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Consolidated Reply

Query 2 –
Artificial Intelligence for Climate Action and Resilience

Community of Practice (CoP) on Climate Technologies

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Community of Practice (CoP) on Climate Technologies

Shared Experiences, Smarter Solutions for Climate Action and Resilience

The Community of Practice (CoP) on Climate Technologies launched by the Asian and Pacific Centre for Transfer of Technology (APCTT) is dedicated to addressing the multifaceted challenges posed by climate change in the Asia-Pacific region through technology solutions. By leveraging the region's rich innovation capacities and good practices, the CoP aims to enhance access to critical knowledge on climate technologies. The Community connects professionals engaged in delivering technological solutions to climate change.

The objective of this Community of Practice is to:

- Promote collaborative problem-solving and policy-relevant dialogue
- Support the localization and transfer of innovations suited to national priorities
- Enhance institutional capacities for climate technology governance
- Enable matchmaking between solution providers and implementers

The Community is driven by a participatory and adaptive model that combines knowledge generation, engagement, and access to resources through the following mechanisms: monthly Query-Response Consolidated Reply (CR) cycle, webinars and interactive discussions, knowledge repository and much more.

Original Query by: Mr. Khagendra Bahadur Basnet, Government of Nepal

16th October 2025

Posted: 10th September 2025

Artificial Intelligence (AI) has been contributing to advancing climate action, with applications ranging from early warning systems and climate modelling to clean energy optimization, sustainable agriculture, and resilient infrastructure planning. However, the full potential of AI for climate action remains underutilized due to data deficiencies, inadequate policy frameworks and technical capabilities, lack of suitable digital infrastructure, funding constraints, and ethical governance gaps. In this context, we invite members of the Community of Practice on Climate Technologies to share their insights and experiences on the following:

1. Please share how AI has supported your work on climate action, along with any key lessons learned.

2. What policies, capacity-building initiatives, or partnerships have supported you to use AI to advance climate action?

Your responses will contribute to regional knowledge sharing and will facilitate scaling up of inclusive AI solutions for climate action across the Asia Pacific region.

Khagendra Bahadur Basnet
Director, Technology & Environment
Department of Industry
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1. Summary of Responses

Artificial Intelligence (AI) has rapidly emerged as a game-changing force for accelerating climate action and resilience globally, especially in the Asia-Pacific region. By integrating high-end data analytics, predictive models, and real-time decision-support systems, AI is supporting governments, researchers, and industries to respond to advanced environmental issues with unprecedented accuracy. International organizations, such as the United Nations and Organization for Economic Co-operation and Development (OECD), and intergovernmental platforms such as the Group of Twenty (G20), are acknowledging the importance of AI in areas such as climate forecasting, optimizing renewable energy, and advancing rights-based, evidence-led policymaking to meet the Sustainable Development Goals.

AI's role in climate action spans five interlinked dimensions- technological and functional applications, data and analytics, governance and ethics, geography and socioeconomics, and strategic impact. Together, these five dimensions provide a pathway for using AI to move from innovation to systemic change.

On the **technological and functional dimension**, AI is transforming the assessment, prediction, and management of climate risks. The Google Flood Forecasting Initiative and IBM Green Horizons Project demonstrate how satellite data and predictive analytics enhance flood and air-quality forecasting in India, Bangladesh and China. United Nations Development Programme (UNDP) and the Government of Maharashtra deployed AI simulations during the monsoons in 2025 to predict flood areas and consequent evacuation plans, thus saving lives. Likewise, Bangladesh's Ministry of Disaster Management and Relief uses similar tools to predict cyclones and floods and to optimize solar power. The Heimdall Project of Thanks Carbon in the Republic of Korea uses satellite-based monitoring,

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reporting, and verification to track methane emissions from rice paddies in Vietnam, Cambodia, and Bangladesh, linking agricultural innovation to sustainable finance and carbon credit markets. India's CSIR-NEERI applies AI for refining environmental data, carbon sequestration mapping, and pollutant dispersion modelling as part of the National Action Plan on Climate Change (NAPCC) while PCSIR in Karachi, Pakistan uses AI for agriculture forecasting and early warning. In urban environments, Singapore's Virtual Singapore digital twin maps urban heat islands, flooding, and sea level rise for resilient urban planning while Indian cities (e.g. Bengaluru, Chennai, Delhi and others) use it to enhance disaster resilience.

