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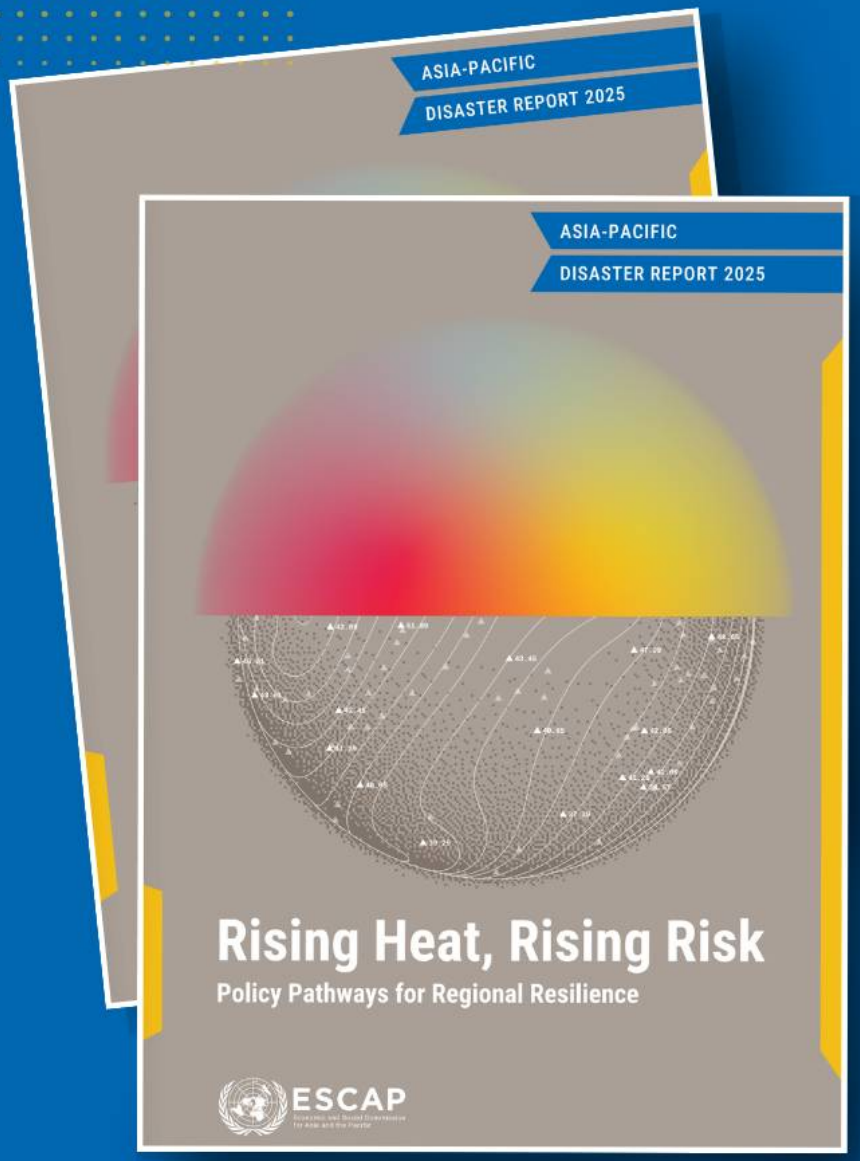
Use of Climate Projections for Planning and Climate Adaptation Strategies



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ASIA-PACIFIC DISASTER REPORT 2025

Rising Heat, Rising Risk

Policy Pathways for Regional Resilience

View/Open

High Temperatures Drive Expanding Disaster Risks

Asia and the Pacific faces intensifying climate hazards, with extreme heat emerging as the fastest-growing threat. 2024 was the hottest year on record globally, with most regional countries experiencing extreme heat episodes.

33M
People Affected
Bangladesh heatwave (April-May 2024) impacted the most people

700
Fatalities
India heatwave was the second deadliest event

35°C
Severe Heat Stress
Heat index threshold posing health dangers with prolonged exposure

41°C
Extreme Danger
Heat stroke becomes likely at this heat index level

Cascading Impacts Across Systems

Urban Heat Islands

Cities like Seoul, Tokyo, Beijing, Delhi, and Manila face an extra 2°C-7°C on top of global warming. Children, elderly, and outdoor low-wage workers in poor urban areas are disproportionately affected.

Economic Toll

Under SSP 5-8.5, total losses expected to reach $498 billion. Working hours lost to heat stress projected to more than double, from 3.75 million to 8.1 million full-time job equivalents by 2030.

Health Hazards

Heat disrupts thermoregulation, straining cardiovascular and respiratory systems. Causes heatstroke, kidney injury, and long-term cognitive impacts.

Agricultural Stress

Five countries at high risk: Afghanistan, India, Pakistan, Nepal, Bangladesh. Reduces crop yields and livestock productivity while entrenching rural poverty.

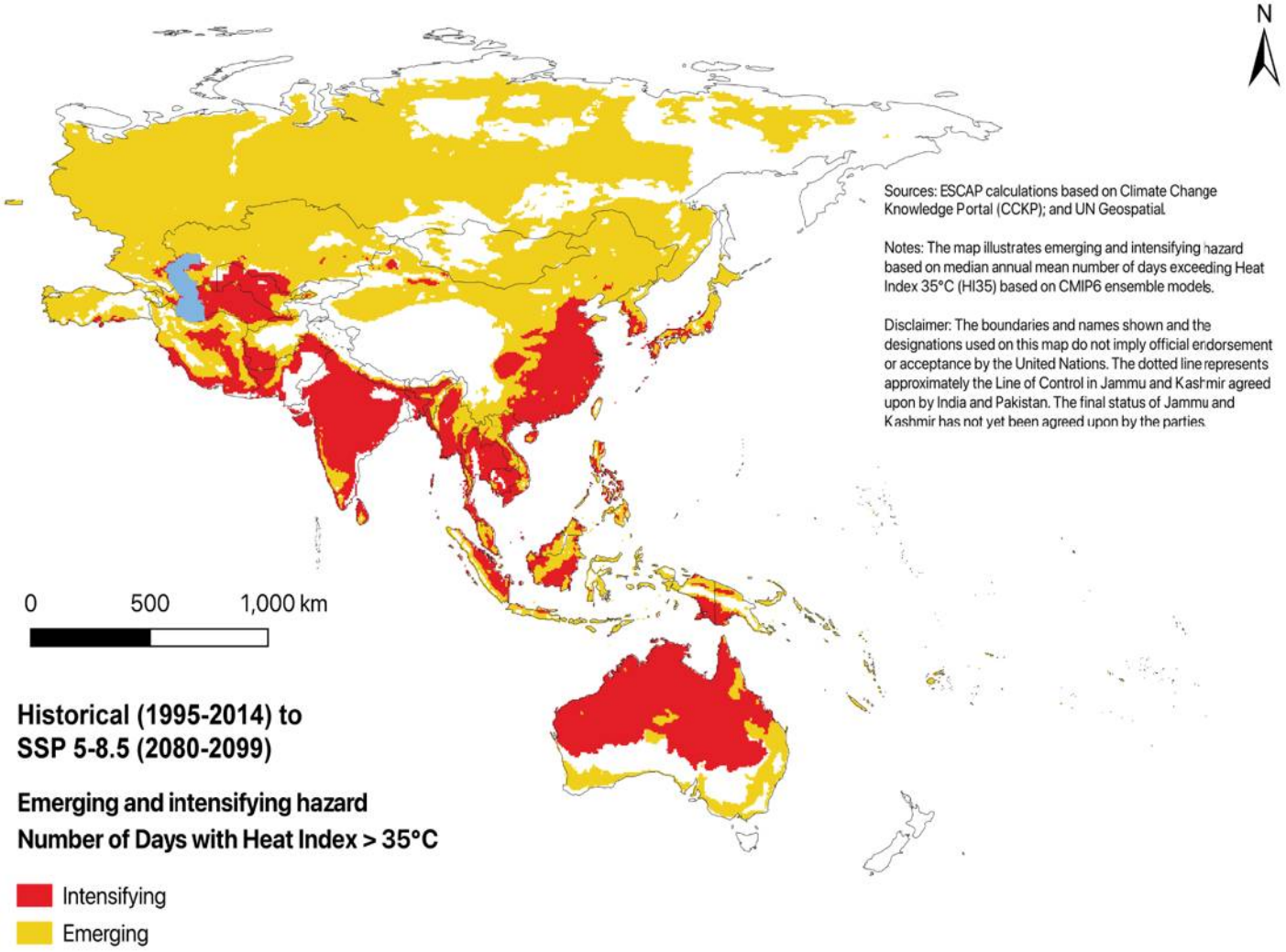
Energy Vulnerabilities

Air-conditioning demand projected to triple by 2050. Power plants exposed to 40°C+ days will double to 8% under future scenarios.

Myanmar, Islamic Republic of Iran, American Samoa, India, and **Türkiye** face the largest composite risks from warming impacts on oceans, land, glaciers, and atmosphere.

Escalating Heat Across Subregions

Severe heat stress – emerging and intensifying areas across Asia and the Pacific

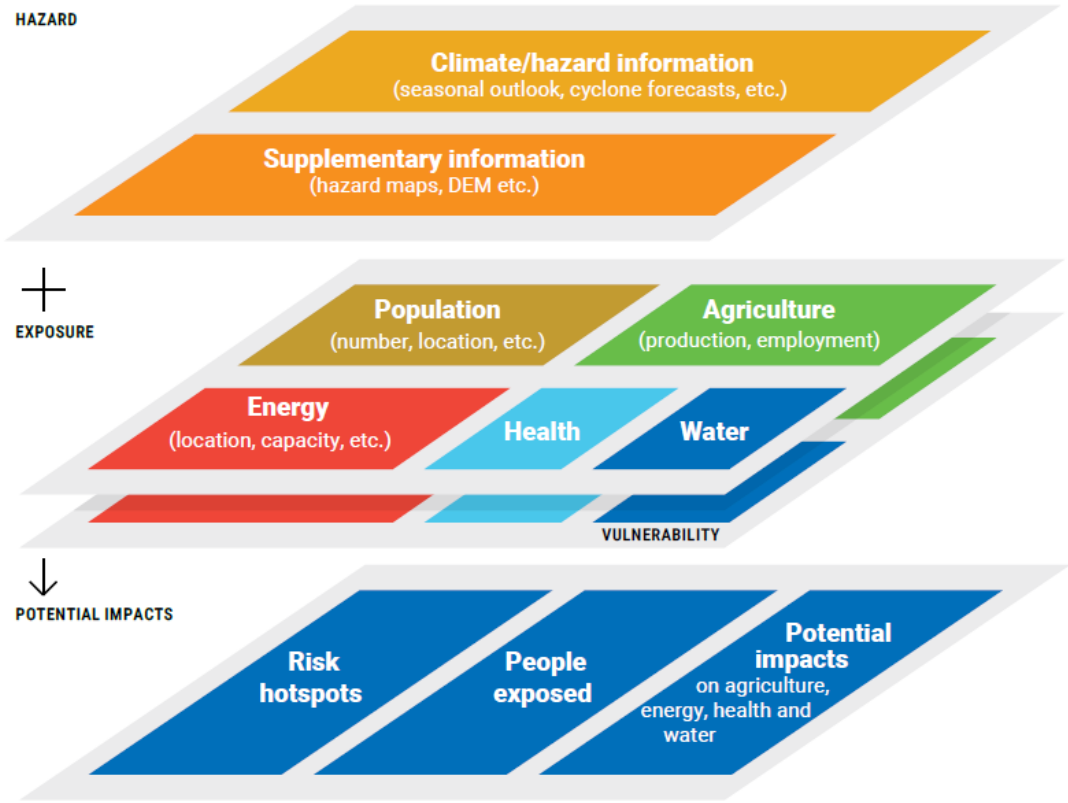


Extreme heat days above 35°C are expanding across all subregions, turning short events into season-long exposure.

