



#CAIP2025

CLIMATE ADAPTATION INVESTMENT PLANNING FORUM 2025

Session 4: Risk-informed adaptation investment planning



4.a. Panel Discussion: Understanding physical climate risks to inform adaptation investments

INTRODUCTION



Martin Okata

Senior Climate and Disaster Risk Specialist, ADB

KEYNOTE



Robert Wilby

Professor of Hydroclimatic Modelling, Loughborough University

#CAIPForum2025
3-4 September 2025
Manila, Philippines

INTERNAL. This information is accessible to ADB Management and Staff. It may be shared outside ADB with appropriate permission.



Lessons in Application of Climate Diagnostics across CAIP Countries: Adding downstream value to CAIP



Photo credit: ADB



Photo credit: ADB



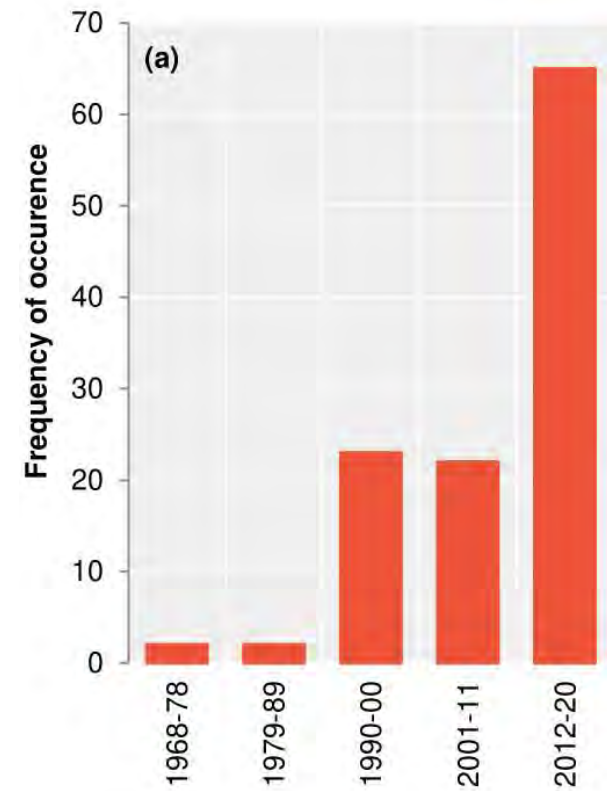
Photo credit: The Farsight

#CAIPForum2025
3-4 September 2025
Manila, Philippines

Bhutan: Starting with stakeholders rather than climate models

Information sources

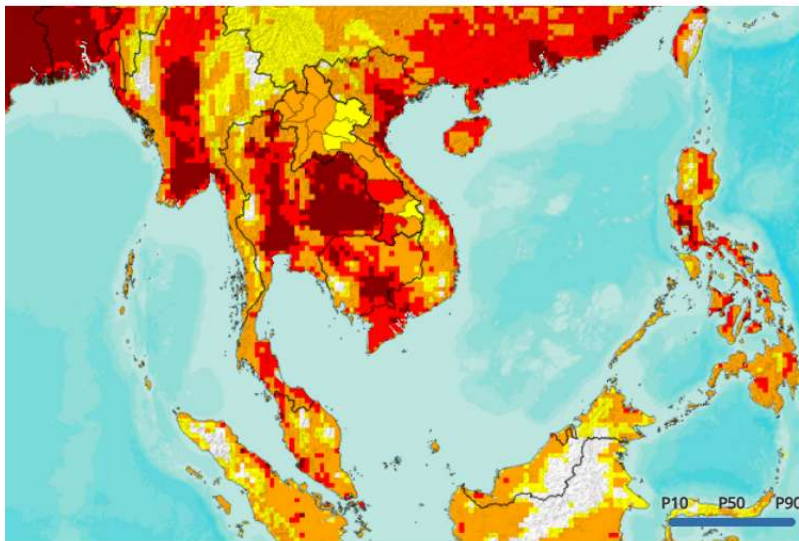
- Perspectives and knowledge from stakeholders, working groups and local experts.
- Media and community reports of weather impacts.
- Historic weather and climate data, including extreme event and trend analysis.
- Technical assistance and consulting reports on similar projects, including their climate risk assessments.
- Peer-reviewed scientific literature on the region(s) and sector(s) of interest.
- Portals with maps, time series, and distributions of future climate scenarios.
- Ready reckoners based on global and regional climate model projections under various emissions scenarios.



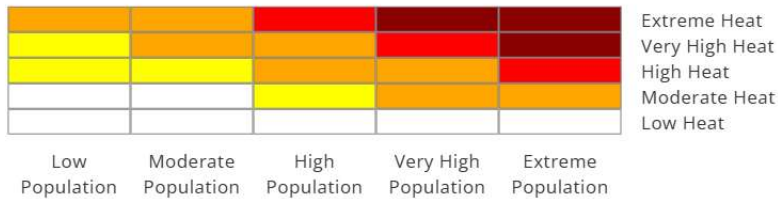
Frequency of floods in Bhutan by decade during the period 1968-2020.
Source: Tempa (2022)

Cambodia: Considering climate impacts on agricultural workers as well as crops

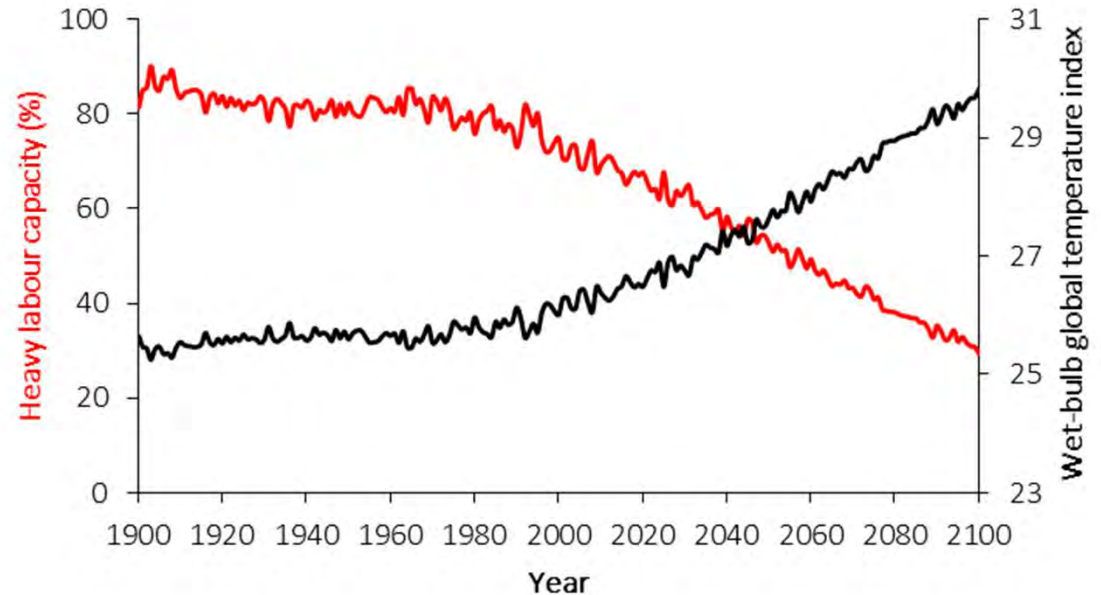
Humid-heat and population risk categories under SSP5-8.5 for 2040-2059. Source: WB CCKP



RISK FACTOR CATEGORIZATION



Protecting agricultural workers and their crops from heat



Heavy labour capacity (%) estimated for Battambang during May under RCP8.5. Heavy labour capacity is projected to be ~60% by 2030, and ~50% by 2050 (compared with ~70% in 1991-2020).