The **data and analytics dimension** emphasises building solid, interoperable, and inclusive data ecosystems. By integrating satellite data, remote sensing, internet of things (IoT) sensor networks, and socioeconomic data, AI platforms produce high-resolution environmental intelligence. Open, connected data platforms facilitate continuous feedback loops, enabling governments and institutions to foresee evolving climate risks and optimize adaptation strategies. Ongoing investment in open data infrastructure, renewable-powered digital systems and local knowledge networks is critical to provide context-specific and credible modelling across the region's diverse ecologies.

In the **governance and ethical dimension**, responsible and inclusive AI calls for accountable and human-focused governance. The United Nations Educational, Scientific and Cultural Organization (UNESCO) Recommendation on the Ethics of Artificial Intelligence is a guide to fairness, privacy, and safeguarding human rights. Ethical governance should also mitigate algorithmic bias, make systems explainable and auditable, and capture the voices of women, youth, indigenous peoples, and marginalized groups in AI development and deployment. Institutional capacity and interdisciplinary know-how in AI, climate science and policy will help democratisation of AI agendas.

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In the **geographic and socio-economic dimension**, AI use cases crosscut all levels - from global observation and regional cooperative platforms to national initiatives and community action. At the national level, AI application is largely context-dependent, as seen in cases mentioned above. This multi-scalar inclusive approach guarantees that AI technologies yield solutions responding to local contexts and social equity.

The **strategic impact** of AI extend beyond technical performance to quantifiable climate, social, and governance benefits. Improved precision in flood, cyclone, and air-quality forecasting minimises disaster losses through early warning and precision-evacuation. It increases resource efficiency of agricultural, water, and energy systems and enables local decision-making through participatory data visualization and digital twins; widens access to sustainable finance through verified carbon credits; and enhances policy coherence by linking AI innovation with Nationally Determined Contributions and the SDGs.

Despite remarkable progress, several barriers remain; limited interoperability of climate data; uneven digital infrastructure; shortage of skilled professionals; weak regulatory oversight and a global adaptation finance gap exceeding USD 2.7 trillion. These challenges can be addressed through coordinated action-enhancing data ecosystems; ethical and accountable AI governance; investing in interdisciplinary capacity development; scaling up multi-stakeholder partnerships through initiatives such as GPAI, and AI for Earth; leveraging climate finance for vulnerable communities and aligning National AI plans with Nationally Determined Contributions and Adaptation Plans.

AI therefore presents a historic chance to convert global scientific potential into practical local solutions. When led by ethical stewardship, open-ended participation and clear accountability, AI transform enormous amounts of climate data into context-based knowledge, streamline resource use and strengthen policymaking. Integrating AI into rights-informed and sustainable systems will enable the Asia-Pacific region to convert technological achievements into just, climate-resilient development pathways, demonstrating how intelligence, when applied responsibly, can become the foundation for planetary resilience.

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2. Relevant Experiences

Australia
AI for Bushfire Prediction and Response: CSIRO's Spark platform applies AI to model bushfire behaviour in real time, enabling emergency agencies to anticipate fire spread and allocate resources efficiently. The system processes satellite imagery, topography, and wind data, enhancing national preparedness under hotter, drier climate conditions. This innovation exemplifies AI's role in translating data into life-saving resilience operations.

Bangladesh
Bangladesh applies AI both in **flood forecasting** and **climate-smart agriculture**. The SURF-IT program uses machine-learning algorithms combined with community knowledge to predict coastal storm surges and improve preparedness for delta communities. In agriculture, AI-enabled advisory platforms issue SMS alerts on rainfall, pest outbreaks, and soil moisture, improving smallholder productivity and food security under changing climatic conditions.

Brazil
The **Amazon Protection System (SIPAM)** applies AI and satellite analytics to track deforestation, illegal burning, and land-use change across the Amazon Basin (SIPAM). This information supports law enforcement and early-intervention actions, reducing emissions from forest loss and preserving carbon sinks that stabilize regional climates.

Canada
AI for Wildfire Risk Reduction: Natural Resources Canada uses AI to model wildfire behaviour and map fire progression in near-real time. These insights guide evacuation routes, water-bomber deployment, and fuel-management strategies, critical resilience interventions in a warming boreal zone increasingly threatened by mega-fires.