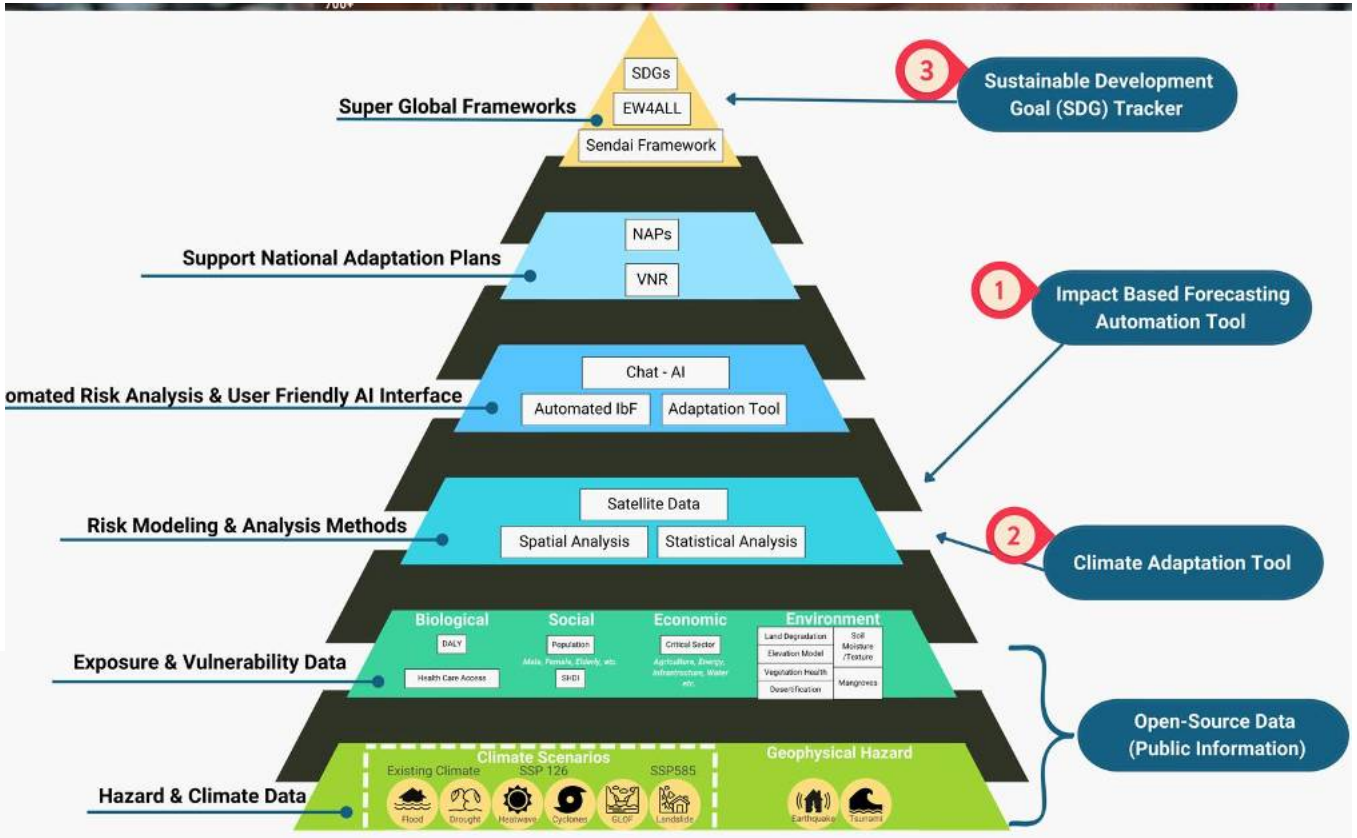
Over 60 heat-stress days each year projected for **South and South-West, East, and South-East Asia**

Pacific SIDS experience record durations of **high heat and humidity**.

Understanding the region's Risk Profile



A comprehensive approach exploring different time frames and multisectoral socio-economic vulnerabilities would ensure a sustainable strategic result.



Integration of weather and climate information for critical sectors

Operational decisions

Tactical decisions

Strategic decisions

Long-term decisions

Early warning & crisis management

Few days ahead

preparation and prepositioning emergency relief stock and deployable personnel in sectors

5-day flood forecast for food and energy infrastructure (Google flood hub)

Exposure reduction

One season ahead

targeted resilience building in at-risk states, districts, vulnerable communities and infrastructure

Automated seasonal impact forecasting (ex. crop-based analysis)

Vulnerability reduction

Few year ahead

inter-ministry coordination, anticipatory action, climate impact forecasting for vulnerable sectors (energy, agriculture)

Downscaled climate decision support systems

Strategic planning & deployment

Years ahead

finance, budgeting, adaptation process, NDC
Sector plans and budgeting

Climate policy tools for targeted sectors

Regional Hotspots Screening with Open-Source Climate and Hazard Projections

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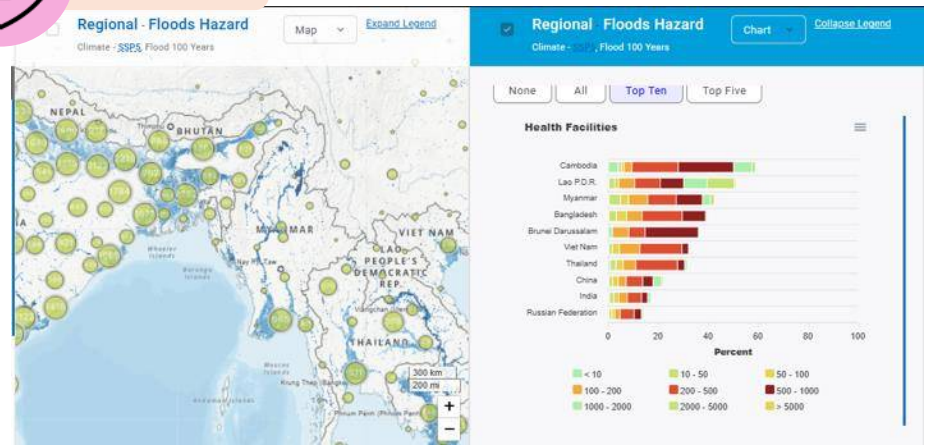
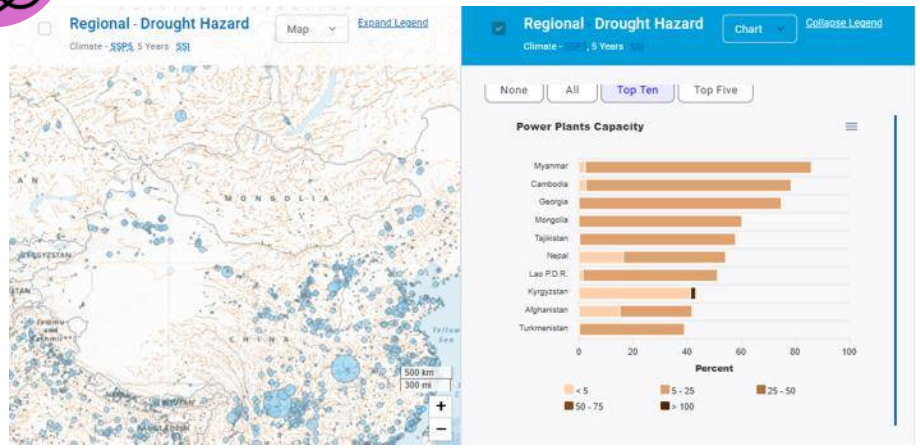
Health



Energy



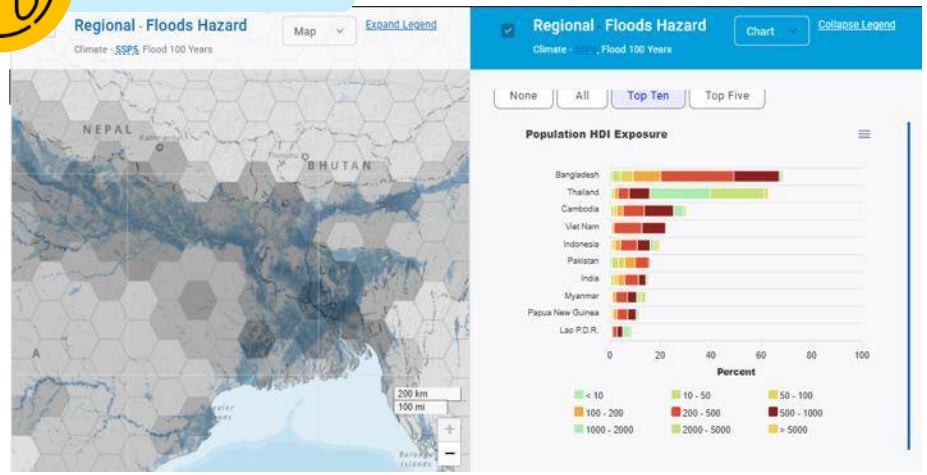
Multi-hazard views (heat, flood) across time horizons

Aggregate exposure by country

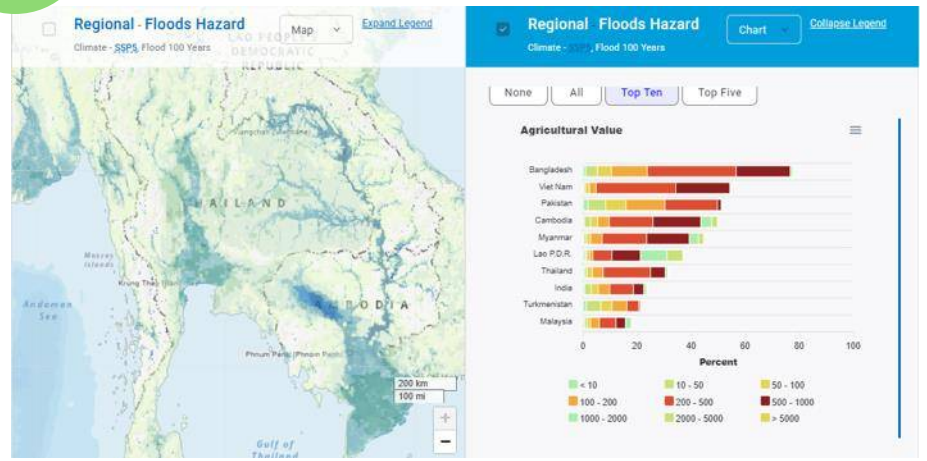
Consistent baselines for cross-country comparison

Filters to rank and map priority countries

Population



Agriculture



ESCAP RISK AND RESILIENCE PORTAL

An Initiative of the Asia Pacific Disaster Resilience Network

Bridging the science policy gap for informed disaster and climate action

rrp.unescap.org

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Portal Products and Services: from Historical Insight to Future Readiness

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Historical evidence → **Operational decisions** → **Forward planning**

Disaster and climate risk analysis

- Resilience SDG Tracker
- SATGPT
- Country profiles
- Country profiles
- Country decision support systems
- Sector analysis
- Risk Atlas

Early warning & response

- Rapid IBF Seasonal Forecast
- Flood forecasting

Regional strategy and cooperation

- Storyboards for Aral Sea and Central Asia

The motivation behind the Risk and Resilience Portal

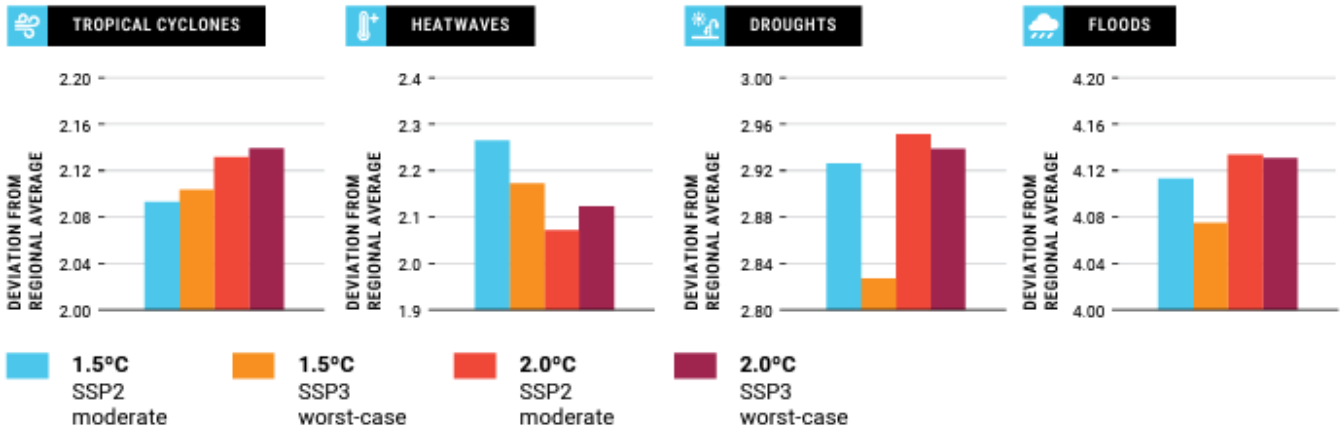
GLOBAL

Translating global risks to the region

	present +1.1 °C	+1.5 °C	+2 °C	+4 °C
Temperature Temperature of the hottest day in a decade increases (+°C)	+1.2 °C	+1.9 °C	+2.6 °C	+5.1 °C
Drought Drought occurring once in a decade happens x times more frequently	2 × more frequent	2.4 ×	3.1 ×	5.1 ×
Precipitation What used to be the wettest day in a decade now occurs x times more frequently	1.3 × more frequent	1.5 ×	1.8 ×	2.8 ×
Tropical cyclones Proportion of intense tropical cyclones increases (%)		+10 %	+13 %	+30 %

Based on IPCC's Sixth Assessment Report, Working Group I. © FMI and Ministry of the Environment, 2021. Climateguide.fi

ASIA-PACIFIC REGION



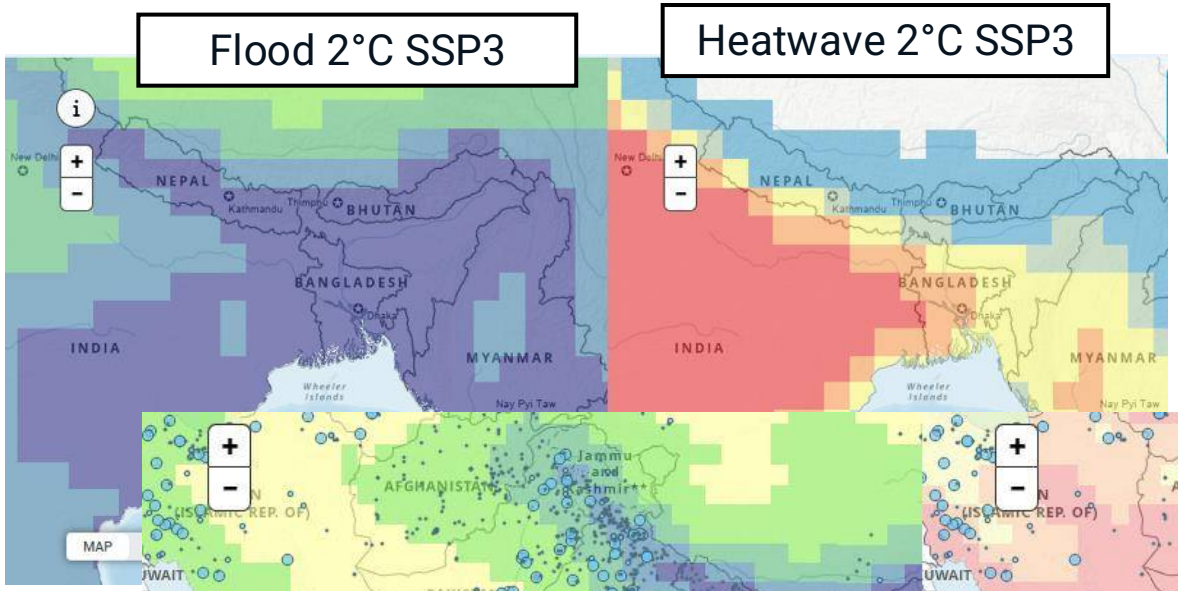
Transboundary hazard and impact analysis