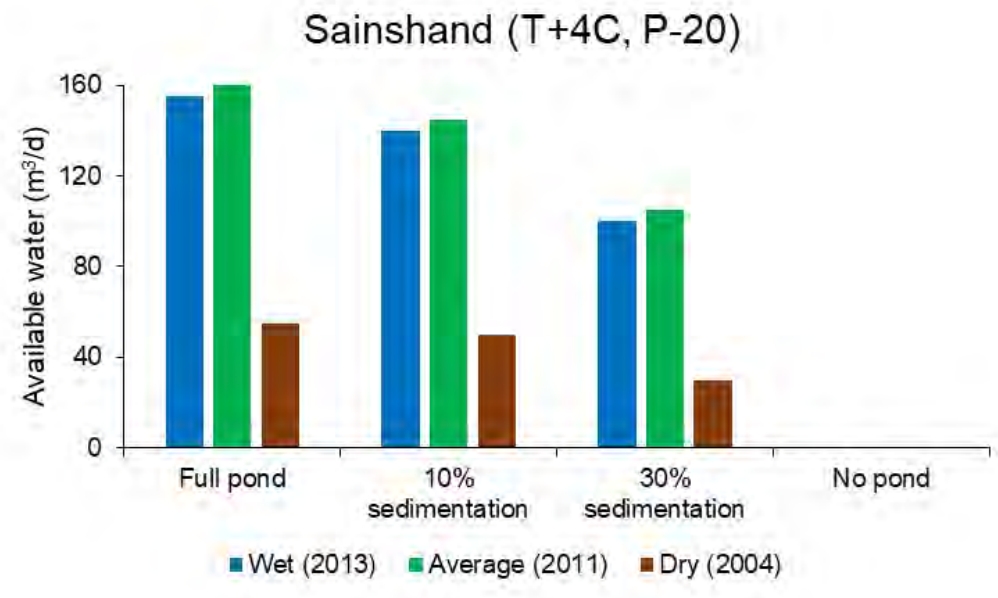


Mongolia: Focusing on what really matters

Seeking climate-smart pond sites, designs and operations



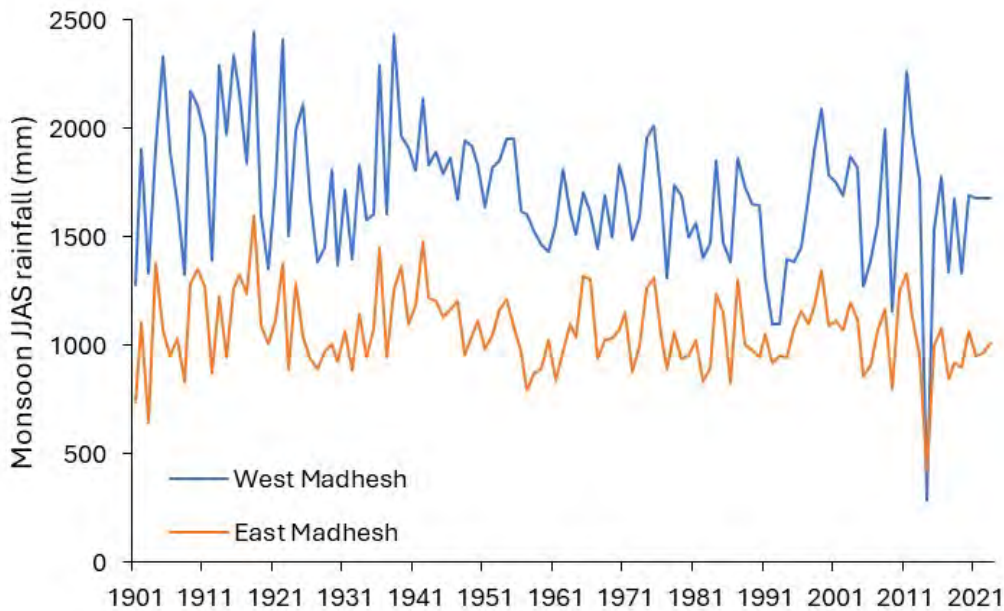
#CAIPForum2025
3-4 September 2025
Manila, Philippines



Pond water availability depends on many factors including amount and timing of rainfall, rates of pond sedimentation, and design.

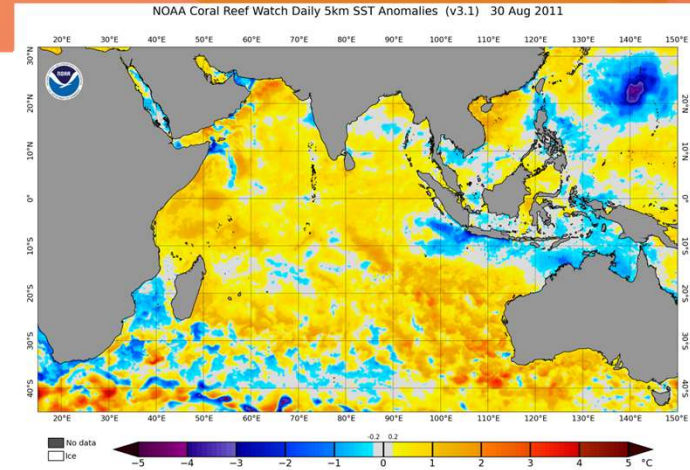


Nepal: Adapting to climate variability and change

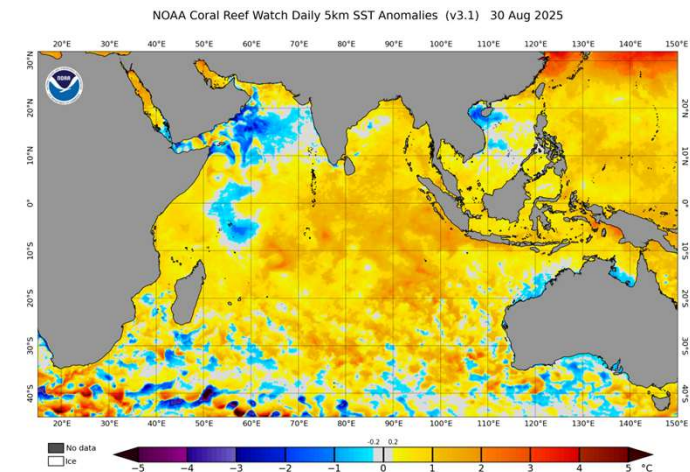


Data source: CRU TS4.08

#CAIPForum2025
3-4 September 2025
Manila, Philippines



August 2011
Positive IOD
Strong monsoon
Source: [NOAA](#)



August 2025
Negative IOD
Weak monsoon
Source: [NOAA](#)

INTERNAL. This information is accessible to ADB Management and Staff. It may be shared outside ADB with appropriate permission.

Lessons in Application of Climate Diagnostics across CAIP Countries: Thanks for listening



#CAIPForum2025
3-4 September 2025
Manila, Philippines

INTERNAL. This information is accessible to ADB Management and Staff. It may be shared outside ADB with appropriate permission.





4.a. Panel Discussion: Understanding physical climate risks to inform adaptation investments

MODERATOR



Natasha Kuruppu

Climate Change Specialist,
ADB

PANELISTS



Amjad Abdulla

Director General, Climate
Change Department,
Ministry of Tourism and
Environment, Maldives



Mozaharul Alam

Regional Coordinator,
Climate Action
UNEP Asia and the
Pacific Office



Yasmin Siddiqi

Director, Agriculture,
Food, Nature, and Rural
Development, ADB

#CAIPForum2025
3-4 September 2025
Manila, Philippines

INTERNAL. This information is accessible to ADB Management and Staff. It may be shared outside ADB with appropriate permission.





4.b. Deep dives: Understanding physical climate risks to inform investments

Parallel Sessions

Deep dive 4.1: Understanding climate risks in agriculture value chain to identify adaptation investments

Deep dive 4.2: Understanding climate risks in the water sector to identify adaptation investments

Deep dive 4.3: Understanding climate risk in the financial sector to enable adaptation investments

Deep Dive Session Questions

General questions:

1. What are the main lessons learned from applying climate risk assessment to adaptation planning in your sector/region?
2. What were the most useful information sources, tools and techniques for evaluating climate risks in your sector/region?
3. What is needed to enable the scaling up of climate risk assessment in other sectors and/or regions?