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Chile

AI for Wildfire Forecasting and Resource Planning: Chilean agencies and universities integrate **machine-learning fire-risk models** with Copernicus climate datasets to anticipate outbreaks and allocate firefighting resources efficiently. AI enhances predictive capacity, mitigating economic and ecological damage linked to prolonged droughts.

Ethiopia

AI Early-Action Systems for Locust Control: Building on the same toolkit, **Ethiopia and Horn-of-Africa partners employ AI to predict swarm movement** and coordinate control operations, limiting crop loss and ensuring food resilience across drought-prone zones. Similarly, **the** Kuzi **early-warning system provides real-time SMS alerts to farmers in local languages for locust prediction and management**. This demonstrates how AI contributes to adaptive capacity and regional cooperation on transboundary climate risks.

France

IBM's Green Horizons initiative employs IoT and big-data analytics to forecast urban air quality and recommend emission-control measures. The same modelling frameworks are now informing city-level climate-mitigation plans and heat-health alerts, showing how digital intelligence serves both environmental protection and public-health resilience.

India

India's collaboration with Google Research has scaled an **AI-based river-flood forecasting system** that integrates satellite, rainfall, and hydrologic data to generate forecasts up to seven days in advance. The model supports the Central Water Commission and state emergency agencies, enabling targeted warnings for millions living in flood-prone districts. By transforming large, unstructured datasets into actionable predictions, AI directly strengthens climate adaptation and reduces economic losses from recurrent monsoon floods.

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Kenya

AI for Pest Surveillance and Food Security: The PlantVillage Nuru application uses AI-powered image recognition to diagnose crop pests and diseases in the field, while Food and Agriculture Organization i.e. FAO's eLocust3m platform combines satellite data and mobile reporting for desert-locust early warning. These systems protect livelihoods, reduce pesticide use, and strengthen adaptation in climate-sensitive agriculture.

Netherlands

AI Flood Modelling for Impact-Based Forecasting: Deltares' Delft-FEWS platform integrates AI emulators that replicate hydrodynamic models in seconds rather than hours. This accelerates flood-alert generation, allowing emergency services to act sooner. By enabling near-real-time hydrological analysis, AI enhances community resilience to Europe's increasingly frequent high-impact floods.

New Zealand

AI for Flood and Coastal Forecasting: New Zealand's **National Institute of Water and Atmospheric Research (NIWA)** uses **machine learning** to generate near-real-time flood-inundation maps, cutting computation time from hours to minutes. AI-based tide, surge, and wave forecasting models also enhance coastal risk management and early warning systems for communities along the country's shores.

The Republic of Korea

The Republic of Korea's start-up *Thanks Carbon* developed Heimdall, an AI and satellite-based **Monitoring, Reporting, and Verification (MRV)** platform that measures methane emissions from rice paddies. By analysing irrigation patterns and verifying alternate wetting and drying techniques, the system generates field-level data for carbon-credit certification. This links farmers directly to green-finance mechanisms and demonstrates how AI can couple mitigation with rural-livelihood resilience. Pilots of Heimdall technology in Vietnam, Cambodia and Bangladesh have scaled climate-smart irrigation across thousands of

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hectares, proving that AI can monitor compliance with low-emission farming and reward sustainable producers. These applications reduce methane emissions, a key agricultural greenhouse gas while maintaining yields and farmer incomes.

Saudi Arabia
Artificial Intelligence (AI) for Renewable-Energy Optimization: Saudi Arabia employs AI models inspired by the UK's Artificial Intelligence for Numerical Weather Prediction (**AI4NWP)** research to forecast solar and wind generation. These insights ensure grid stability during heat extremes and accelerate the nation's low-carbon-transition strategy, aligning energy security with climate resilience.

Singapore
AI Digital Twins for Urban Resilience: Under its Smart Nation Programme, Singapore created Virtual Singapore, a three-dimensional (3D) digital-twin city model that employs AI to simulate **urban heat islands, sea-level rise, and flood dynamics**. The platform supports planners in optimizing cooling networks, drainage capacity, and emergency evacuation routes. AI thus enables evidence-based climate adaptation in one of the world's most densely urbanized environments.