SAARC

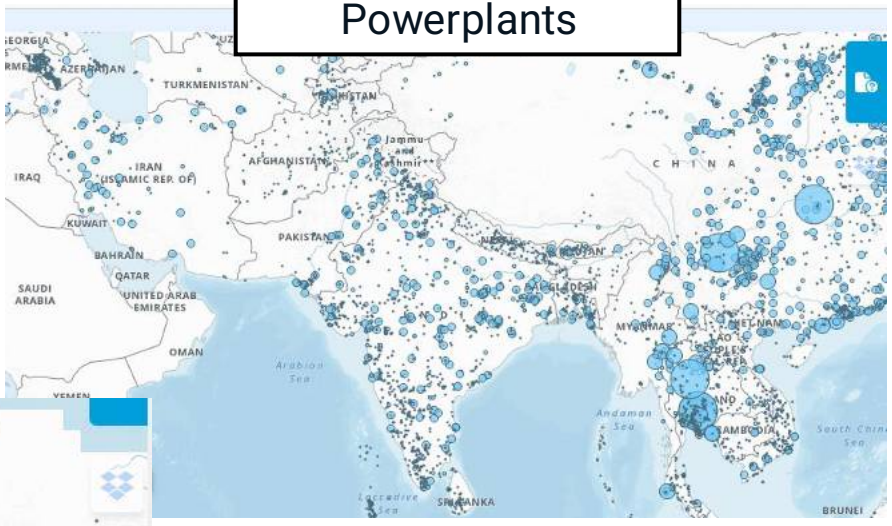
Facilitate collaboration to tackle intersecting transboundary climate risks and shared challenges

Flood 2°C SSP3

Heatwave 2°C SSP3



Powerplants



Understanding where future power plants should be built and where infrastructure needs to be resilient to multiple hazards under 2°C warming

From Impact Assessment to Action: Our Country Decision Support Systems

(Bhutan, Kazakhstan, Kyrgyzstan, Lao PDR, Maldives, Mongolia, Nepal, Tajikistan)

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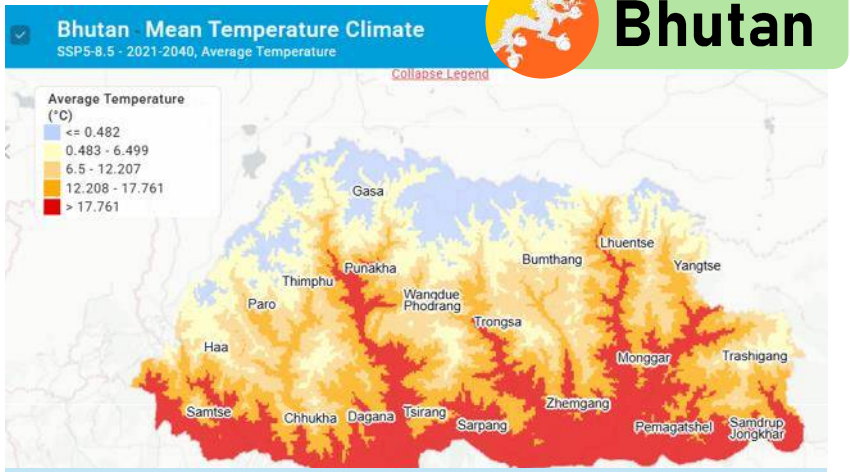
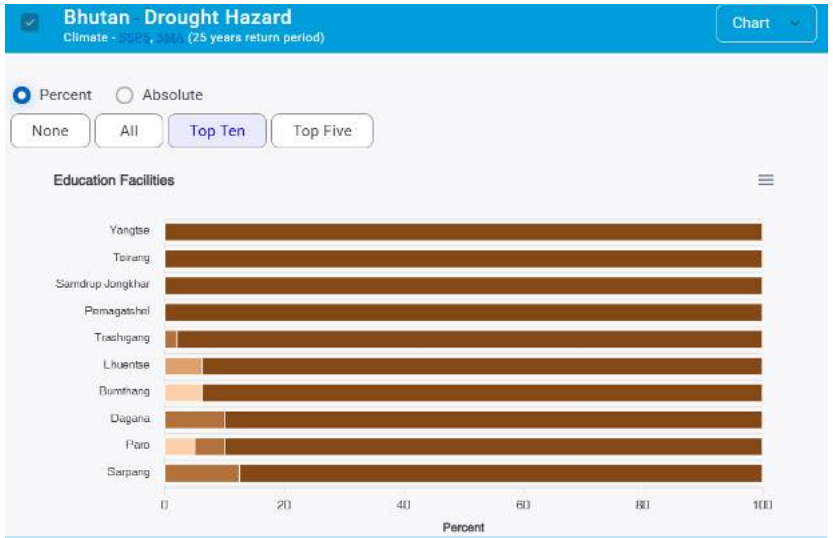
Bhutan

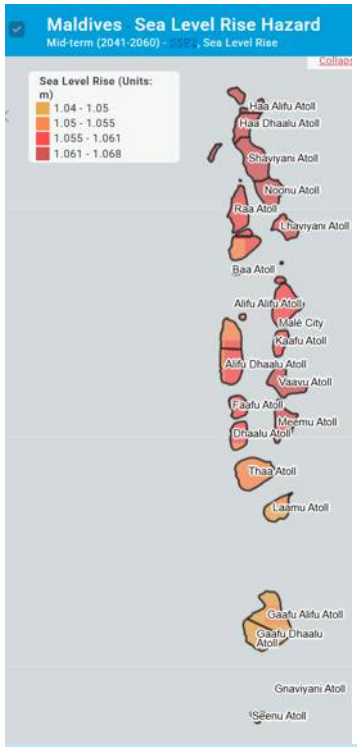


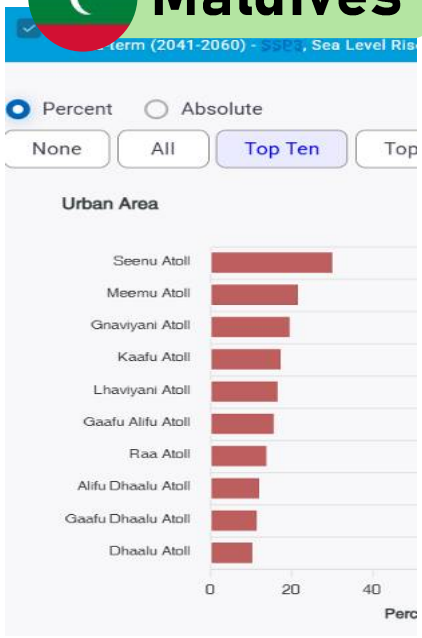
Bhutan's mean temperature
Under SSP5-8.5, 2021-2040



Education facilities affected impacted by rising temperatures

Maldives



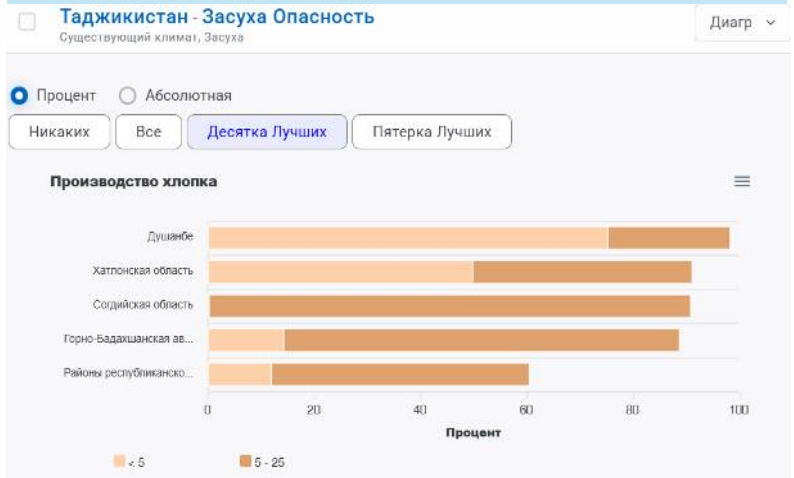


Urban area exposed to
future sea level rise in Maldives
Under SSP2(Left) and SSP3(Right)

Common method, province-specific data. Comparable results for operational planning and financial investments.

Tajikistan

Cotton production exposed to drought in Tajikistan
under SSP5, 5years



High Resolution Impact Analysis: Downscaling Global IPCC Climate Scenarios for the Asia Pacific Region

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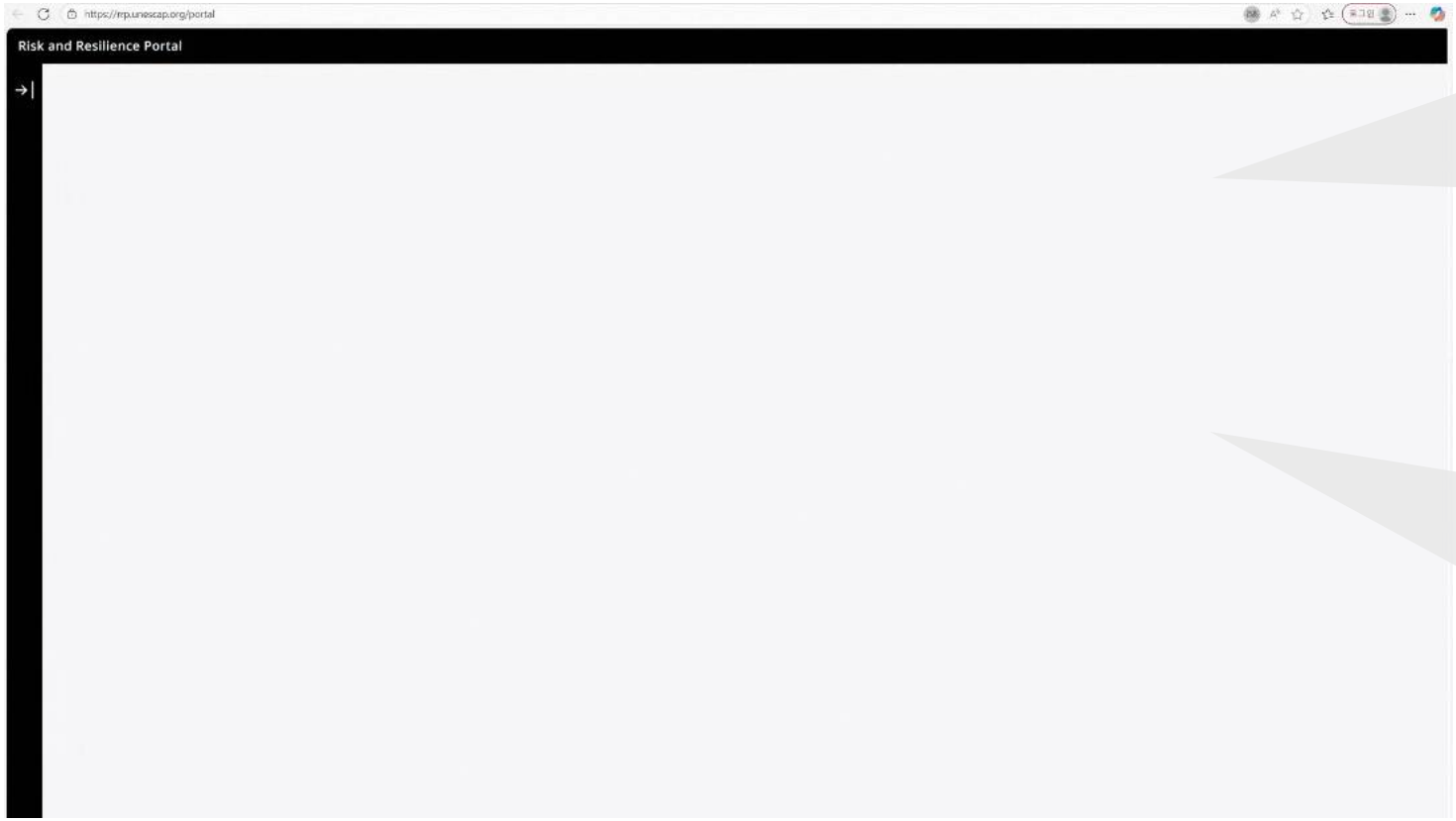
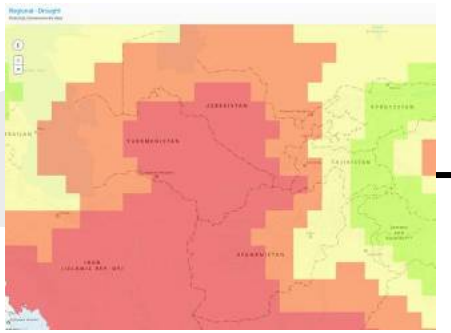
From 100×100 km to 1×1 km: global data, local decisions