Sector specific reflections:

4. What new or surprising insights have emerged from climate risk assessments applied in your sector?





Deep dive 4.1: Understanding climate risks in agriculture value chain to identify adaptation investments

MODERATORS



Leo Kris Palao

Associate Climate Change Officer



Piseth Long

Principal Project Officer, ADB

PANELISTS



Heng Chan Thoeun

Deputy Director General of General, Ministry of Environment, Cambodia



Prakash Pantha

Senior Horticulture Development Officer, Ministry of Agriculture and Livestock, Nepal



Lloyd Cameron

Economic and Climate Counsellor at the British Embassy, Manila, UK FCDO



Stefania Giusti

Programme Officer, UN Food and Agriculture Organization



Dave Sivaprasad

Boston Consulting Group

#CAIPForum2025
3-4 September 2025
Manila, Philippines

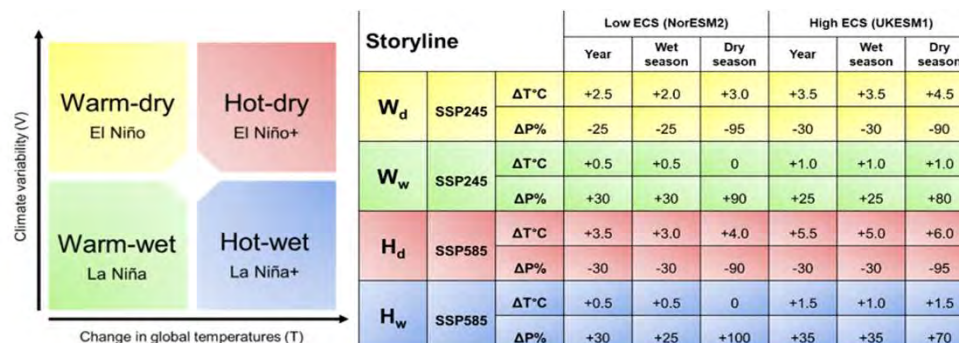
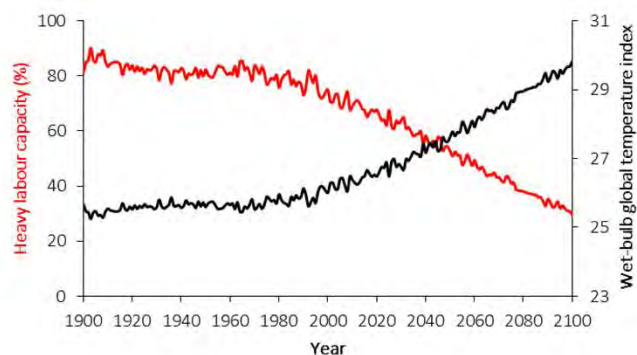
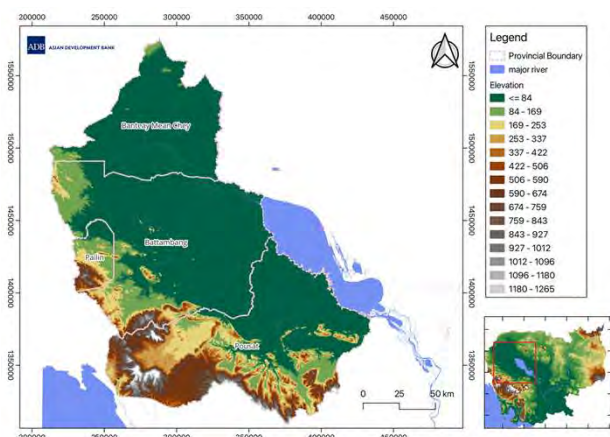
INTERNAL. This information is accessible to ADB Management and Staff. It may be shared outside ADB with appropriate permission.



CAMBODIA: UNDERSTANDING CLIMATE RISKS IN AGRICULTURE VALUE CHAIN TO IDENTIFY ADAPTATION INVESTMENTS

KEY OBJECTIVE

Translate climate risk assessments into investment-ready evidence—quantifying avoided losses, benefit-cost ratios, and fiscal impacts—to position adaptation in Cambodia’s Economic Pol 4 as an economically rational investment for decision-makers.



MOST USEFUL INFORMATION SOURCES, TOOLS AND TECHNIQUES

- Integrated Climate Diagnostics – Combines historical data with future climate storylines to stress-test investments under multiple scenarios.
- Spatial Risk Mapping – Uses hazard maps overlaid with crop suitability and water resources to identify concentrated risk areas.
- Economic Analysis – Pairs physical risk assessments with avoided-loss modeling and benefit-cost analysis to evaluate adaptation investments

LESSONS LEARNED IMPACT/OUTCOME

- Integrating CRA findings into **finance and planning processes** will ensure they directly influence public investment decisions and develop bankable project proposals. This approach guarantees that risk assessments actively guide national and sectoral investment priorities instead of being overlooked.
- Line ministries – MAFF, MOE, MOWRAM, and MLMUPC and Provincial Departments involved in the consultation process, and it requires training and resources to systematically carry out, interpret, and utilize CRAs for local adaptation planning and investment.

SUPRISING INSIGHTS

- A notable finding was the increasing significance of **heat stress**—a risk previously underestimated compared to floods and droughts, yet one with major effects on crop yields and farm labor.
- Another important realization was that **climate risks go beyond agriculture**. For instance, floods can interrupt transport routes, agricultural storage facilities, and processing plants, causing losses throughout the entire value chain.

Title: Understanding climate risks in agriculture value chain to identify adaptation investments

Objectives

Assess climate risks across Nepal's agriculture value chain to inform policy and decision-making, identify priority adaptation investments through diverse financing, enhance resilience especially for smallholders, and align efforts with national and international frameworks.

Methods

Stakeholder consultations, Field surveys, Vulnerabilities & Impact Assessment, Climate Resilient Index, Loss & Damage assessment, Crop modelling, Value chain mapping, GIS mapping, Climate adaptation investment planning

Lessons learned from applying climate risk assessment to adaptation planning

- Local, community-based assessments with indigenous knowledge are essential for sustainability.
- Scaling adaptation needs tailored technical, institutional, and policy support.
- Multi-sector collaboration, climate literacy, integrated planning is required for concurrent hazards.
- Conserving and using local landraces, technologies supports resilience.
- Transformative adaptation, like switching to high-value crops with efficient irrigation, is necessary.
- Scaling up climate risk assessment in Nepal's agriculture must go beyond climate-smart farming to strengthen the entire agricultural value chain.
- It's crucial to identify investment priorities and match them with the right financing—using grants where essential and leveraging tools like equity or credit to scale.

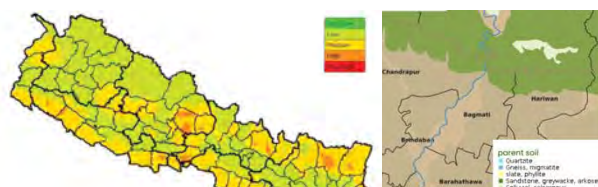
Most useful information sources, tools and techniques for evaluating climate risks

DHM, NARC, CBS (Nepal Agricultural Census, NLSS), AEPC, MoALD, MoFE, NTNC, Intergovernmental Institutions (UNDP, FAO, ICIMOD, CIMMYT, GGGI, GEF, GIZ, IFC), NGOs, NMB, GeoKrishi Initiatives and Pathway Technologies

Insights from climate risk assessments applied in agriculture

Shifting Crop Calendars, Emergence of New Pests, Water Stress in Water-Rich Areas, Labor Migration leading to labor shortages in agriculture, Gendered Impacts

<https://soil.narc.gov.np/soil/soilmap/>



<https://soil.narc.gov.np/crop/cropmap/>



<https://www.acasa-bisa.org/>

Prakash Pantha

Ministry of Agriculture and Livestock Development, Nepal

INTERNAL. This information is accessible to ADB Management and Staff. It may be shared outside ADB with appropriate permission.



Food and Agriculture Organization
of the United Nations

FROM RISK TO RESILIENCE: INVESTING IN DROUGHT RESILIENCE THROUGHOUT THE AGRICULTURAL VALUE CHAIN

Key objectives:

- Align development, adaptation and drought resilience agendas
- Transform drought challenges into investable opportunities
- De-risk investments along the agricultural value chain.

Methods include policy alignment, stocktaking of multi-purpose mitigation measures, and project portfolio development.

Lessons learned

Systematic policy alignment, stocktaking of multipurpose mitigation measures, and building blended finance portfolios along whole value chain essential to transform drought risks into investable opportunities

Useful information sources

- National Drought Plans and sectoral policies
- CBA of drought mitigation measures
- Public budget and international financial sources

New or surprising insights

Investments aligned with development, adaptation, and drought resilience goals deliver benefits even under varying drought conditions and additional co-benefits under non-drought settings.