United Kingdom
AI for Weather and Energy Forecasting: The United Kingdom Meteorological Office (UK Met Office), in partnership with DeepMind (a UK-based AI research organization owned by Alphabet Inc.), developed GraphCast, an AI model capable of producing global 10-day forecasts faster and more accurately than traditional numerical systems. This leap in forecasting precision strengthens national preparedness for extreme weather while supporting renewable-energy balancing and agriculture scheduling, core dimensions of climate resilience.

The United States

The US leverages **AI-driven hydrologic models** through partnerships with Google Research and NOAA to deliver predictive flood and severe-weather warnings. Concurrently, machine-learning tools are optimizing air-pollution monitoring and energy-system efficiency, helping cities design integrated adaptation-mitigation policies that safeguard both people and ecosystems.

The United Arab Emirates

AI for Heat and Flood Preparedness: The UAE's national meteorological centre collaborates with ECMWF on AI-enabled extreme-weather forecasting under the **DestinE** initiative. Enhanced predictive analytics support urban-planning measures for heat stress, flash-flood management, and infrastructure resilience in arid environments.

3. Related Resources

Relevant Documentation

Bezos Earth Fund & Columbia Climate School: Landscape Assessment of Artificial Intelligence (AI) for Climate and Nature (2024) - a global review of AI applications across climate sectors, analyzing innovation hotspots and investment trends to guide scaling efforts.
(https://www.climate.columbia.edu/sites/default/files/content/research/AI%20for%20Climate%20%26%20Nature%20-%20Bezos%20Earth%20Fund/Landscape%20Assessment%20of%20AI%20for%20Climate%20and%20Nature%20-%20May%202024.pdf)

Climate Change AI - Primer on Machine Learning (ML) and Climate Change - an extensive review of ML applications across energy systems, weather prediction, carbon accounting, and climate finance, designed to guide researchers, policymakers, and practitioners.
(https://www.climatechange.ai)

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Copenhagen Adaptation Plan Document - details Copenhagen's strategies and actions for climate adaptation from the City of Copenhagen. (https://international.kk.dk/sites/default/files/2021-09/Copenhagen%20Climate%20Adaptation%20Plan%20-%202011.pdf)

Copernicus Climate Change Service (C3S) - managed by **European Centre for Medium-Range Weather Forecasts (ECMWF)** for the European Commission, C3S provides open, AI-ready climate datasets used globally for climate-risk modeling, adaptation planning, and infrastructure resilience assessments.(https://climate.copernicus.eu/climate-datasets)

European Centre for Medium-Range Weather-Range (ECMWF) - AI for Weather and Climate Preparedness and Resilience (DestinE Initiative) - the European Centre for Medium-Range Weather Forecasts leads this initiative to integrate AI in climate modeling and forecasting for adaptive infrastructure and policy planning. (https://destine.ecmwf.int/ai-for-weather-and-climate-preparedness-and-resilience/)

Food and Agriculture Organization (FAO) - **eLocust3m: Smartphone-Based Early Warning for Desert Locusts** - FAO's AI-enabled locust monitoring tool combines mobile data collection with satellite analytics to predict pest outbreaks and protect crop systems under changing climate conditions. (https://www.fao.org/locust-watch/)

Frontiers in Climate - The Role of AI in Enhancing System Resilience to Climate Change - a peer-reviewed synthesis that maps how AI supports resilience-building across water, energy, agriculture, and disaster-risk systems. (https://www.frontiersin.org/journals/climate/articles/10.3389/fclim.2025.1585331/full)

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Global Disaster Alert and Coordination System (GDACS) - a platform by **United Nations Office for the Coordination of Humanitarian Affairs (UN OCHA)** and the **European Union (EU)** that combines satellite imagery and ML analytics to issue real-time disaster alerts worldwide, enhancing coordination of humanitarian response and early warning dissemination. (https://gdacs.org/)

Global Methane Tracker 2023 Report by International Energy Agency (IEA) - about methane emissions and impacts due to it on global rise in temperature. (https://www.iea.org/reports/global-methane-tracker-2023)

Google Research - Using AI to Expand Global Access to Reliable Flood Forecasts - showcases Google's AI-driven flood forecasting systems that integrate satellite data, hydrological models, and ML algorithms to generate localized predictions for vulnerable communities in India, Bangladesh, and Africa.(https://research.google/blog/using-ai-to-expand-global-access-to-reliable-flood-forecasts/)

