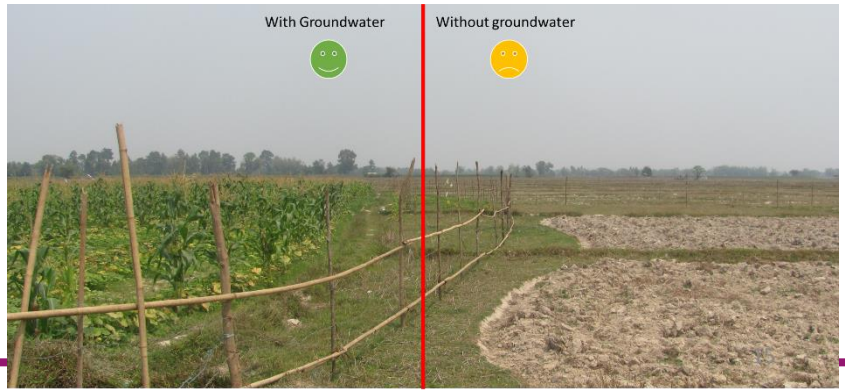
Case 7: Introducing groundwater irrigation as a part of resilience building: Khon Khen (Thailand)



Case 7: Introducing groundwater irrigation as a part of resilience building: Vientiane Province (Lao PDR)

Case 7: Lessons

- Groundwater is a strategic resource for climate smart agriculture and resilience building:
  - Supplementary irrigation to save crops such as during droughts (adaptation)
  - Provides additional income generation opportunity such growing high value crops (productivity/income generation)
  - Use of renewable for pumping (such as solar irrigation) (GHG mitigation)



Case 8: Crop insurance in the Philippines, Indonesia, Thailand

Philippines: Philippine Crop Insurance Corporation (PCIC) in collaboration with the World Bank, DA-PhilRice and PAGASA implemented a pilot weather index insurance. Insurance premium is 891 peso per ha (100% subsidized to subsistence farmers) and farmers will receive seeds and fertilizers as incentives to join the program.

Indonesia: Directorate General of Agricultural Infrastructures and Facilities under the Ministry of Agriculture (MOA) has stipulated the Guidelines for Rice Farming Insurance Premium Aid (for damages >=75%)

Thailand: Bank for Agriculture and Agricultural Cooperatives (BAAC),in collaboration with Sompo Japan Insurance, has introduced Weather Index Insurance (WII) against Drought Risk in Northeast Thailand since 2010. The insurance payments made based on a trigger designed around weather elements such as temperature, precipitation and relative humidity rather than based on the direct assessment of the crop loss

Case 8: Lessons

- Could be used against a range of hazards (flood, droughts, typhoons)
- Quick insurance pay-outs leads to less financial stress to farmers
- Availability of weather related technology, remote sensing, and indices plays a key role in decision making

Case 9: Traditional knowledge for Participatory Plant Breeding(PPB) in Southwest China