ADB Climate Adaptation Investment Planning (CAIP) Forum

Session 4: Risk-informed adaptation investment planning

Understanding Climate Risks in Agricultural Value Chains to Identify Adaptation Investments

3 September 2025





Philippines is among world's most climate vulnerable countries

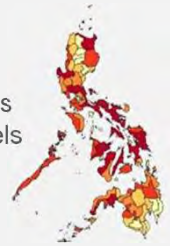
1



Assess climate risks & socio-economic impacts and develop adaptation and resilience plan (NAP)

Climate impacts modeled for 4 key CIDs¹ across 81 provinces:

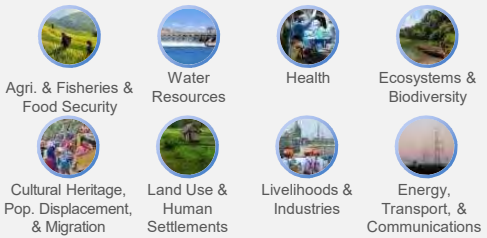
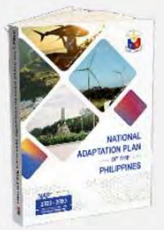
- Extreme winds and tropical cyclones
- Sea level rise and extreme sea levels
- Extreme precipitation
- Extreme temperature and drought



₱1.2-1.4 T

Potential cost of inaction in 2030

1st NAP submitted to the Govt. & UNFCCC, outlining strategies for 8 priority sectors



2



Design solution portfolio based on socio-economic ROI

Deep-dived on Water & Food systems in a selected province

- Estimated production losses if no action taken
- Identified & estimated impact of private sector-led projects to build resilience of sector



3



Mobilize investments to fund project implementation

Advanced projects for investment mobilization

- Detailed project model to facilitate finance from multi-sector partners



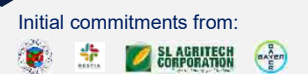
Negros Occidental: Commercialisation of climate-resilient and high-yielding sugarcane

16B PHP Investment advanced²



Iloilo: Commercialisation of climate smart rice and provision of irrigation as a service to rainfed farms

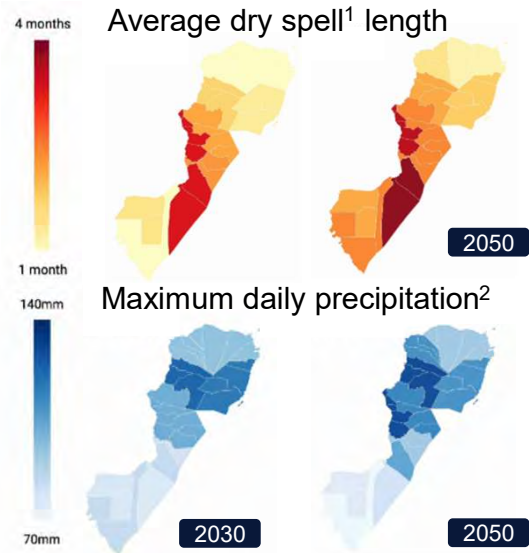
~6B PHP Investment advanced²





Deep-dive: Negros Occidental's sugarcane production sector faces increasing risk of losses due to climate change

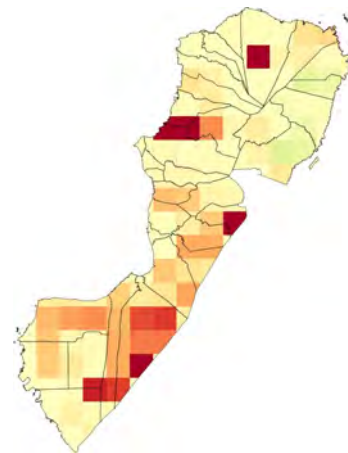
Climate change to drive longer dry spells and flooding...



- By 2030, ~20% of cropland exposed to dry spells >3 months, threatening water availability given >90% of farmland is rainfed
- By 2050, ~60% of area exposed to pluvial flooding

...resulting in production losses of 4.6% annually by 2030...

Change in sugarcane production in a **do nothing scenario** (2025-2035 vs 2010-2020)



4.6%

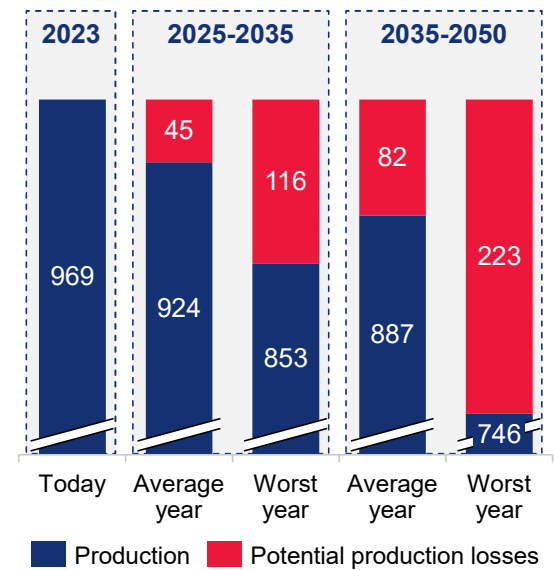
Avg. annual cane production loss (by 2030)

Up to 12%

Production loss in the worst years

...putting the security of provinces' sizable sugar sector at risk

Average annual raw sugar³ production in Negros Occidental (000s MT) in a **do nothing scenario**



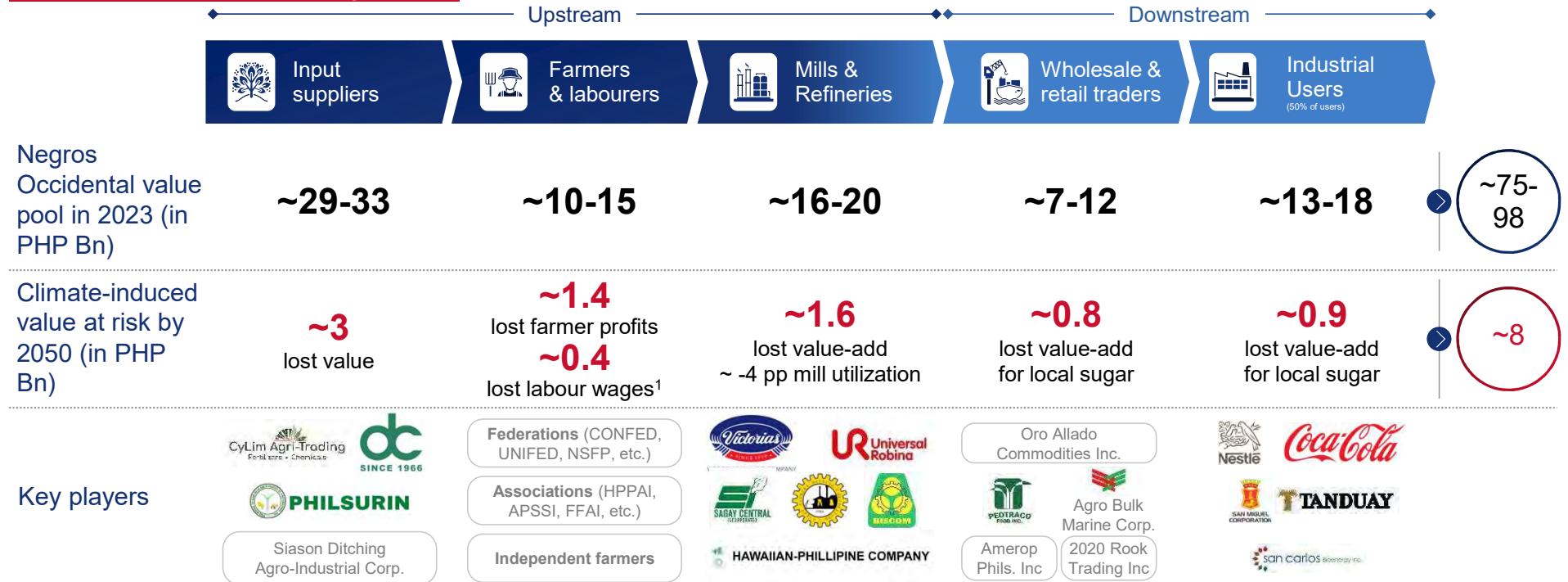
Results of climate models developed for this intervention; **Do nothing scenario** estimates impact of climate change without adaptation investments

1. Defined as three consecutive months of below normal (21%-60% reduction from average) rainfall conditions or two consecutive months of way below normal (more than 60% reduction from average) rainfall conditions (PAGASA definition);
 2. Maximum mm rainfall within any point in province boundary; 3. Assumes a constant sugar content of ~1.67 LKG sugar per metric ton of sugarcane
 Source: Philippine National Adaptation Plan 2023-2050; Negros Occidental Provincial Water Security & Sanitation Master Plan; CMIP6 data; FAO; NESADEM; SPAM; Soil grid; USDA Sugar Annual Report for the Philippines; Expert interviews; BCG analysis



These climate change-driven production losses could translate to ~PHP 8Bn of value at risk for the province's sugar sector annually by 2050 if no action is taken

Losses estimated for the do nothing scenario



Similar magnitude of losses could be expected for **crops critical to PH food security** (e.g. rice, corn) and other high value crops driving economic growth (e.g. banana, pineapple, coffee, cacao)

1. Lost wages based on rate of PHP 350 in 2024 for tapasero wages/ ton of cane harvested, based on the analysis of CONFED (tapasero referring to farmers contracted during harvest season)
 Note: Value loss by 2050 only considers estimated losses due to climate change, assuming constant prices, sugar content (Lkg/TC), harvested area, number & scale of mills in operation in 2050
 Source: SRA; Farmer interviews; Figures & analysis compiled by Confederation of Sugar Producers Association, Bacolod City office; BCG analysis.