Global Partnership on Artificial Intelligence (GPAI) & **Climate Change AI** - Climate Change and AI: Recommendations for Government Action - a collaborative publication offering actionable policy guidance to scale responsible AI for climate mitigation, adaptation, and monitoring. (https://www.gpai.ai/projects/climate-change-and-ai.pdf)

Heimdall Project by Thanks Carbon - AI & Satellite MRV (Monitoring, Reporting, and Verification) for Low-Emission Rice Cultivation - a field-level AI monitoring system measuring methane emissions from rice fields to enable carbon-credit verification in Vietnam and India. (https://thankscarbon.com/en/service/haimdall)

International Business Machines (IBM) - Green Horizons Initiative - an IBM-led partnership with national governments in China and India that applies AI and big data for air quality prediction, renewable energy forecasting, and emission optimization.

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(https://uk.newsroom.ibm.com/2015-Dec-09-IBM-Expands-Green-Horizons-Initiative-Globally-To-Address-Pressing-Environmental-and-Pollution-Challenges)

ICLEI - Local Governments for Sustainability & **Asian Cities Climate Change Resilience Network (ACCCRN)**Process IAP (ICLEI ACCCRN Process Integrated Action Planning) Toolkit Document - a guide for local governments on climate adaptation and resilience planning. (https://southasia.iclei.org/wp-content/uploads/2021/08/ICLEI-ACCCRN-Process-IAP-A-toolkit-for-Local-Governments.pdf)

IEA - Digital Demand-Driven Electricity Systems (3D Report) - highlights AI's role in balancing renewable grids, forecasting demand, and supporting decarbonization of energy systems globally. (https://www.iea.org/reports/digital-demand-driven-electricity-systems-3d)

International Telecommunication Union (ITU) - AI for Good: Artificial Intelligence/ Machine Learning (AI/ML) Solutions for Climate Change - repository compiling global AI innovations tackling climate change through predictive analytics, satellite monitoring, and disaster resilience technologies. (https://aiforgood.itu.int/about-us/aiml-solutions-for-climate-change/)

Met Office UK - AI for Numerical Weather Prediction (AI4NWP Program) - a national AI initiative integrating ML with meteorological modeling to enhance storm forecasting and flood risk prediction. (https://www.metoffice.gov.uk/research/approach/collaboration/artificial-intelligence-for-numerical-weather-prediction)

Microsoft AI for Earth - Microsoft's global program supporting projects that apply AI to environmental challenges, focusing on water, agriculture, biodiversity, and climate modeling to accelerate resilience innovation. (https://www.microsoft.com/en-us/ai/ai-for-earth)

Organisation for Economic Co-operation and Development (OECD).AI - Environment and Climate Theme Portal- OECD's portal curating global research and policy guidance on AI's role in environmental sustainability, covering governance, regulation, and technology transfer mechanisms.
(https://oecd.ai/en/themes/environment)

PlantVillage - Nuru (AI for Crop Disease Diagnostics) - developed by **Pennsylvania State University (Penn State University)** and FAO, this smartphone application uses AI-driven image recognition to detect crop diseases, helping farmers adapt to pest and climate-related stressors. (https://plantvillage.psu.edu/)

Rolnick et al. - Tackling Climate Change with Machine Learning (ML) - a foundational academic paper detailing over 100 use cases where AI and ML contribute to climate solutions in energy systems, carbon removal, and policy design. (https://arxiv.org/abs/1906.05433)

ScienceDirect - AI for Wildfire Risk Prediction in Indonesia - a case study demonstrating how ML improves wildfire forecasting, prevention, and community preparedness under climate extremes. (https://www.sciencedirect.com/science/article/pii/S1569843225000822)

Sustainable Smart City Administration Research Paper by Ani Matei and Madalina Cocoşatu - Faculty of Public Administration, National University of Political Studies and Public Administration, Bucharest, Romania – explores sustainable practices in smart city management in Romania.
(https://www.mdpi.com/2071-1050/16/16/6749)

United Nations Development Programme (UNDP) - E-Waste Policy Brief - discusses strategies for managing electronic waste in South Korea. (https://www.undp.org/sites/g/files/zskgke326/files/migration/seoul_policy_center/USPC-SDG-Policy-Brief-7-E-waste.pdf)