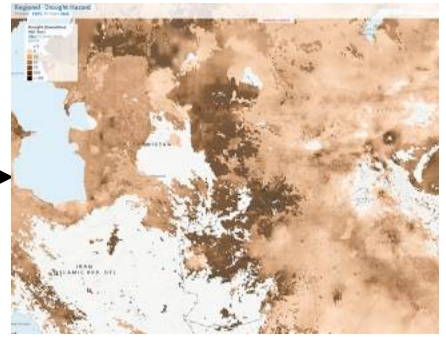


Downscaled global CMIP6 data

Previous version

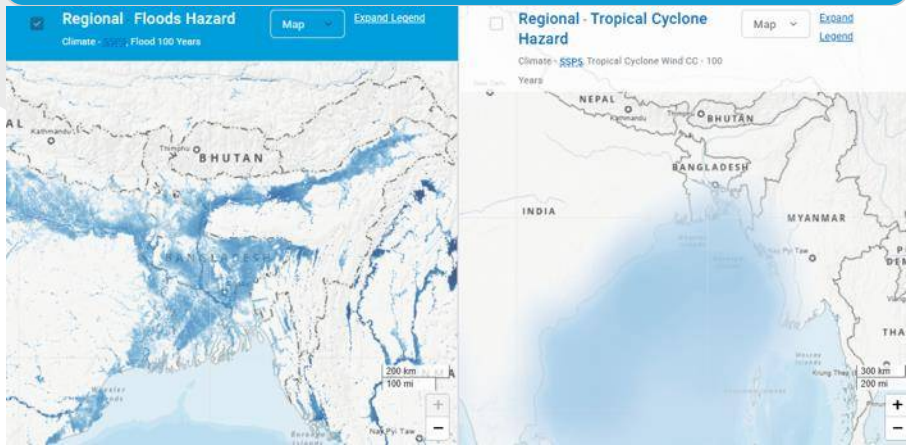


New version



National Institute for Environmental Studies, Japan

High resolution Hazard data from CDRI for impact analysis

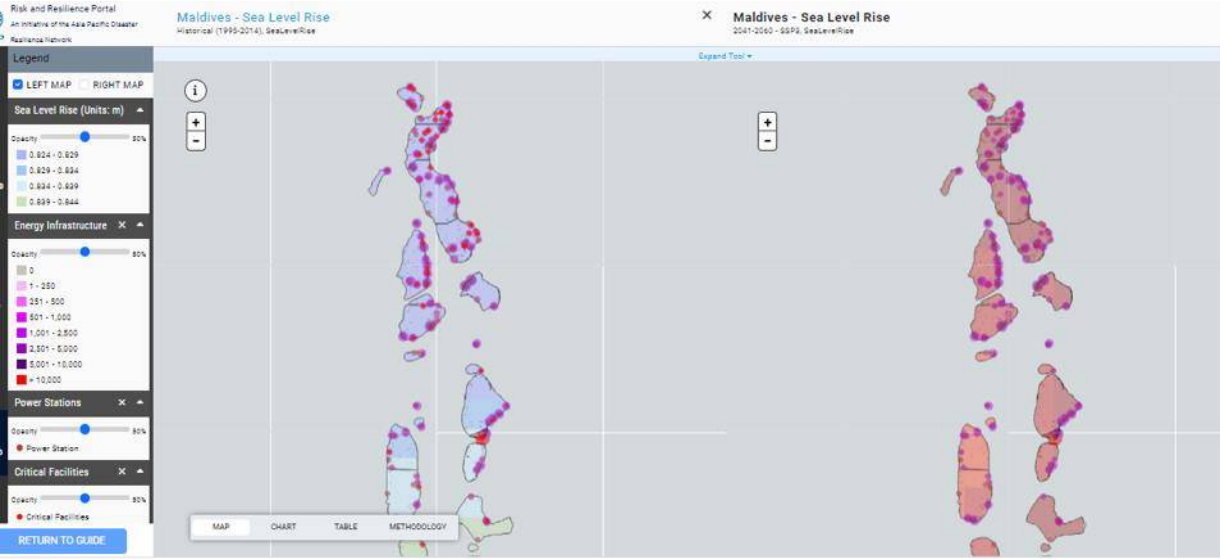


CDRI

Customized downscaling of global climate data

Downscaled climate projection to 1 x 1 resolution for pilot countries

Maldives



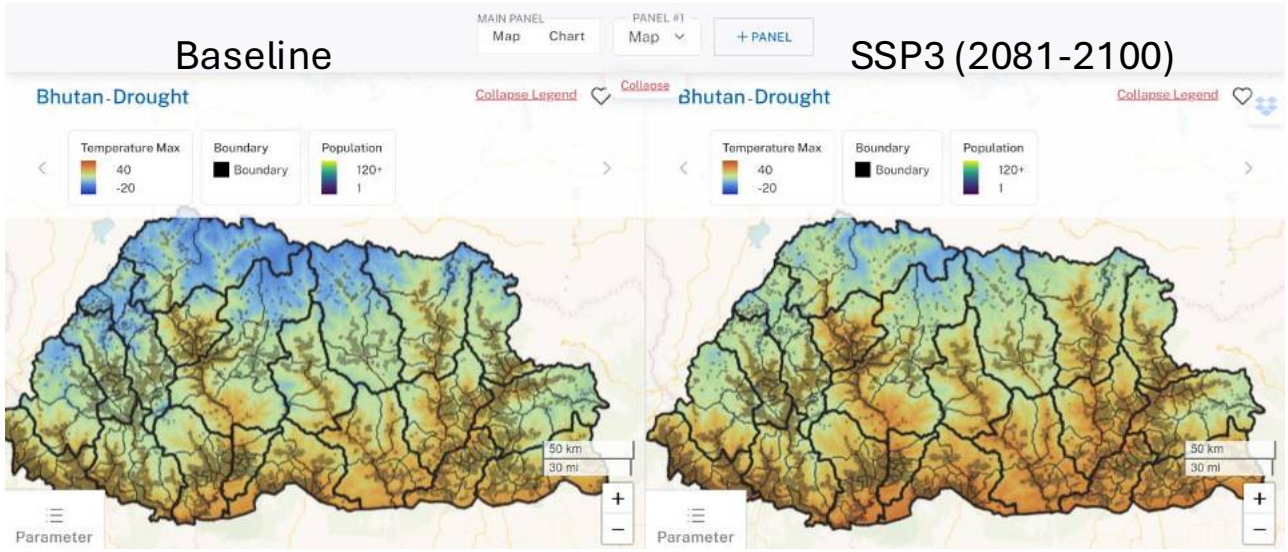
No risk at baseline but alarming increase under 2 degrees for sea level rise

High impact on future coastline infrastructure

Bhutan

Baseline

SSP3 (2081-2100)



Risk of high temperatures is a threat for GLOFs and other hazards

High impact on future hydropower infrastructure

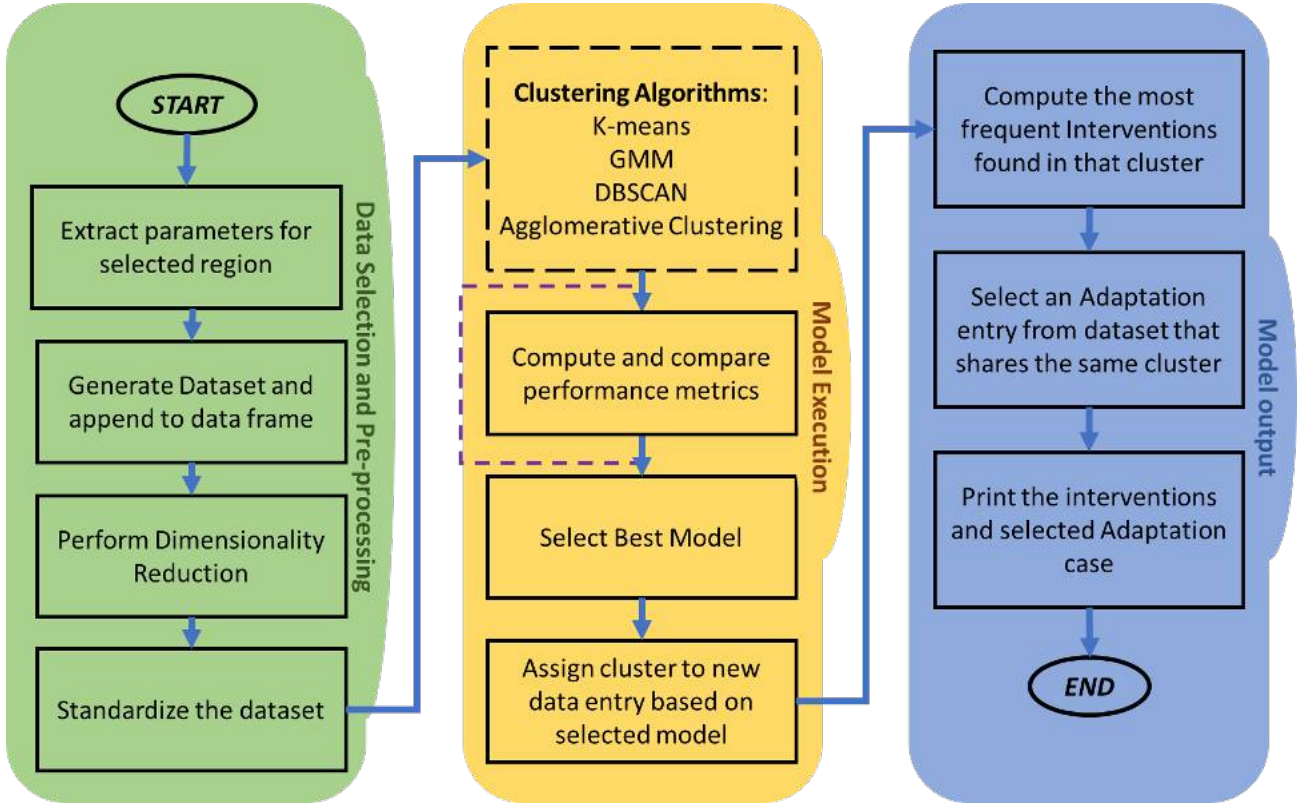
ClimaWise: AI-Powered Adaptation Planning

Empowering Climate Decision-Makers with AI

A comprehensive tool powered by machine learning and large language models that provides tailored recommendations on adaptation from worldwide case studies based on your area's unique risk profile.

- [Map of Adaptation Solutions Database]
- [Adaptation Recommendations for Mongolia]

Funded By
CARA Climate Action for a Resilient Asia
UK International Development
Partnership | Progress | Prosperity



Process Pipeline

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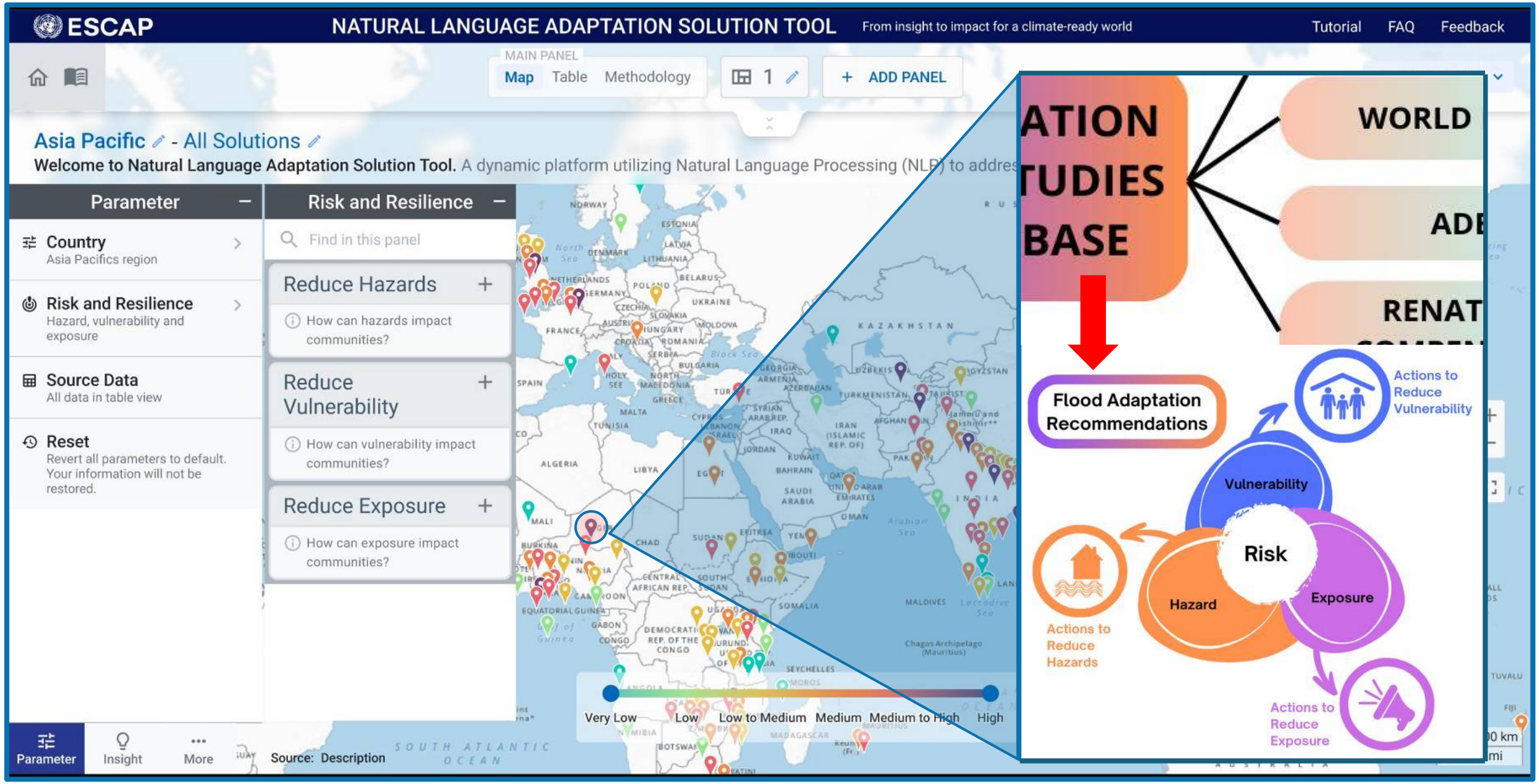
Map of Adaptation Solutions Data Base