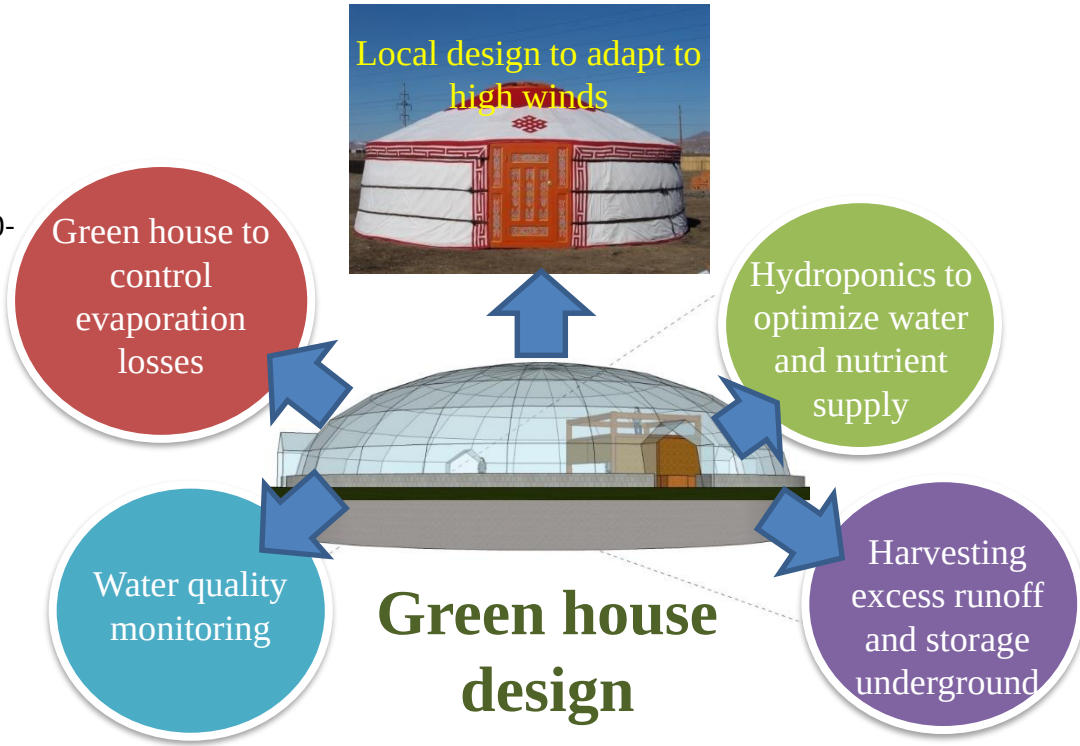
- Adopting new hybrid maize leads to replacement and disappearance of local varieties
- But local varieties survived droughts while hybrid maize did not
- Through PPB, scientists worked with local farmers to develop new maize and rice varieties with increased yield and resilience through breeding hybrids with local varieties.
- Farmers knowledge on local seeds (usually selected and saved by them) played a key role
- This approach not only helped in technological innovation at the local level but was found instrumental in re-introduction of traditional farming methods

Source: IIED, 2016

Case 10: Multi-purpose green house and water storage inspired by traditional Mongolian House-Yurt

Gobi desert

- Low precipitation (50-150 mm/year)
- ET higher than precipitation rate
- CC: hotter summer and high intensity rainfall, more flash floods, less recharge
- Complete dry in about one day after the flash floods

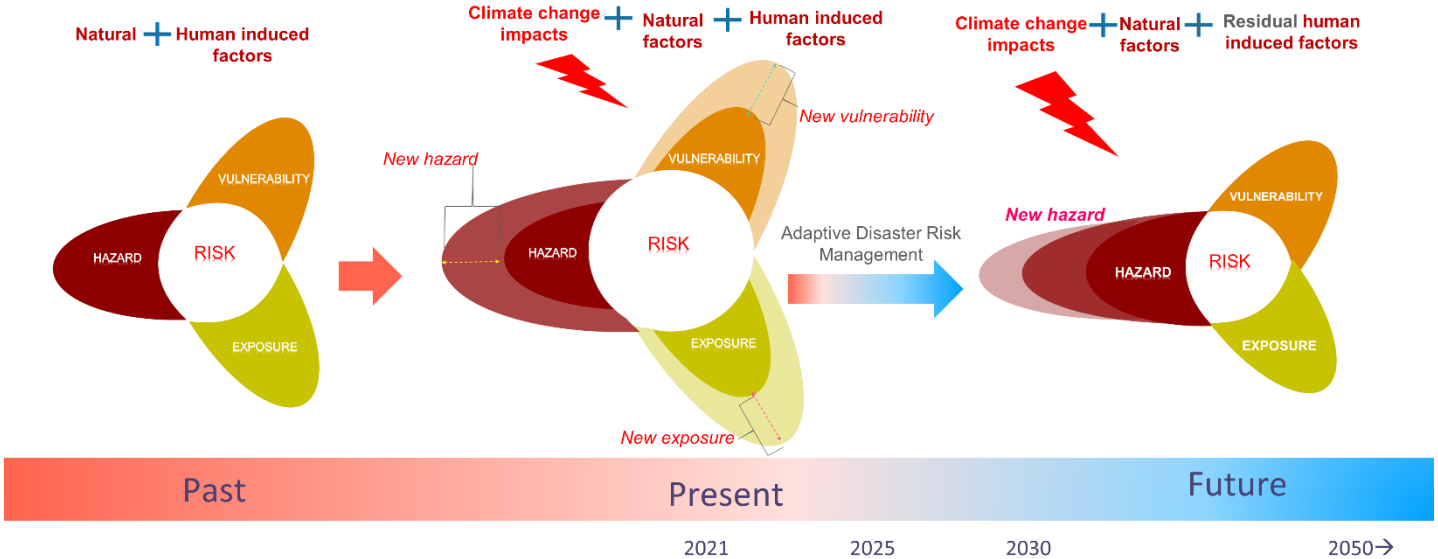


Source: Mr.Zulkhuu Uuganbaatar (IGES Intern 2017, Lecturer National Univeristy of Mongolia)