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United Nations Educational, Scientific and Cultural Organization (UNESCO) - Recommendation on the Ethics of Artificial Intelligence - adopted by 193 countries, this landmark document establishes global standards for ethical AI, emphasizing environmental responsibility, transparency, and accountability.
(https://unesdoc.unesco.org/ark:/48223/pf0000381137)

United Nations Environment Programme (UNEP) Adaptation Gap Report 2023 - this flagship report warns that global adaptation efforts remain **"Underfinanced and Underprepared."** Developing countries adaptation needs are up to **18 times higher** than current finance flows, leaving an **annual gap of US $194-366 billion**. It calls for scaling public and private investment, reforming finance systems, and leveraging loss-and-damage funding. (https://www.unep.org/resources/adaptation-gap-report-2023)

UNEP - Artificial Intelligence (AI) End-to-End: Environmental Impact of AI – this UNEP report examines the environmental footprint of AI technologies throughout their lifecycle from data centers and algorithmic processing to e-waste management. (https://www.unep.org/resources/report/artificial-intelligence-ai-end-end-environmental-impact-full-ai-lifecycle-needs-be)

UNEP - Artificial Intelligence Solutions for the Environment and Prototypes - UNEP presented various reports on AI solutions for the environment that contribute to achieving environmental goals. (https://www.unep.org/topics/digital-transformations/digital-accelerator-lab/ai-solutions-environment)

United Nations Framework Convention on Climate Change (UNFCCC) - Artificial Intelligence for Climate Action in Developing Countries (Information Note) - explores how AI applications are transforming climate mitigation and adaptation efforts in developing nations.

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(https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/AI4climateaction/28da5d97d7824d16b7f68a225c0e3493/a4553e8f70f74be3bc37c929b73d9974.pdf)

United Nations (UN) High-Level Advisory Body - Governing AI for Humanity - outlines global governance mechanisms for AI, emphasizing ethical frameworks, sustainability, and public-good alignment for climate resilience.
(https://www.un.org/sites/un2.un.org/files/governing_ai_for_humanity_final_report_en.pdf)

United Nations University Institute for Water, Environment and Health (UNU-INWEH) - Harnessing the Power of AI for Climate Change Impact Assessment - this policy brief illustrates how AI enhances modeling of climate impacts, especially in water-scarce regions of the Global South. (https://unu.edu/inweh/article/harnessing-power-ai-climate-change-impact-assessment)

World Bank - Open Data for Resilience Initiative (ODR) - provides open-access geospatial and climate datasets leveraged by AI models for disaster-risk management and adaptive planning. (https://www.gfdrr.org/)

World Bank Global Facility for Disaster Reduction and Recovery (GFDRR) - Machine Learning for Disaster Risk Management - showcases AI-based analytics in hazard assessment, post-disaster recovery planning, and risk-informed infrastructure design. (https://www.gfdrr.org/en/knowledge-hub)

World Economic Forum (WEF) - AI for Climate Adaptation and Nature-Based Solutions - examines how AI supports ecosystem-based adaptation, green infrastructure planning, and community-led climate solutions.
(https://www3.weforum.org/)

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Relevant Organizations

AICE - AI for Climate (University of Chicago, USA) - A multidisciplinary initiative that integrates AI, environmental science, and computational modeling to accelerate climate adaptation, emissions reduction, and risk forecasting through data-driven innovation. (https://datascience.uchicago.edu/research/aice-ai-for-climate/)

AI Institute for Research on Trustworthy AI in Weather, Climate, and Coastal Oceanography (AI2ES) - A National Science Foundation (NSF) institute developing reliable AI tools for weather forecasting, climate modeling, and coastal resilience to improve hazard preparedness and risk communication.
(https://www.ai2es.org/)

AI Institute for Resilient Agriculture (AIIRA) - A U.S. NSF-funded center that uses artificial intelligence to strengthen agricultural resilience, enhance crop productivity, and support adaptive management under variable climatic conditions. (https://aiira.iastate.edu/)

AI-LEAF (AI for Land, Economy, Agriculture & Forestry) - A research consortium focused on applying AI to sustainable land management, forestry, and agricultural systems for enhanced carbon sequestration and resilience to climate stressors. (https://cse.umn.edu/aileaf)