7 high-impact, private sector-led projects conceptualised to build resilience of Negros Occidental's Food x Water systems against identified climate risks



Legend:	Project archetype	Climate-adapted on-farm solutions	Nature-based solutions for climate-resilient watersheds	Climate-smart water delivery for food systems
1	Commercialise use of proven climate-resilient, high-yielding varieties and scale extension services for SWC ¹ practices			
2	Accelerate bio-innovation across crop varieties with increased climate resilience			
3	Commercialise cloud-based, on-farm water mgmt. solutions through satellite data services			
4	Protect threatened watershed ² forest cover across province, restore with agroforestry systems			
5	Convert farmland on watershed recharge zones to forest / agroforestry			
6	Deploy small scale impounding and irrigation systems across farms outside of irrigable areas			
7	Accelerate development of National Irrigation Systems through PPP mechanisms			



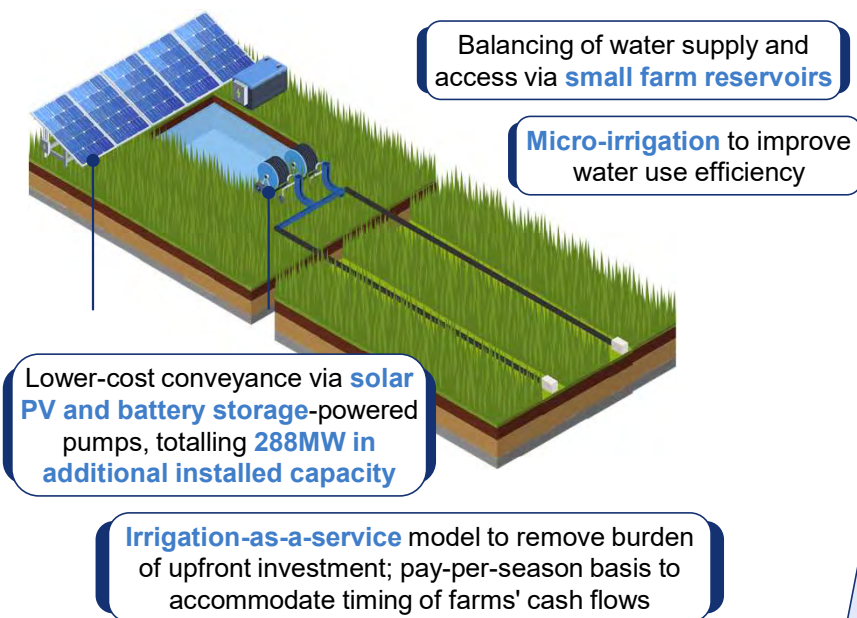
Example: deploying impounding and water-efficient, solar-powered irrigation in just 15% of sugarcane farms allows recovery of 75% of expected production losses

Project: Deploy small scale impounding and water efficient solar-powered micro-irrigation systems across farms outside of irrigable areas

Key challenges

- 1 Declining water availability for a water intensive crop**
Driven by erratic rainfall and lack of access to water sources; 8.5% production decline by 2050
- 2 Use of diesel pumps**
Drives energy costs and carbon emissions up
- 3 Limited capacity for upfront capital investments**
- 4 Limited ability to pay during 12-mos growing period**
Farmer cash flows only come in 1x/year during the harvest season

Objective of the project



Estimated impact of province-wide investment

Change to annual sugarcane production in Mn tons by 2030



Change in water use efficiency with the project versus no action taken

+ 4%
(-450 m³)

Results of climate models developed for this intervention!



Deep dive 4.2: Understanding climate risks in the water sector to identify adaptation investments

MODERATORS



Alex Harvey
Senior Climate
Change Specialist



Zhe Yuan
Natural Resources
Economist, ADB

PANELISTS



Sopheap Sao
Secretary of State, Ministry
of Land Management Urban
Planning and Construction



Denchen Yangden
Director, Ministry of
Energy and Natural
Resources, Bhutan



Tiaravanni Hermawan
Researcher, Flood and
Drought Risk, Deltares



Abinash Mohanty
Global Sector Head-
Climate Change and
Sustainability, IPE Global

#CAIPForum2025
3-4 September 2025
Manila, Philippines

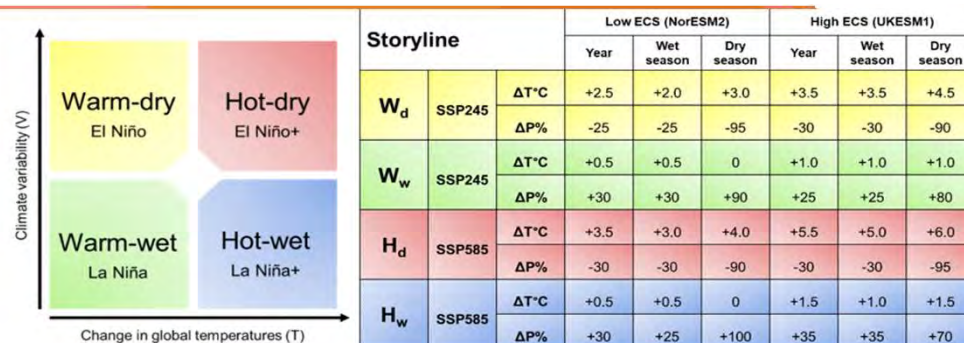
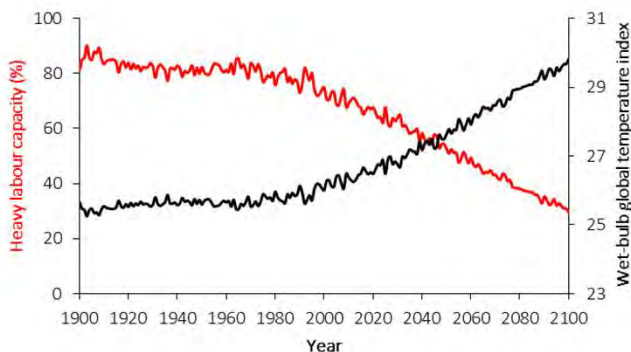
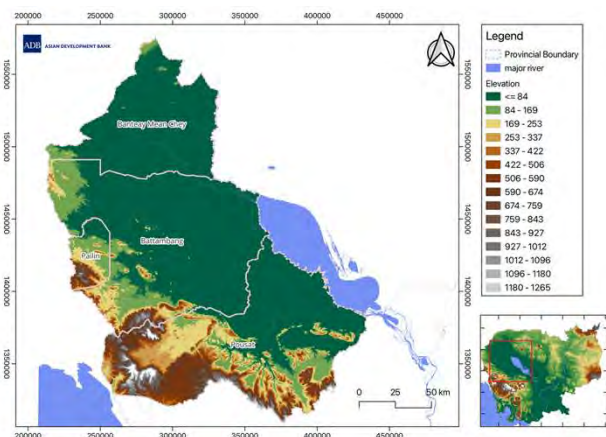
INTERNAL. This information is accessible to ADB Management and Staff. It may be shared outside ADB with appropriate permission.



CAMBODIA: UNDERSTANDING CLIMATE RISKS IN AGRICULTURE VALUE CHAIN TO IDENTIFY ADAPTATION INVESTMENTS

KEY OBJECTIVE

Translate climate risk assessments into investment-ready evidence—quantifying avoided losses, benefit–cost ratios, and fiscal impacts—to position adaptation in Cambodia’s Economic Pol 4 as an economically rational investment for decision-makers.



MOST USEFUL INFORMATION SOURCES, TOOLS AND TECHNIQUES

- Integrated Climate Diagnostics – Combines historical data with future climate storylines to stress-test investments under multiple scenarios.
- Spatial Risk Mapping – Uses hazard maps overlaid with crop suitability and water resources to identify concentrated risk areas.
- Economic Analysis – Pairs physical risk assessments with avoided-loss modeling and benefit–cost analysis to evaluate adaptation investments

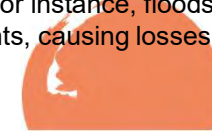
LESSONS LEARNED IMPACT/OUTCOME

- Integrating CRA findings into **finance and planning processes** will ensure they directly influence public investment decisions and develop bankable project proposals. This approach guarantees that risk assessments actively guide national and sectoral investment priorities instead of being overlooked.
- Line ministries – MAFF, MOE, MOWRAM, and MLMUPC and Provincial Departments involved in the consultation process, and it requires training and resources to systematically carry out, interpret, and utilize CRAs for local adaptation planning and investment.