Explore, learn, and adapt from proven adaptation solutions



Transition to a More Coastal Centered Analysis

International

Funded By

Closing the Coastal Risk Gap in the Risk and Resilience Portal

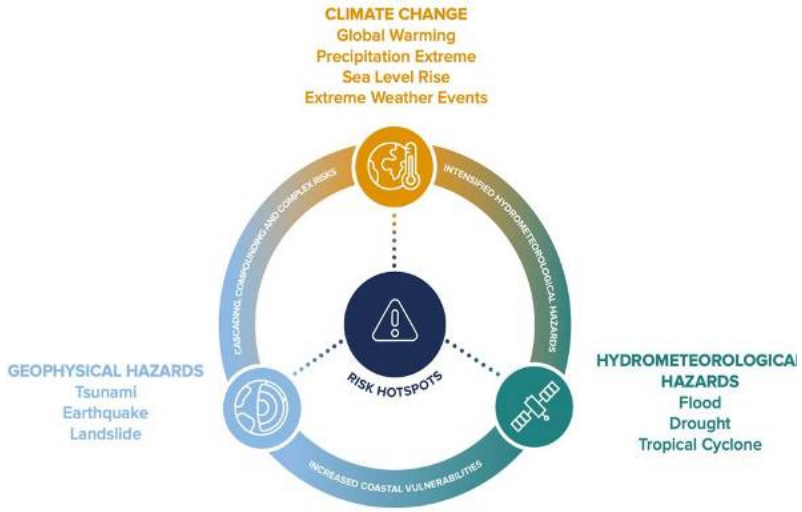
Coastal countries in Asia-Pacific face a convergence of tsunamis, climate, and ocean-related hazards that threaten millions of people, critical infrastructure, and fragile ecosystems.

To address these risks, we need to

- Move beyond national-scale hazard maps
- Link tsunami inundation and exposure with cascading threats (e.g., cyclones, flooding, sea-level rise, and storm surges).

Until recently, the Risk & Resilience Portal & our work

- Focused mainly on land-based hazards.
- Represented tsunamis only as probability curves (PTHA), without inundation, making exposure and vulnerability assessment impossible.
- Offered mostly national statistics, missing the subnational hotspots where coastal risks converge.



Today, new data and processing power allow us to integrate high-resolution coastal hazard layers (100m–1km), making it possible to showcase risk in detail.

National Partners

Sri Lanka

Maldives

ESCAP
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From Land-Based to Coastal Hazards: ClimaCoast

1 HAZARD LAYERS

Coastal flooding

Deltares bathtub-style inundation using extreme sea levels + DEMs; current framing is present-day 2018 vs 2050 with return periods.

Tsunami

Single 500-year return-period inundation layer; earthquake-induced and not climate-related.

SST / Reef thermal stress

DHW >4 and >8 day-counts plus event probabilities for reef impacts.

Observed: 1985–2019 | Projected: 2021–2100

2 TIME HORIZONS & SCENARIOS

Historical	Short	Medium	Long
Flood: 2018 SST: 1985–2019	2021–2040	2041–2060	2061–2080 2081–2100

Scenario set currently available for SST / reef indicators

SSP1 2.6 | SSP2 4.5 | SSP3 7.0 | SSP5 8.5

Full multi-scenario framing is strongest for SST / reef stress; coastal flooding currently follows the Deltares 2050 RCP8.5-based setup.

3 EXPOSURE LENSES

- Population & settlements
- Infrastructure & assets
- Livelihoods, fisheries & tourism
- Reefs & ecosystems

4 RISK OUTPUTS

Coastal hotspots

Overlay hazards with exposed coastal systems to identify where impacts concentrate and where follow-up action should be prioritized.

- Analyze relative risk impacts
- Identify high-priority coastal zones
- Support screening for planning & action

Current scope: Flooding = Deltares methodology | Tsunami = separate non-climate 500-year screening layer | SST = reef-focused DHW indicators across four SSPs

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What Will CARA Help Governments Achieve?

Regional Policy Instrument

Identify hotspots of risk and vulnerable communities along Asia–Pacific coastlines, complementing existing detailed risk assessments and indicating **where** more in-depth studies are needed.

Visualize Coastal Risks

Clearly show the threat posed by tsunamis and other coastal inundation hazards and quantify their socio-economic impacts in a **consistent way** across countries. Incorporates **heat-related hazards in coastal zones** as well.

Multi-Hazard Impact Analysis

Using the **Coastal Multi-Hazard Zone (CMZ)** methodology developed for Odisha, India, assess socio-economic risks from tsunamis and other oceanogenic and climate-related hazards in an integrated way.

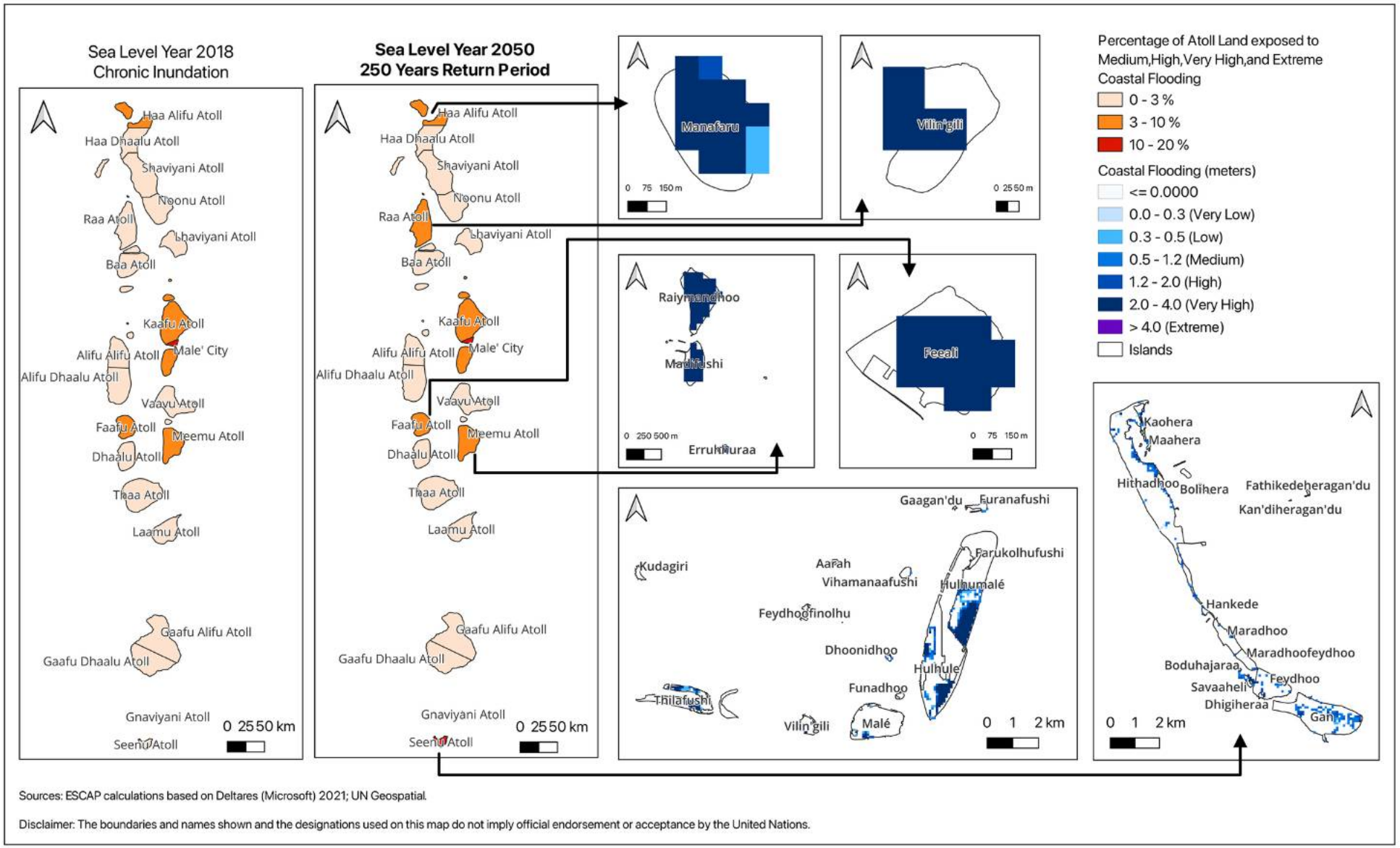
Enhance Coastal Resilience

Support better preparedness, adaptation planning and investment decisions – including how **tsunami preparedness** can also reduce impacts of other climate-related disasters.

Expand Tsunami Coverage

Integrate exposure to **landslide- and volcanic-generated tsunamis**, with inundation calculated using INCOIS' new high-resolution bathymetry – expanding beyond **earthquake-induced tsunamis** alone.

Coastal Flooding Exposure in the Maldives

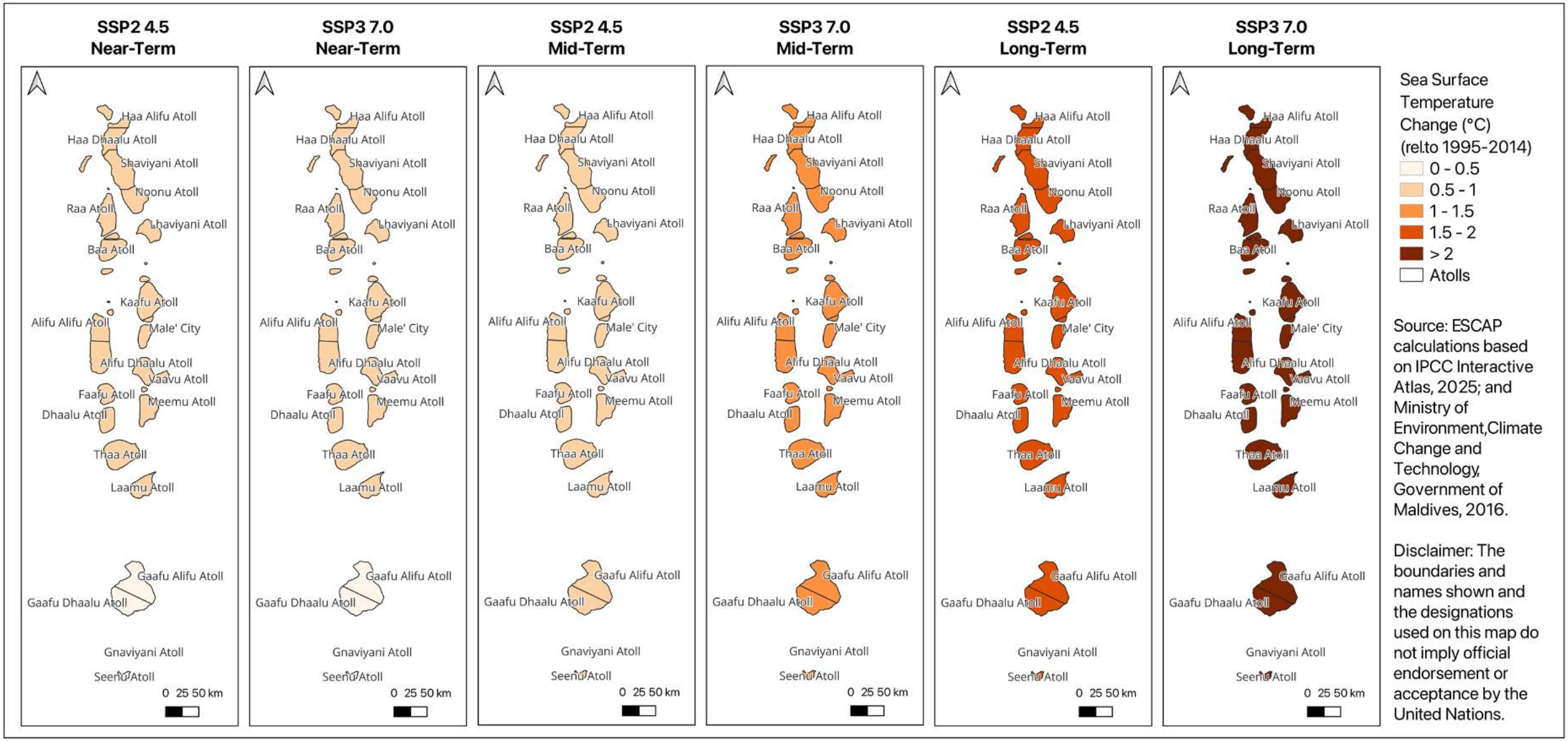


Sources: ESCAP calculations based on Deltares (Microsoft) 2021; UN Geospatial.