AI for Climate Action Innovation Factory (ITU / AI for Good) - A United Nations initiative that supports global innovation by promoting AI-based solutions for climate mitigation, adaptation, and resilience through multi-stakeholder collaboration and competitions. (https://aiforgood.itu.int/)

AI for Climate and Sustainability (AI4CaS) - A research network leveraging AI, data analytics, and predictive modeling to design sustainable climate adaptation frameworks, optimize resource use, and build resilient infrastructure systems. (https://ai.northeastern.edu/ai-climate)

AI for Climate Resilience Programme (Milkywire Foundation, Sweden) - A global funding initiative supporting research and technology ventures using AI to address climate-related challenges such as floods, droughts, and heatwaves in vulnerable communities. (https://www.milkywire.com/ai-for-climate-resilience-program)

AI for Earth (Microsoft) - A philanthropic and technical program providing AI tools, cloud credits, and grants to organizations working on environmental issues including climate resilience, water management, biodiversity, and agriculture. (https://news.microsoft.com/apac/features/ai-for-earth-helping-save-the-planet-with-data-science/)

AI for Planet Alliance (Capgemini & UNESCO) - A worldwide alliance promoting the ethical and impactful use of artificial intelligence for environmental protection, carbon reduction, and strengthening planetary resilience. (https://www.aifortheplanet.org/content/ai-for-the-planet-alliance)

Alan Turing Institute (United Kingdom) - Environment and Sustainability Programme - The UK's national data science institute applying AI for climate modeling, environmental monitoring, and sustainable decision-making across ecosystems and cities. (https://www.turing.ac.uk/research/research-programmes/artificial-intelligence)

Carnegie Mellon University - AI for Climate Initiative (USA) - Advances interdisciplinary research in AI-driven decarbonization, energy

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optimization, and predictive climate modeling to enable data-backedresilience planning. (https://www.cmu.edu/)

Centre for Study of Science, Technology and Policy (CSTEP, India) - A premier Indian think tank integrating AI-based analytics into energy, air quality, and climate resilience planning, with a focus on sustainable urban systems and risk forecasting. (https://cstep.in/)

Climate Action Network-International (CAN) - The world's largest environmental network of over 1,800 non-governmental organisations in over 130 countries fighting the climate crisis. (https://climatenetwork.org/)

Climate Centre for Cities (C-Cube) - Established at National Institute of Urban Affairs (NIUA) to create synergy across all climate actions being undertaken in Indian cities by various stakeholders. (https://niua.in/c-cube/content/climate-centre-cities-c-cube)

Climate Change AI (CCAI) - A global nonprofit community fostering research and capacity building at the intersection of artificial intelligence and climate science, producing reports, workshops, and open datasets for climate solutions. (https://www.climatechange.ai/)

Coalition for Disaster Resilient Infrastructure (CDRI) - A global partnership led by India that promotes climate-resilient and disaster-proof infrastructure systems, increasingly integrating AI and data science in resilience assessments. (https://cdri.world/)

Commonwealth Scientific and Industrial Research Organisation (CSIRO) Data61 (Australia) - The data and digital science arm of Australia's national research agency applying AI to climate risk modeling, water management, disaster forecasting, and resilient infrastructure design. (https://research.csiro.au/data61/)

DeepMind - AI for Energy and Climate (United Kingdom) - A Google-owned research platform using reinforcement learning and deep neural

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networks to improve energy efficiency, renewable energy forecasting, and climate system modelling. (https://deepmind.google/discover/blog)

Digital Earth Africa - A continental platform leveraging machine learning and Earth observation data to monitor land, water, and climate trends for improving adaptation and resource planning across Africa. (https://www.digitalearthafrica.org/)

Federal Office of Meteorology and Climatology MeteoSwiss - Observes the weather around the clock, creating forecasts and alerting authorities and the population when strong winds, heavy rainfall, storms, or heat waves are forecast. (https://www.meteoswiss.admin.ch/about-us/contact.html)

Google Earth Engine (GEE) - A cloud-based AI-enabled geospatial analysis platform providing access to global satellite data for applications in land-use monitoring, water stress mapping, and disaster assessment. (https://earthengine.google.com/)

IBM Environmental Intelligence Suite (EIS) - An AI-powered climate analytics platform offering predictive weather insights, risk forecasts, and sustainability intelligence for governments and private sector resilience planning.
(https://www.ibm.com/products/environmental-intelligence-suite)