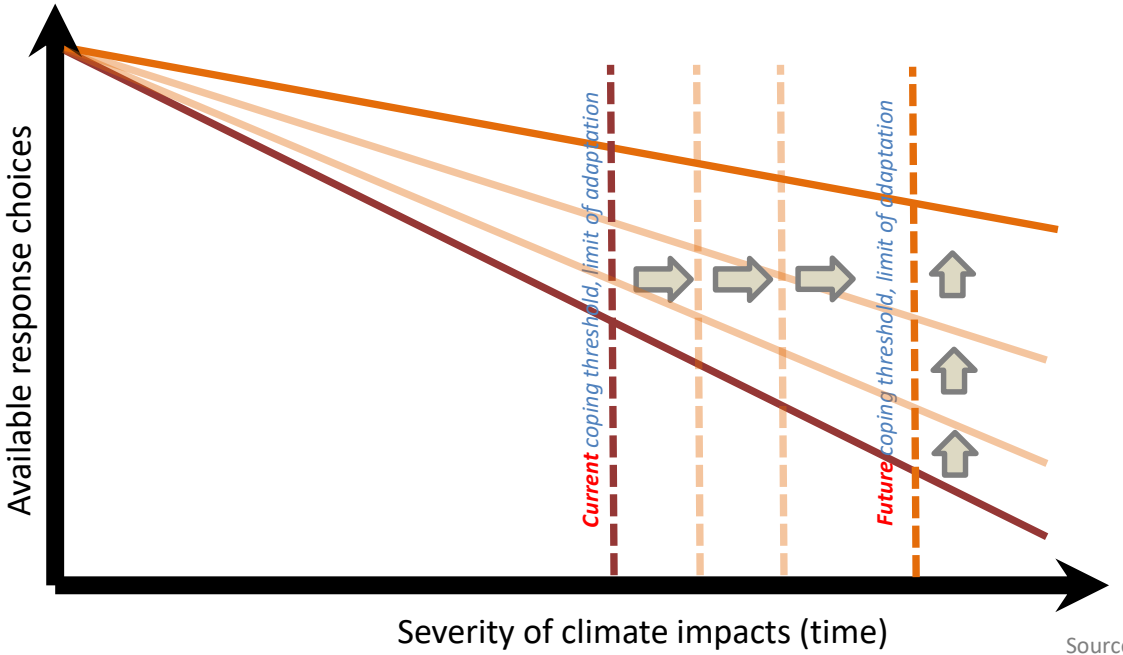
Case 10: Lessons

- 90% less water use comparing to traditional open field irrigation
- Reducing evaporation loss
- Possible to control water quality: salinity, hardness
- Allow cropping in winter in addition to summer. Important to meet growing demand for special vegetables (lettuce, tomato, cucumber) from tourist and new comers (mining sector);
- Speed up production time and increase yield size
- Possible to invest by local development fund and helps to generate income through commercial vegetable farming.

How to upgrade societal capacity (e.g., disaster)?



Targets for adaptation?



Source: Binaya

Some takeaways

- By nature adaptation is about navigating uncertainty, which required trial and errors or learning by doing.
- There are no perfect, one-size-fits all, adaptation cases
- Cases provides an opportunity to understand vulnerability contexts, coping strategies, and options for adaptation and resilience building
- Upscaling these cases is a challenging from technical, institutional and financial standpoints
- Improving decision-making capacity helps in upscaling
- Ultimately, it boils down to creating a society in which adaptation becomes a part of lifestyle or culture, i.e., transformation

Some questions for discussion

- Share the vulnerability context you are aware of, either your own country or places you have visited/studied
- Any alternative/innovative suggestions on improvising or replicating any of the cases
- Any brainstorming questions or queries?

Thank you for your kind attention