Disclaimer: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Between baseline and Sea Level Year 2050, Return Period 250 Years, **Raa Atoll** and **Seenu Atoll**'s exposure to Coastal Flooding for depths of 0.5 meters and above (threshold chosen for vulnerable population risk) increases significantly.

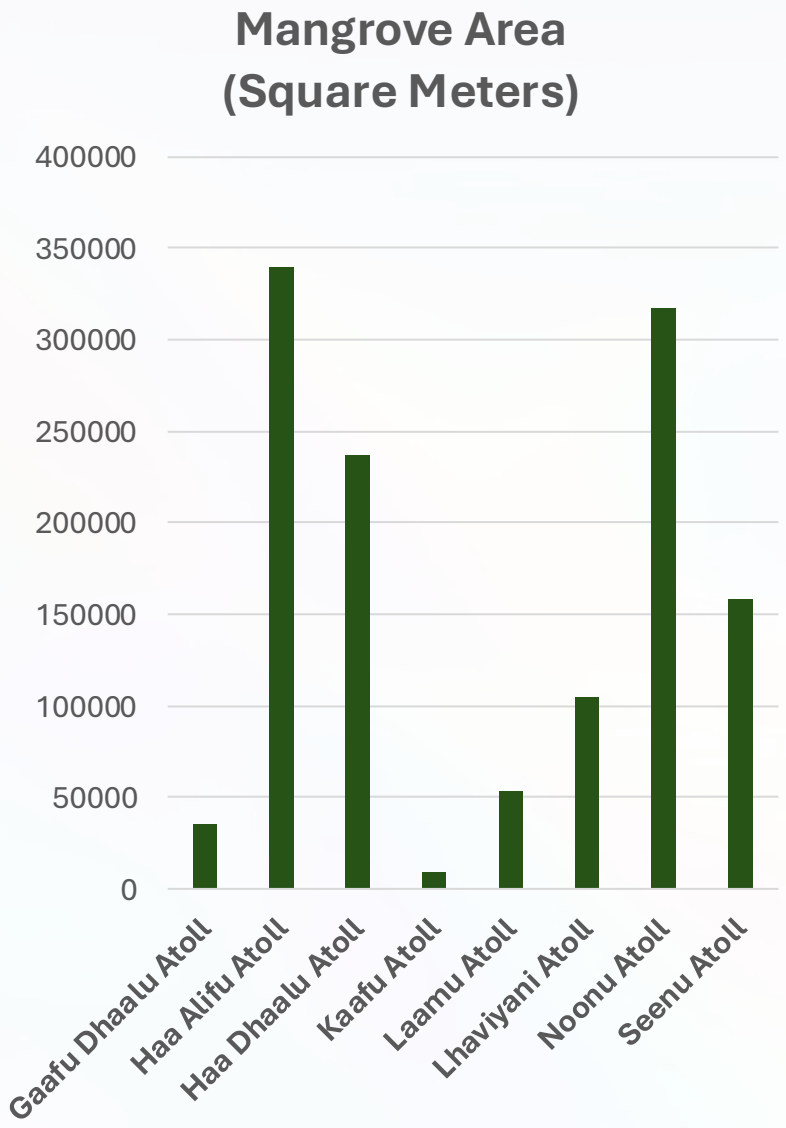
Sea Surface Temperature Change Analysis for the Maldives



Source: ESCAP calculations based on IPCC Interactive Atlas, 2025; and Ministry of Environment,Climate Change and Technology, Government of Maldives, 2016.

Disclaimer: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Sea Surface Temperature Change and Exposed Mangroves in the Maldives



SSP2-4.5 | Near → Medium

From **0–0.5 °C** to **0.5–1 °C** → **Gaafu Dhaalu, Seenu**

Stay at **0.5–1 °C**: **Haa Alifu, Haa Dhaalu, Kaafu, Laamu, Lhaviyani, Noonu**

SSP2-4.5 | Medium → Long

From **0.5–1 °C** to **1.5–2 °C** → **Gaafu Dhaalu, Haa Alifu, Haa Dhaalu, Kaafu, Laamu, Lhaviyani, Noonu, Seenu**

SSP3-7.0 | Near → Medium

From **0–0.5 °C** to **1–1.5 °C** → **Gaafu Dhaalu, Seenu**

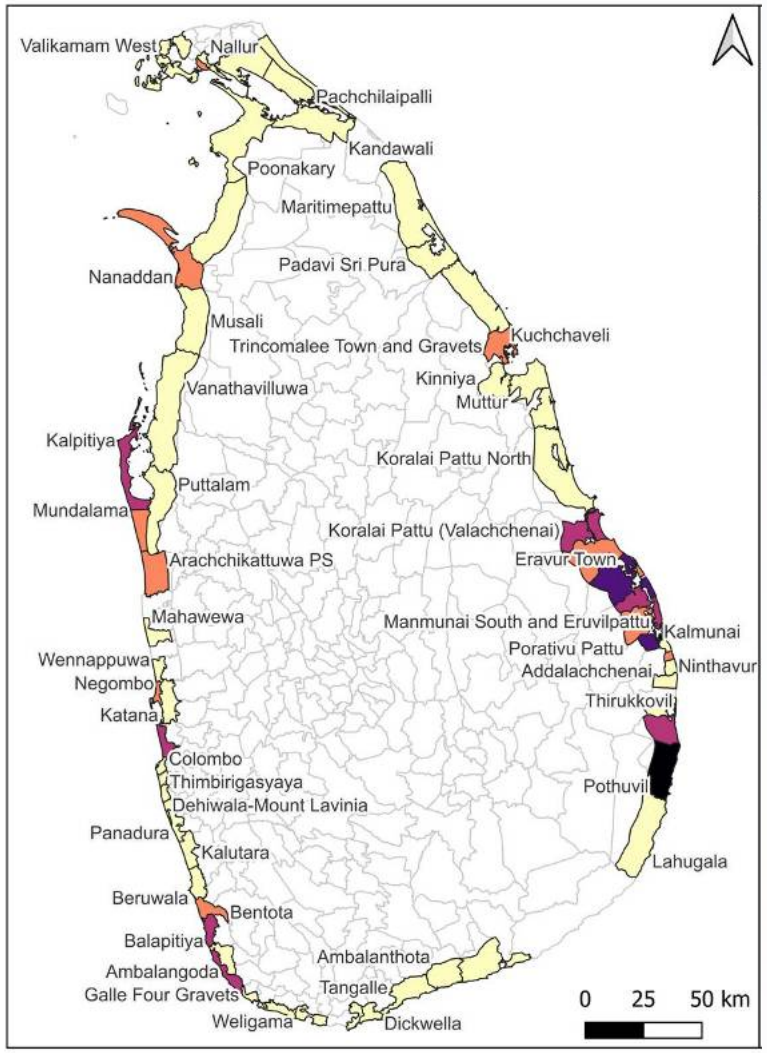
From **0.5–1 °C** to **1–1.5 °C** → **Haa Alifu, Haa Dhaalu, Kaafu, Laamu, Lhaviyani, Noonu**

SSP3-7.0 | Medium → Long

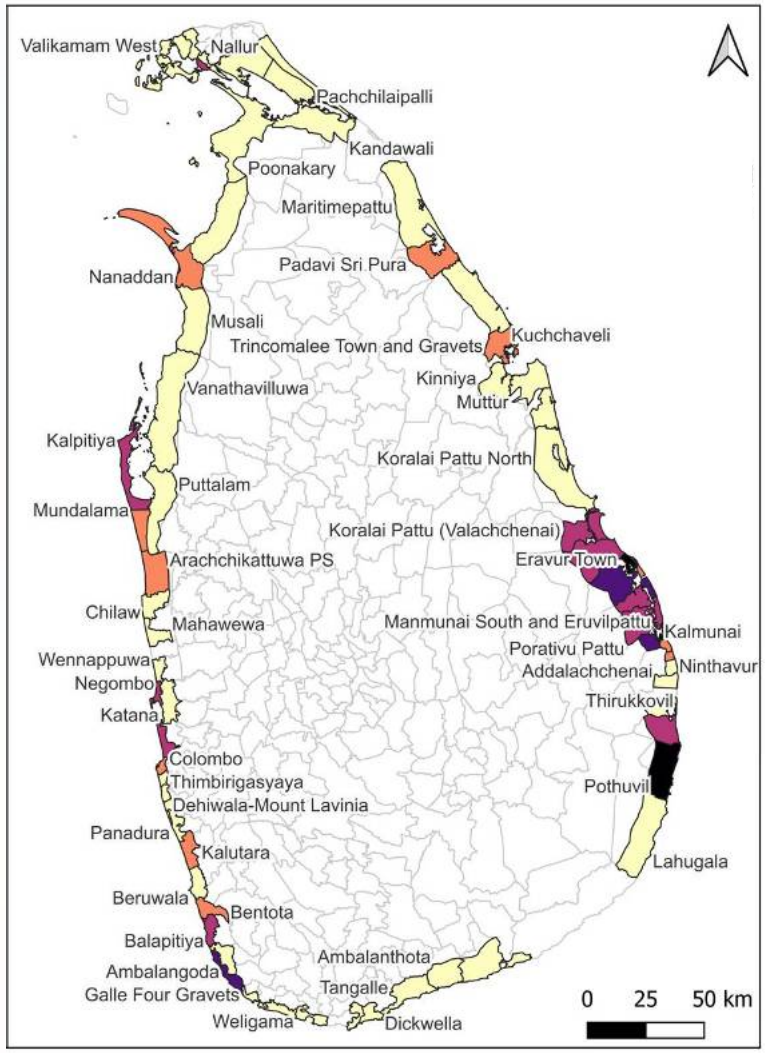
From **1–1.5 °C** to **≥ 2 °C** → **Gaafu Dhaalu, Haa Alifu, Haa Dhaalu, Kaafu, Laamu, Lhaviyani, Noonu, Seenu**

Coastal Flooding Exposure in Sri Lanka: Total Population (Divisions)

Sea Level Year 2018
100 Years RP



Sea Level Year 2050
100 Years RP

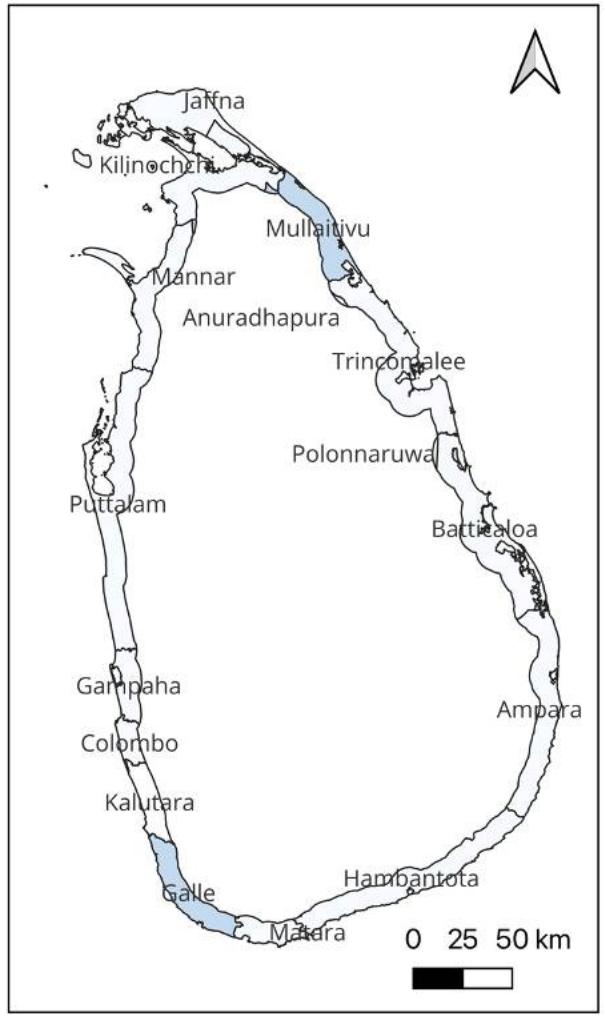


Percent of coastal population 2025 exposed to coastal flood

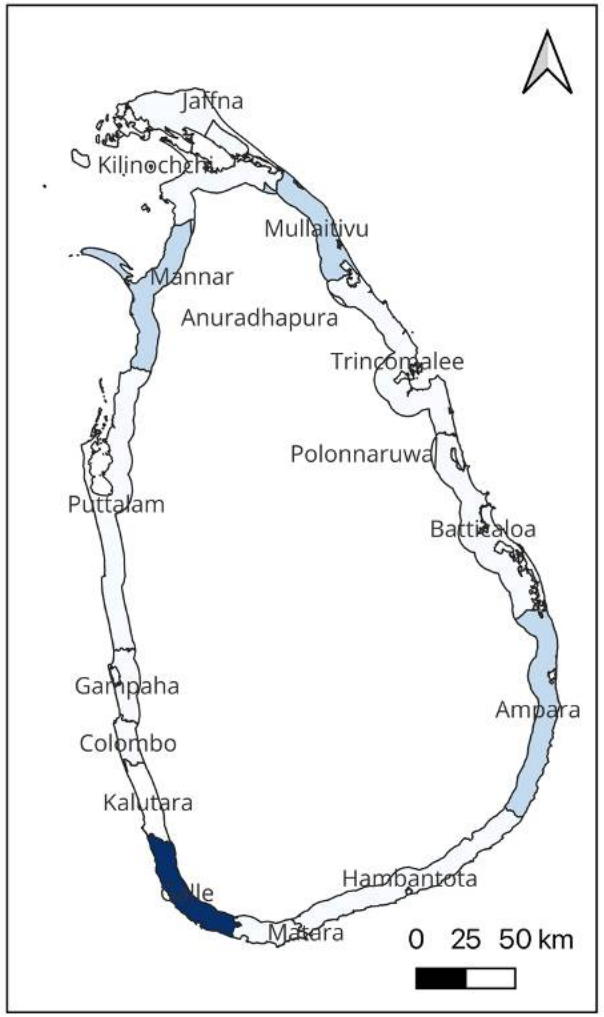
- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 2
- >2