SUPRISING INSIGHTS

- A notable finding was the increasing significance of **heat stress**—a risk previously underestimated compared to floods and droughts, yet one with major effects on crop yields and farm labor.
- Another important realization was that **climate risks go beyond agriculture**. For instance, floods can interrupt transport routes, agricultural storage facilities, and processing plants, causing losses throughout the entire value chain.

in is accessible to ADB Management and Staff. It may be shared outside ADB with appropriate permission.





BHUTAN
Believe

Understanding Climate Risk - Water sector: To Identify Adaptation Investment, 2nd CAIP Forum

**Department of Water,
Ministry of Energy and Natural Resources,
September 3, 2025.**





General geography

Land area

- 38,394 square km.

Water sources and discharges

- 95,500 m³ per capita per year
 - ✓ Precipitation-88%,
 - ✓ 2-12% glacial melt, and springs, and
 - ✓ 2% from snow melt.



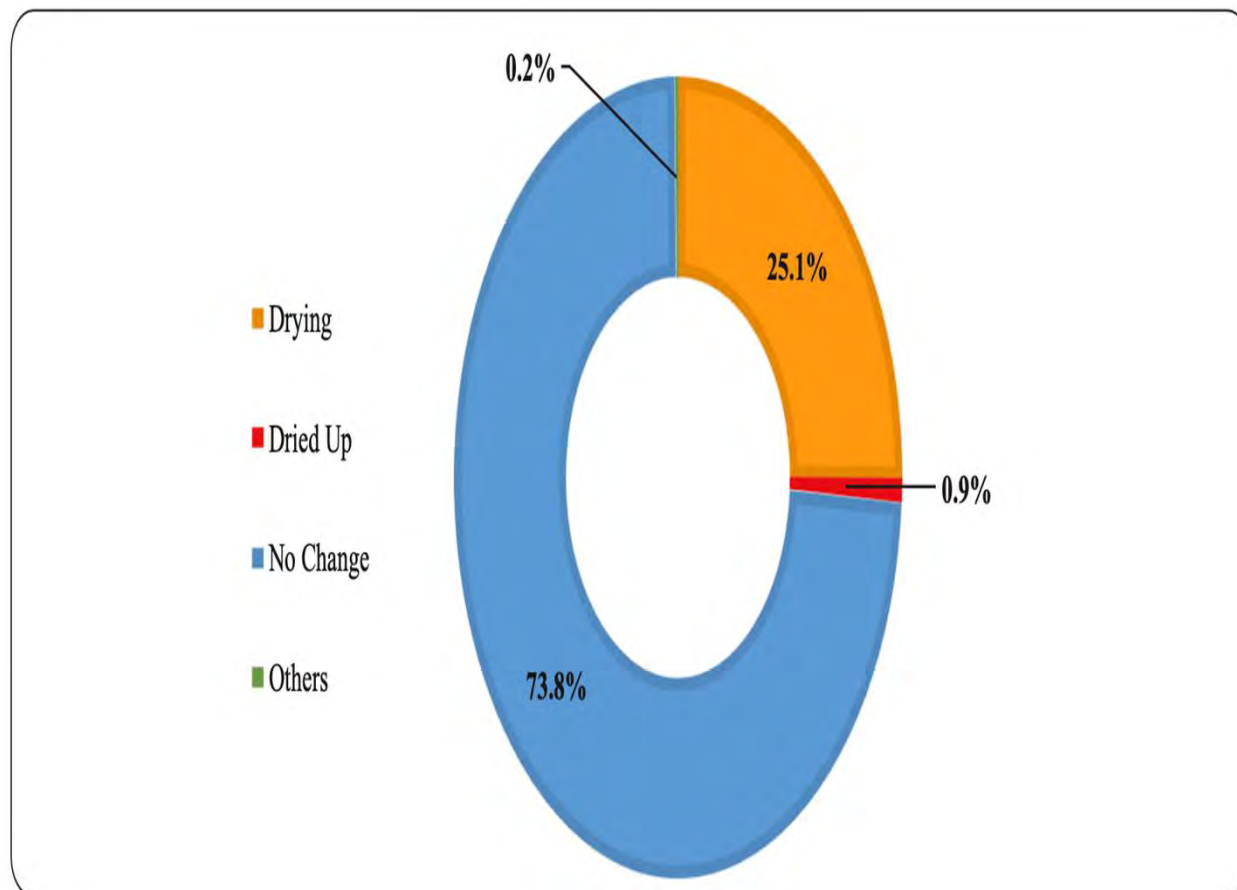
Water and Climate

Climate change presents a clear and imminent threat, which will have a major bearing on our socio-economic sectors, primarily depending on water resources. As per assessments, it is projected that climate change will exacerbate issues in water availability through increase in seasonal variability, leading to erratic flows, and depreciation of water supply infrastructure. The wet season will be wetter and shorter, whereas dry season will be drier and longer.



Water and Climate

Status of Water Sources	No of Water Sources
Drying	1856 (25.08%)
Dried Up	69 (0.93%)
No Change	5457 (73.75%)
Others	17 (0.002%)
Grand Total	7399





Water and Climate

- Risks of local dry spells –**Increasing**.
- The risks of increased flood –**High**.
- Potentially triggering landslides –**Increasing**.
- Melting of glaciers –**Continues**, thereby Risks of GLOF events – **Increasing**.



Water and Economic

BHUTAN
Believe

- **+45% GDP – Energy, Agriculture, Ecotourism, and Industrial needs.**

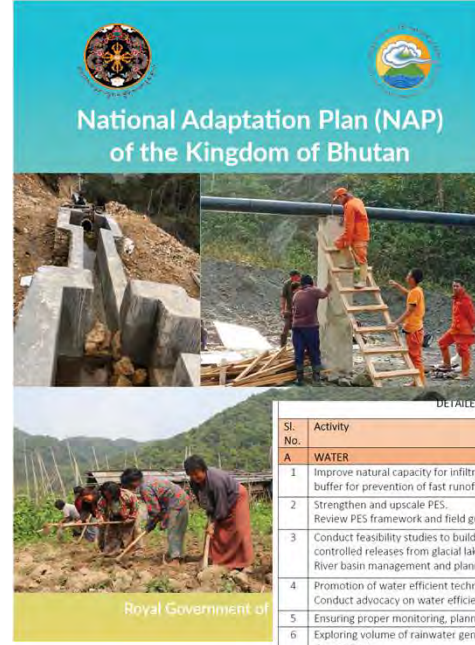


Bhutan's Adaptation

BHUTAN
Believe

About the National Adaptation Plan

- *National Adaptation Plan, 2023,*
- *Seven key thematic areas,*
- *Financing needs: USD: 14B, and*
- *USD-14B?*



DETAILED ADAPTATION PRIORITIES

Sl. No.	Activity	Estimates in USD
A WATER		
1	Improve natural capacity for infiltration, water recharge, and water buffer for prevention of fast runoff and erosion	500,000
2	Strengthen and upscale PES. Review PES framework and field guide	100,000
3	Conduct feasibility studies to build emergency storage, bypasses, and controlled releases from glacial lakes. River basin management and planning for basin optimization.	62,000
4	Promotion of water efficient technologies. Conduct advocacy on water efficient technologies	23,500
5	Ensuring proper monitoring, planning and supply of drinking water	123,000,000
6	Exploring volume of rainwater generated at water stressed areas for domestic use. Developing assessment guide for integration of holistic use of water resources	200,000
7	Reduction of Non-Revenue Water losses	6,500,000
8	Strengthen database/inventory on drinking water supply schemes	4,000,000
9	Improve planning, designing and implementation of climate resilient irrigation	70,000,000
10	Robust water resources planning and monitoring system	18,000
11	Strengthening research on water resource management including	25,400
12	Strengthening research on water resource management including groundwater resources. i. Research on water resource management including groundwater resources and soil moisture ii. Enhance hydrological and groundwater modelling. iii. Carry out studies on the options for household/institution level rainwater harvesting or creating additional water storage capacity. iv. Assess climate risk on water intensive industries (168 water intensive industries as of 2022)	183,000
13	Enhancing capacity of key stakeholders in managing the impacts of climate change on water	135,000
14	Capacity development of flood and storm water management from river flooding and urban floods	150,000
SUB TOTAL WATER		204,896,900





Bhutan's Adaptation

BHUTAN
Believe

Climate Adaptation Investment Plan: Water Sector

- *ADB TA 6963: Water Sector-High climate vulnerability,*
- *Formation: Inter-agency Working Group, Led by DoW,*
- *Strategic and Programmatic Outlook, and*
- *Eight Adaptations Investment Packages- 847 M USD.*





Bhutan's Adaptation

BHUTAN
Believe

“Our approach is a ‘Policy-first’ approach, which aligns adaptation objectives to the development planning and financing landscape, rather than a ‘science-first’ approach that starts with climate change projections.”