Coastal Flooding Exposure in Sri Lanka: Roads (Districts)

Sea Level Year 2018
100 Years RP



Sea Level Year 2050
100 Years RP



% of Roads within 10km Buffer Zone Exposed to Coastal Flooding

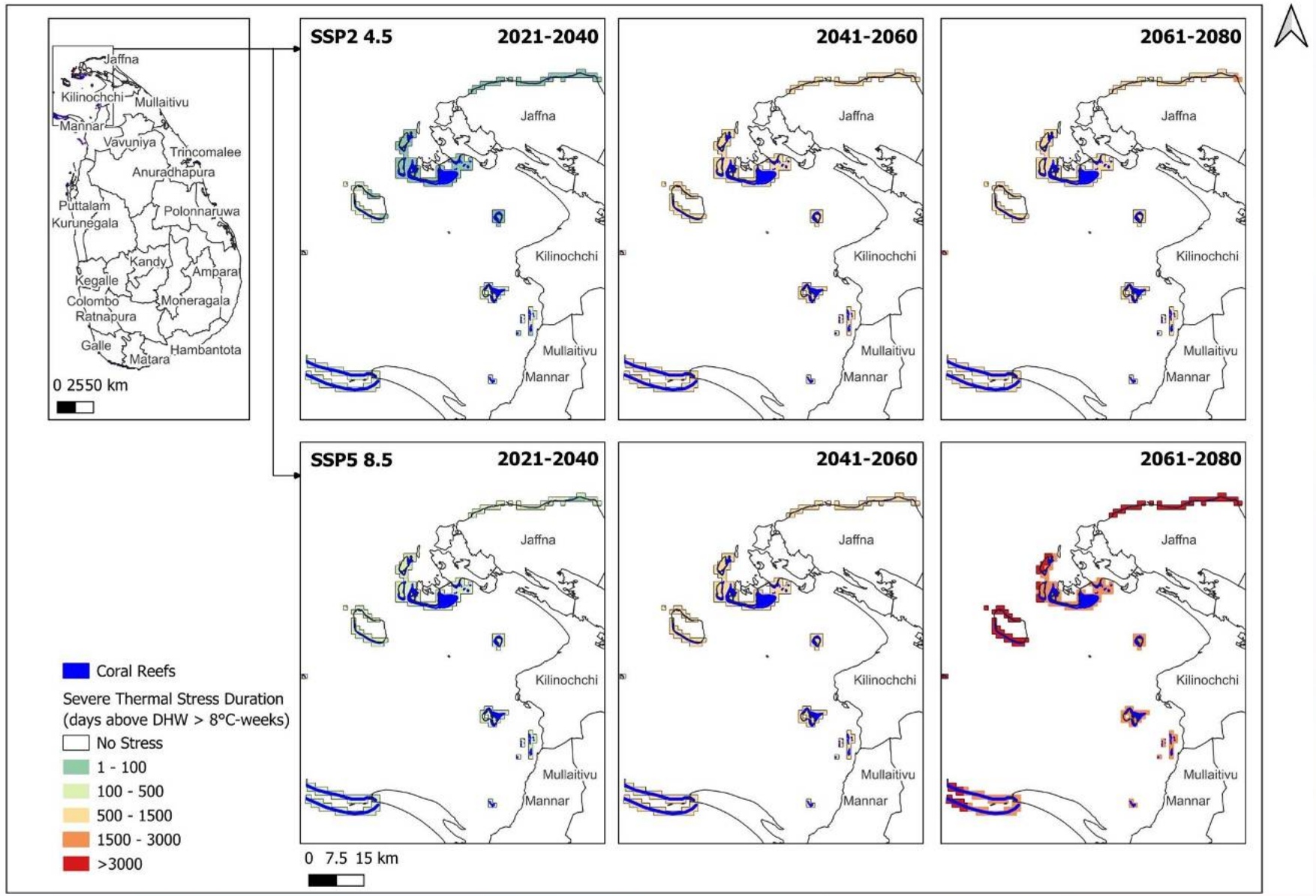
- 0.0 - 0.0
- 0 - 0.3585
- 0.3585 - 0
- 0 - 0.0949
- 0.0949 - 0.0346
- 0.0346 - 0.7345
- 0.7345 - 0.0015
- 0.0015 - 0.0251
- 0.0251 - 0.0421
- 0.0421 - 0
- 0 - 0.0089
- 0.0089 - 0.0352
- 0.0352 - 0.0406
- 0.0406 - 0.3947
- 0.3947 - 0
- 0 - 0.0904
- 0.0904 - 1.0000

Most Exposed Districts

Province	Exposure
Mullaitivu	Highest Proportional Exposure: ~0.39% (4.20 km)
Galle	Highest Absolute Exposure from RP0002: 12.97 km (0.483%) at SLR2050 RP0100
Ampara, Batticaloa, Trincomalee	Moderate but persistent exposure across all scenarios.

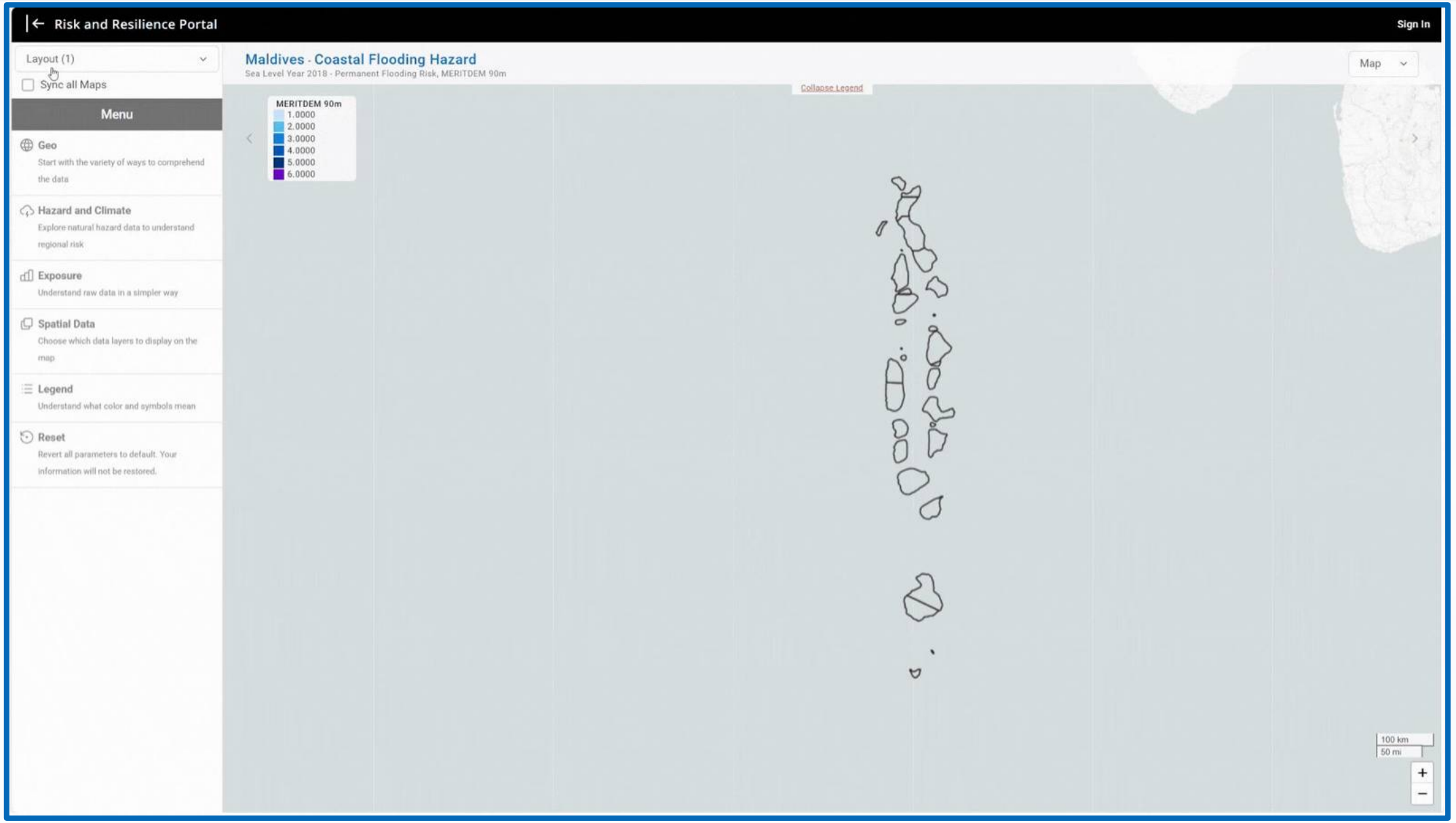
Return Period	2018 → 2050	
	Exposure Increase	Class change to High-risk
RP0000	Ampara: +1.77 km (+314% relative)	
RP0100	Mannar: 0 → 3.21 km (0.314%) Kilinochchi: 0.04 → 3.53 km (0.250%)	Mannar: Very Low → Medium (RP0100) Mullaitivu, Ampara: High → Very High
RP2500		

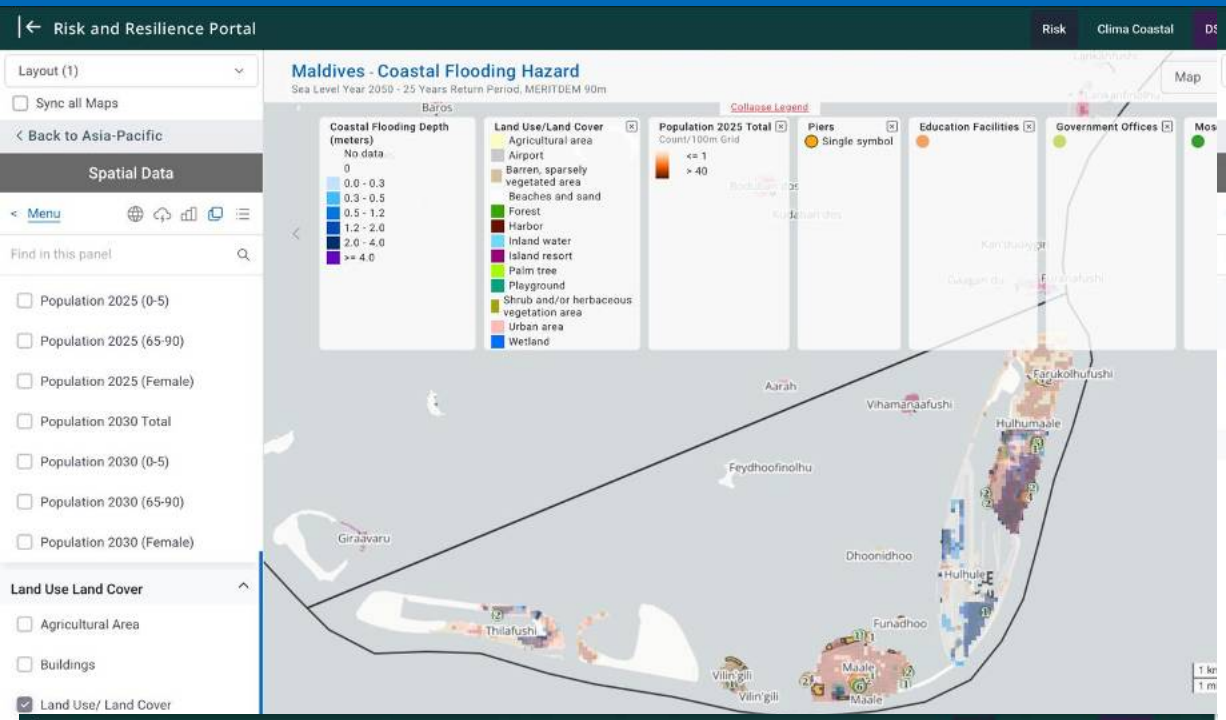
Coral Reef Thermal Stress Exposure in Sri Lanka