Integrated and participatory approach to identify adaptation investments for climate risk resilience in the agricultural value chain

The **Bangladesh MetaModel** is a **Decision Support Tool** developed to assist in implementing the Bangladesh Delta Plan 2100 by providing quantitative information for investment planning.

Rounded understanding of the delta as coupled systems and changes in one aspect may have a cascade of impacts.

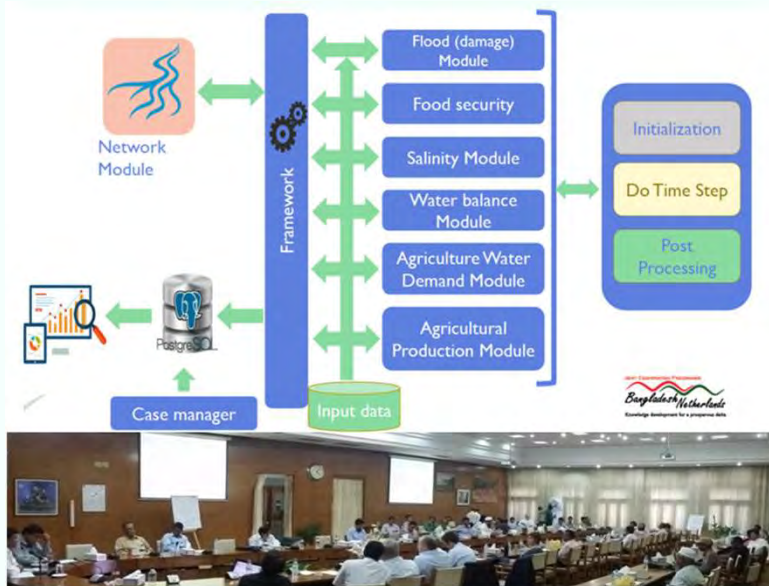
Bangladesh Delta Plan 2100 aims to achieve sustainable development are based on climate-sensitive management: associated policies, strategies and investments concentrate on adaptation.

The **Bangladesh MetaModel** is a simplified integration of various detailed, complex “trusted” local sectoral models, including:

- **Bio-physical modules**, e.g. water balance, agricultural production
- **Socio-ecological modules**, e.g. flood damage and food security

An **iterative learning loop approach** includes stakeholder discussions, led by the General Economic Division of Bangladesh to detail proposed interventions in BDP2100 (e.g. location, dimension). The participatory approach results were incorporated as model parameters, estimating impacts and trade-off between:

- resources vs immediate needs
- competing interests (economic growth vs environmental pollution)



Metamodel frameworks & BDP2100 Training



Values not final yet, need revision!

Case-1

Select a scenario year
2030

Select an climate change scenario
High Low

Select an economic scenario
High Low

Select a project
DP1-2 : Revitalization and Restora...

Case-2

Select a scenario year
2050

Select an climate change scenario
High Low

Select an economic scenario
High Low

Select a Project
DP1-3 : Revitalization and Restor...

BDP SDC DSI SI

Goal Name: All

Division: Rangpur

District: All

Indicators (Unit)	Base Value	Case-1(%)	Case-2 (%)
I-01 : Annual rice production (Tonnes)	5,004,014	-0.3%	-7.3%
I-02 : Annual rainfall damage (BDT)	40,679,323	0.8%	52.9%
I-03 : Food security for the poor (R%)	63	-100.0%	-36.9%
I-05 : Poor households affected by droughts, floods and salinity (number)	30	0.6%	59.3%
I-10 : Annual flood extent (ha)	280,474	2.7%	13.6%
I-11 : Annual flood duration (days)	30	0.0%	4.9%
I-12 : Extreme flood extent (ha)	413,560	-0.0%	19.2%
I-13 : Waterlogged area (ha)	875,762	0.2%	32.7%
I-14 : Dry season river flow (m3/s)	756	5.2%	-33.2%
I-15 : GWL decline at end of dry season (m)	-1,930	-0.7%	-25.6%
I-18 : Annual flood damage (BDT)	20,071,083	1.5%	15.8%

<http://jcpbd.nl>



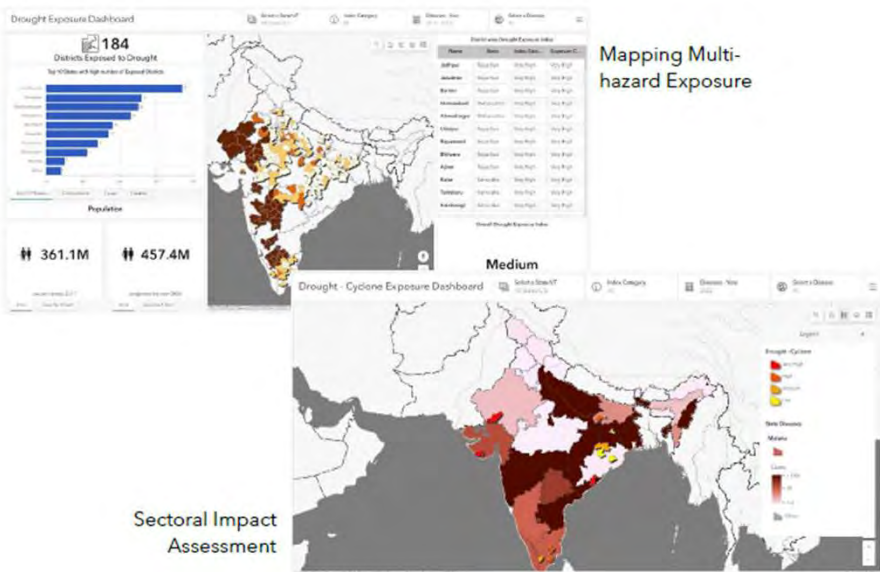
Climate Risks, Adaptation & Resilience Planning

Key Objective

We perform **hyper-granular Climate Risk Assessments** to integrate climate risk information across **upstream** and **downstream** levels.

Method

Climate risk assessments are conducted using a combination of web-based GIS tools and predictive climate modeling based on RCP and SSP scenarios, applied across diverse projects and geographies.



Lessons Learnt

1. Improves **decision-making based on comprehensive climate risk data**
2. Enables **real-time dynamic action planning**
3. Minimizes **Loss & Damage**
4. Developed **foundation knowledge & empirical evidence for investment planning & prioritisation.**
5. Enhances **risk portfolio visibility**

Sources of Information

Hydrological and Meteorological data, Satellite weather data, State Action plan on Climate Change, Disaster Management Authority, Municipal Corporations, etc.

Insights of HRVA

- 🎯 Enables **identification** of both **primary & residual climate risks**. In the **water sector**, most **infrastructural assets are inadequate to hedge against climate risks**.
- 🎯 Multi-hazard mapping **supported decision-makers** in creating **real-time action plans** to address **cascading and compounding impacts**.
- 🎯 Revealed a **triangular nexus between: Judicial use of water, microclimate, & regional climate issues**.

Use Cases

1) Developing a Multi-Hazard Risk Atlas for Mumbai (MHVRA)
 Client: UNDP, BMC | Duration: Phase I: 2023 – 2024; Phase II: 2025 – Ongoing

The **Multi-Hazard Risk & Vulnerability Atlas** was developed for **Mumbai**, integrating **granular risk assessments**, **climate scenario modelling**, **GIS-based decision tools**, and **capacity building**, which led to enhanced urban governance.

“A key highlight was the integration of a state-of-the-art, hyper-granular Climate Risk Assessment into the city’s Command & Control Centre.”

2) Multi-Hazard Risk Mapping for Pilot Cities in Ghana Client: FCDO | Duration: 2024 – 2025

A **multi-hazard risk framework** for Ghana, combining **climate risk assessments**, **AI-based predictive modelling**, a **dynamic city-level dashboard with toolkits & training**—strengthening local capacities, risk-informed sustainable city development.

“A significant milestone was developing Decision Support Systems with limited data availability”

3) Second Strengthening Social Resilience Program (SSSRP) – Bangladesh, Client: ADB | Duration: 2024 – 2025

Social protection systems were designed with **key stakeholders**. The team conducted a **socio-economic vulnerability assessment** to safeguard at-risk communities—from the impacts of climate change and natural disasters.

“A key achievement was generating empirical evidence by performing socio economic vulnerability assessments to inform adaptive & equitable social protection systems.”