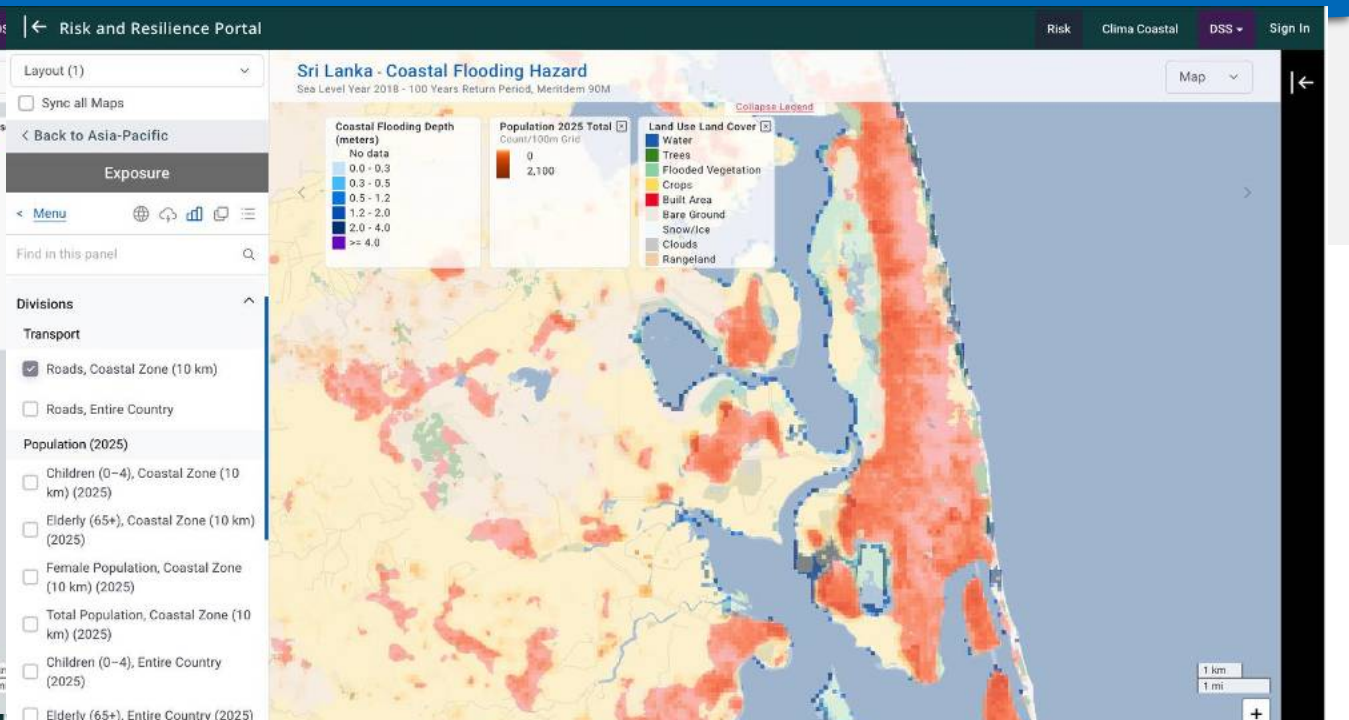


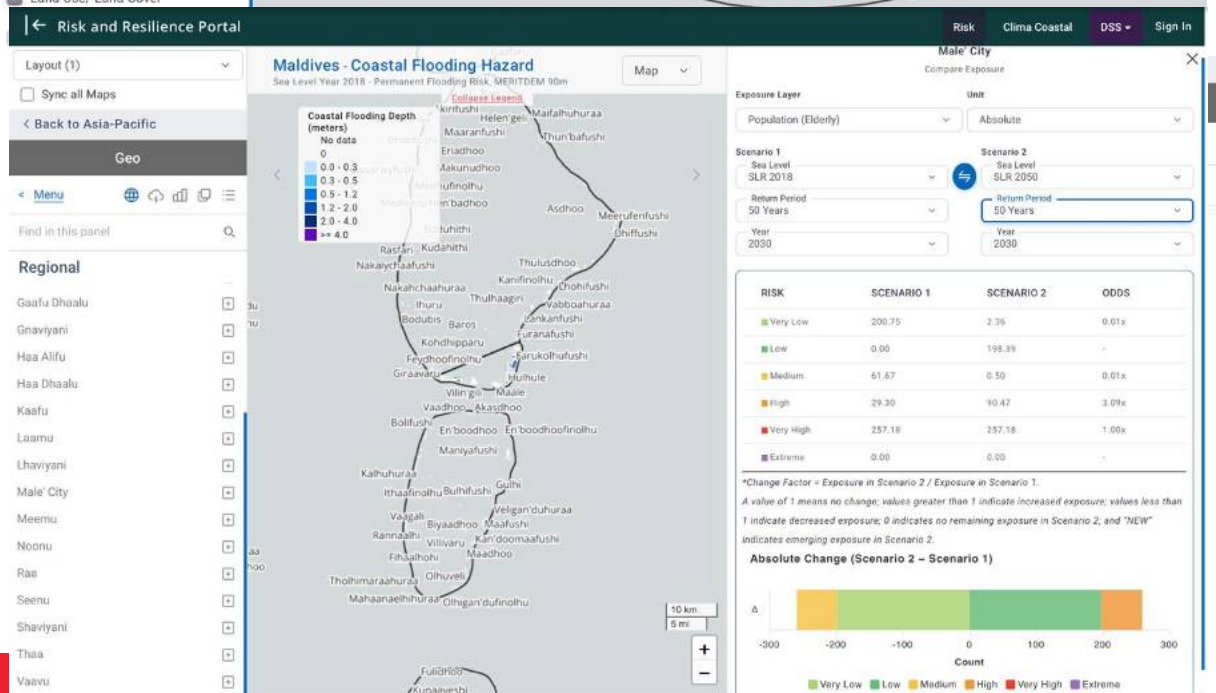
Class breaks are defined to represent increasing durations of severe thermal stress for Sri Lanka

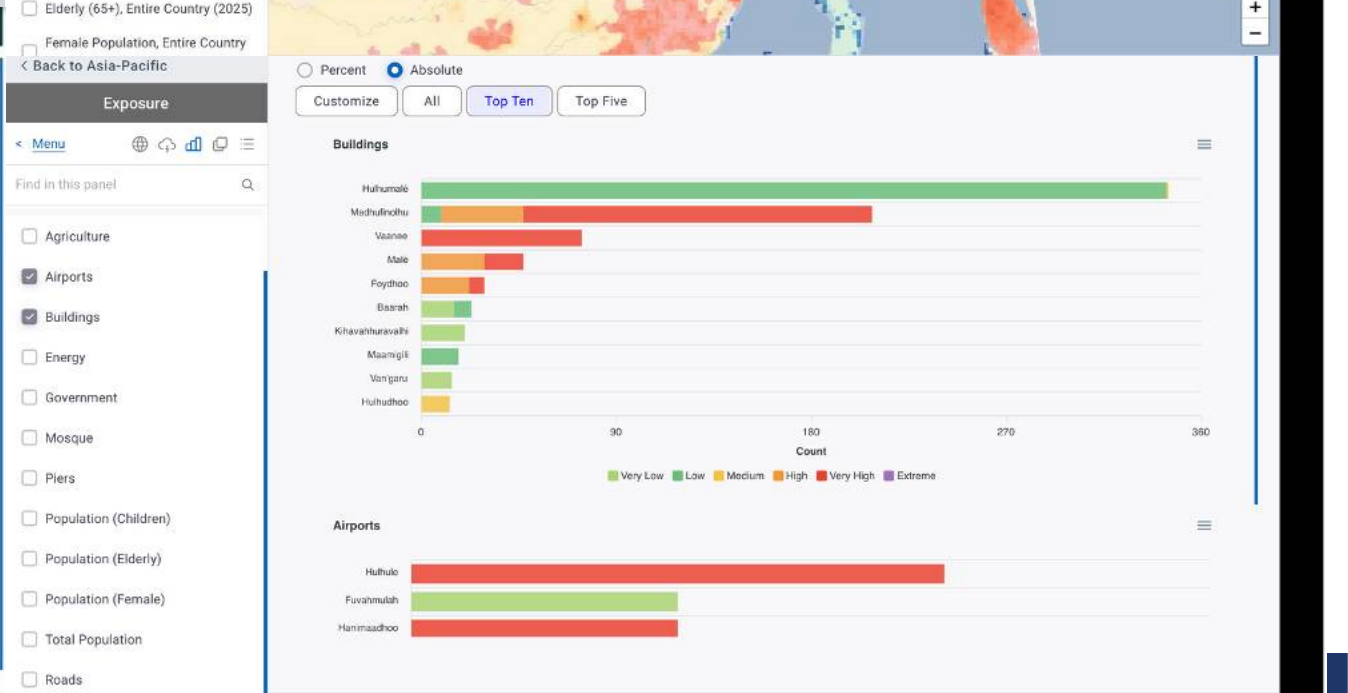
ClimaCoast – A Quick Look




Risk and Resilience Portal
Risk
Clima Coastal
Layout (1)
Sync all Maps
Back to Asia-Pacific
Spatial Data
Menu
Find in this panel
Population 2025 (0-5)
Population 2025 (65-90)
Population 2025 (Female)
Population 2030 Total
Population 2030 (0-5)
Population 2030 (65-90)
Population 2030 (Female)
Land Use Land Cover
Agricultural Area
Buildings
Land Use/ Land Cover
Maldives - Coastal Flooding Hazard
Sea Level Year 2050 - 25 Years Return Period, MERITDEM 90m
Map
Collapse Legend
Coastal Flooding Depth (meters)
No data
0
0.0 - 0.3
0.3 - 0.5
0.5 - 1.2
1.2 - 2.0
2.0 - 4.0
>= 4.0
Land Use/Land Cover
Agricultural area
Airport
Barren, sparsely vegetated area
Beaches and sand
Forest
Harbor
Inland water
Island resort
Palm tree
Playground
Shrub and/or herbaceous vegetation area
Urban area
Wetland
Population 2025 Total
Count/100m Grid
<= 1
> 40
Piers
Single symbol
Education Facilities
Government Offices
Baros
Aarah
Vihamanaafushi
Farukolhufushi
Hulhumaale
Feydhoofinolhu
Giraavaru
Dhoonidhoo
Hulhule
Funadhoo
Thilafushi
Maale
Vilin'gili
1 km
1 mi


Risk and Resilience Portal
Risk
Clima Coastal
DSS
Sign In
Layout (1)
Sync all Maps
Back to Asia-Pacific
Exposure
Menu
Find in this panel
Divisions
Transport
Roads, Coastal Zone (10 km)
Roads, Entire Country
Population (2025)
Children (0–4), Coastal Zone (10 km) (2025)
Elderly (65+), Coastal Zone (10 km) (2025)
Female Population, Coastal Zone (10 km) (2025)
Total Population, Coastal Zone (10 km) (2025)
Children (0–4), Entire Country (2025)
Elderly (65+), Entire Country (2025)
Female Population, Entire Country
Sri Lanka - Coastal Flooding Hazard
Sea Level Year 2018 - 100 Years Return Period, Meritdem 90M
Map
Collapse Legend
Coastal Flooding Depth (meters)
No data
0.0 - 0.3
0.3 - 0.5
0.5 - 1.2
1.2 - 2.0
2.0 - 4.0
>= 4.0
Population 2025 Total
Count/100m Grid
0
2,100
Land Use Land Cover
Water
Trees
Flooded Vegetation
Crops
Built Area
Bare Ground
Snow/Ice
Clouds
Rangeland
1 km
1 mi


Risk and Resilience Portal
Risk
Clima Coastal
DSS
Sign In
Layout (1)
Sync all Maps
Back to Asia-Pacific
Geo
Menu
Find in this panel
Regional
Gaafu Dhaalu
Gnaviyani
Haa Alifu
Haa Dhaalu
Kaafu
Laamu
Lhaviyani
Male' City
Meemu
Noonu
Raa
Seenu
Shaviyani
Thaa
Vaavu
Maldives - Coastal Flooding Hazard
Sea Level Year 2018 - Permanent Flooding Risk, MERITDEM 90m
Map
Collapse Legend
Coastal Flooding Depth (meters)
No data
0
0.0 - 0.3
0.3 - 0.5
0.5 - 1.2
1.2 - 2.0
2.0 - 4.0
>= 4.0
Male' City
Compare Exposure
Exposure Layer
Population (Elderly)
Unit
Absolute
Scenario 1
Sea Level
SLR 2018
Return Period
50 Years
Year
2030
Scenario 2
Sea Level
SLR 2050
Return Period
50 Years
Year
2030
RISK
SCENARIO 1
SCENARIO 2
ODDS
Very Low
200.75
2.36
0.01x
Low
0.00
198.39
-
Medium
61.67
0.50
0.01x
High
29.30
90.47
3.09x
Very High
257.18
257.18
1.00x
Extreme
0.00
0.00
-
*Change Factor = Exposure in Scenario 2 / Exposure in Scenario 1.
A value of 1 means no change; values greater than 1 indicate increased exposure; values less than 1 indicate decreased exposure; 0 indicates no remaining exposure in Scenario 2; and "NEW" indicates emerging exposure in Scenario 2.
Absolute Change (Scenario 2 – Scenario 1)
Count
Very Low
Low
Medium
High
Very High
Extreme
10 km
5 mi


Back to Asia-Pacific
Exposure
Menu
Find in this panel
Agriculture
Airports
Buildings
Energy
Government
Mosque
Piers
Population (Children)
Population (Elderly)
Population (Female)
Total Population
Roads
Percent
Absolute
Customize
All
Top Ten
Top Five
Buildings
Hulhumalé
Madhufinolhu
Vaanee
Male
Foydhoo
Baarah
Kihavahhuravalhi
Maamigili
Van'garu
Hulhudhoo
0
90
180
270
360
Count
Very Low
Low
Medium
High
Very High
Extreme
Airports
Hulhule
Fuvahmulah
Hanimaadhoo

ESCAP
Economic and Social Commission for Asia and the Pacific

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