4) Developing Model Heat Action Plan for Patna District
 Client: UNDP, Government of Bihar | Duration: 2025 – Ongoing

A **district-level Heat Action Plan** for Patna, featuring **hyper-granular risk assessments**, a **dynamic digital plan with monitoring tools**, **capacity building**, & **community-led pilots**—creating a resilient replicable model for other districts.

“A landmark outcome of this project was a first-of-its-kind Dynamic Heat Action Plan.”

Developing a Multi-Hazard Risk Atlas for Mumbai

Client: UNDP, BMC | Duration: Phase I: 2023 – 2024; Phase II: 2025 – Ongoing

Project Overview

- By translating climate risk into localized, actionable intelligence, this initiative paves the way for **mainstreaming adaptation** into **disaster management**, **urban governance**, and **infrastructure planning** - making Mumbai a safer and climate – resilient city.
- The **Multi-Hazard Risk & Vulnerability Atlas** was developed for **Mumbai**, integrating **granular risk assessments**, **climate scenario modelling**, **GIS-based decision tools**, and **capacity building**.
- **Phase II integrates scenario-based hazard modelling** directly into the **Command and-Control System (CCS)** at the **BMC headquarters**.

Key Contributions

- **Risk Modelling:** Mapped future risks & hotspots using past hazards + IPCC scenarios.
- **Vulnerability Assessment:** Combined socio-economic & spatial data to identify at-risk groups & assets.
- **Adaptation Planning:** Early warning, green-blue infra & resilient housing recommendations.
- **Decision Support:** GIS-based platform (with Esri India) for planning & response.
- **Institutional Capacity:** Strengthened BMC & aligned with NDMP/SAPCC.
- **Real-Time Modelling:** GIS & remote sensing simulations for floods, cyclones, heatwaves, landslides.
- **Emergency Support:** Algorithms for cascading impacts & priority interventions.

Community-Level Impact

30,85,410+
people expected to benefit from improved preparedness

16,84,600+
women reached through gender-sensitive risk analysis

\$49 billion+
in estimated loss and damage averted by 2070 (based on IPCC sea-level rise projections)

“A key highlight was the integration of a state-of-the-art, hyper-granular Climate Risk Assessment into the city’s Command & Control Centre.”

Multi-Hazard Risk Mapping for 9 Pilot Cities/ MMDA's in Ghana, GCIEP

Client: FCDO | Duration: 2024-2025

Project Overview

- A **multi-hazard climate risk assessment framework** implemented in pilot cities of Northern Ghana.
- The **Green Cities and Infrastructure Energy Programme (GCIEP)**, under FCDO's urban portfolio, aims to build inclusive, sustainable, and climate-resilient cities by strengthening **early warning systems, risk-informed planning, and investments in climate-resilient infrastructure**
- The framework combines **climate risk assessments, AI-based predictive modelling, a dynamic city-level dashboard with toolkits & training.**
- Anchored in the **Ghana Urban Risk Observatory**, the initiative institutionalizes urban resilience through data-driven governance.

Key Contributions

- **Designing a Robust Risk Mapping Methodology** to identify hazard-prone areas, climate vulnerabilities, and exposure of infrastructure and populations.
- **Building a Dynamic Climate Risk City-level Dashboard**, AI- and predictive analytics-powered, to visualize **evolving risks** and support proactive **urban decision-making**, fully integrated into the **Ghana Urban Risk Observatory** platform.
- **Training & Capacity Building: Producing user-friendly toolkits** and **delivering training** to equip local institutions to conduct climate risk assessments and use the dashboard for planning and response.

1,89,33,711+
people expected to benefit from enhanced climate resilience

36,39,573+
women targeted through inclusive urban risk planning

USD 300 million+
in potential annual Loss and Damage costs projected to be averted

“A significant milestone was developing Decision Support Systems with limited data availability”

Second Strengthening Social Resilience Program (SSSRP) – Bangladesh

Client: ADB | Duration: 2024-2026

Project Overview:

- The project supports the **Ministry of Disaster Management and Relief (MoDMR), Government of Bangladesh**, in designing **climate-proofed social protection programs** that respond proactively to hazards through anticipatory action, early warning systems, and inclusive design.
- **Social protection systems were designed with key stakeholders.** The team conducted a **socio-economic vulnerability assessment** to safeguard at-risk communities—from the impacts of climate change and natural disasters.

Key Contributions:

- **Policy & Institutional Analysis** of national policies to identify gaps and recommend actionable measures for mainstreaming climate adaptation.
- **Program Design for Climate-Resilient Safety Nets** such as designing **inclusive, risk-informed social protection programs** with **early warning systems, disaster preparedness, and anticipatory actions.**
- **Gender-Responsive Adaptation Planning** to address vulnerabilities of women and marginalized groups, ensuring equitable resilience-building.
- **Capacity Building & Community Engagement** of government stakeholders, local institutions, and communities – especially women-led groups - on climate action and disaster response.
- **Stakeholder Consultations** with national and subnational actors to co-create locally grounded solutions.

More than 1.9 million beneficiaries are impacted

200+ Government officials

with increased capacity to design, implement, monitor, and evaluate relevant

“A significant milestone was developing Decision Support Systems with limited data availability”

Developing Model Heat Action Plan for Patna District

Client: UNDP, Government of Bihar | Duration: 2025 – Ongoing

Project Overview

- A **district-level Heat Action Plan for Patna**, featuring **hyper-granular risk assessments**, a **dynamic digital plan with monitoring tools**, **capacity building**, & **community-led pilots**—creating a resilient replicable model for other districts.
- The **Government of Bihar**, in partnership with the **United Nations Development Programme (UNDP)**, has launched the development of a Model Heat Action Plan for Patna district. This plan will **provide district-specific, data-driven strategies to enhance resilience and preparedness for extreme heat events**.
- This initiative will not only **enhance the departmental disaster response capacity** but also serve as a model for replication in other Indian states seeking to embed disaster resilience within departmental governance structures.

Key Contributions

- **Hyper-Granular Risk Mapping:** Using AI/ML-driven climatological and meteorological models to produce real-time, sub-district heat risk data from satellite and local monitoring inputs.
- **Discomfort Index Estimation:** Incorporating temperature, humidity, and urban heat island effects to assess human health vulnerabilities across Patna.
- **Forecasting & Early Warning:** Developing predictive tools and protocols to enable timely responses and reduce heat-related casualties.
- **District-Level Action Framework:** Designing tailored, cross-sectoral response plans involving health, urban planning, disaster management, and community outreach.
- **Stakeholder Engagement & Capacity Building** to strengthen readiness among local authorities and first responders.

2.1 million+ citizen

USD 35 million +
Resilient investment
mobilisation

“A landmark outcome of this project was a first-of-its-kind Dynamic Heat Action Plan that democratises heat risks.”



Deep dive 4.3: Understanding climate risk in the financial sector to enable adaptation investments

MODERATOR



Nisha Krishnan

Climate Change Specialist, ADB

PANELISTS



Knarik Yedigaryan

Chief Specialist
Ministry of Finance,
Armenia



Feng Hu

APAC Policy Advisor,
United Nations Environment
Program Finance Initiative
(UNEP FI)



Paras Abbasi

Deputy Director SMR,
Housing and Sustainable
Finance, State Bank of
Pakistan



Luis Almeida

Public Sector Specialist,
Public Sector Management
and Governance Sector
Office, ADB

#CAIPForum2025
3-4 September 2025
Manila, Philippines

INTERNAL. This information is accessible to ADB Management and Staff. It may be shared outside ADB with appropriate permission.





UN 
environment
programme

finance
initiative

September 2025

UNEP FI Climate Adaptation & Resilience Team

ADB CAIP forum



UNEP FI publications to support A&R action

Principles for Responsible Banking

- **Climate Adaptation Target Setting** published in November 2023 to articulate how banks can undertake action around A&R, and establish practice targets.
- In 2024 a working group of banks was mobilised to implement these targets and share methodologies and learnings. The working focused its efforts on the real estate (retail and commercial) and agriculture sectors. The outputs of this Adaptation and Resilience WG informed the **Practical Guidance on Implementing Adaptation and Resilience for Banks** that was launched in July this year.



Climate Adaptation Target Setting



Practical Guidance on Implementing Adaptation and Resilience for Banks

ARIC

- The **Adaptation & Resilience Impact: A measurement framework for investors** guidance was produced by ARIC in April 2024 to support investors in applying impact metrics to investments
- ARIC also produced the **Physical Climate Risk Assessment And Management Investor Playbook** in October 2024 to support investors in understanding the step-by-step actions necessary to engage in physical climate risk management



Adaptation & Resilience Impact: A measurement framework for investors



Physical Climate Risk Assessment And Management Investor Playbook