Japan Meteorological Agency (JMA) - Focuses on monitoring the earth's environment and forecasting natural phenomena related to the atmosphere, oceans, and earth, as well as conducting research and technical development in related fields.
(https://www.jma.go.jp/jma/en/Background/mission.html)

National Oceanic and Atmospheric Administration (NOAA) - U.S. scientific and regulatory agency charged with forecasting weather, monitoring oceanic and atmospheric conditions, conducting deep sea exploration, and managing fisheries and marine protection. (https://www.noaa.gov/)

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NVIDIA Earth-2 - A high-performance AI supercomputing initiative creating a "digital twin" of the Earth to simulate climate and weather at kilometer-scale precision, aiding adaptation and resilience efforts. (https://www.nvidia.com/)

Radiant Earth Foundation (Radiant MLHub) - Provides open machine-learning-ready Earth observation datasets and models for global climate monitoring, sustainable agriculture, and disaster risk reduction. (https://radiant.earth/)

RIKEN Center for Computational Science (Japan) - Integrates AI with supercomputing to enhance weather forecasting and climate simulation capabilities, contributing to early warning and resilience research across Asia. (https://www.r-ccs.riken.jp/en/)

The Bureau of Meteorology (Australia) - Australia's national weather, climate, and water agency. Its expertise and services assist Australians in dealing with drought, floods, fires, storms, tsunami, and tropical cyclones. (http://www.bom.gov.au/)

UN Global Pulse (United Nations) - The UN's flagship innovation initiative leveraging AI and big data for humanitarian response, climate risk detection, and strengthening community resilience worldwide. (https://www.unglobalpulse.org/)

Wadhwani Institute for Artificial Intelligence (India) - Applies AI for social impact in agriculture, health, and climate sectors, including pest forecasting, crop advisories, and water resource optimization for smallholder farmers. (https://www.wadhwaniai.org/)

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Relevant Websites

AgriDigital Platform for Farmers (Australia): Connects farmers with climate-smart agriculture practices through a digital platform (https://www.agridigital.io/)

AI for Climate Action Accelerator (Impact Hub Berlin) - Program to help AI climate innovators scale. (https://berlin.impacthub.net/climate-action-accelerator/ai-for-climate-action-accelerator/)

AI for Climate Action Innovation Factory - International Telecommunication Union (ITU / AI for Good) - UN's accelerator platform to support AI solutions for climate change challenges. (https://aiforgood.itu.int/about-us/ai-for-climate-action-innovation-factory/)

AI for Climate Resilience Programme (OSU / Klarna) - Funding program for AI-driven adaptation projects in climate-vulnerable regions. (https://internal.science.oregonstate.edu/rdu/funding/ai-for-climate-resilience-program)

AI for Monitoring Air Quality (AirVisual): Utilizes internet of things (IoT) and AI for real-time air quality data to improve public health. (https://www.iqair.com/)

AI-Powered Environmental Governance (China): Utilizes AI for enforcing environmental regulations and monitoring pollution in real-time. (https://www.sciencedirect.com/science/article/abs/pii/S0959652620323295)

Artificial Intelligence for Climate and Sustainability (AI4CaS) (Northeastern University) - Research lab developing knowledge-integrated AI on climate risk, resilience, energy sustainability. (https://ai.northeastern.edu/ai-climate)

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AI4SDGs Think Tank – Principles on AI for Climate Action - Publishes principles for using AI responsibly in climate contexts. (https://ai-for-sdgs.academy/principles-on-ai-for-climate-action)

Artificial Intelligence in Urban Forestry (Queensland University of Technology, Australia): Applies AI algorithms, including Ant Colony Optimisation, to guide tree planting for thermal comfort and reduced heat stress, supporting sustainable city planning. (Artificial Intelligence in urban forestry)

AI-Driven High-Performance Data Analytics for Renewable Energy (Saudi Arabia): Joint study by Islamic University of Madinah, Jubail Industrial College, University of Jeddah, and King Abdulaziz University on using AI, big data, high-performance computing (HPC), and edge computing to improve renewable-energy forecasting and governance frameworks. (AI driven high performance data analytics)

Australia Climate Service (ACS) Website - Delivers climate data and insights from the Australian government. (https://www.acs.gov.au/)

Blockchain for Climate Action (Climate Ledger Initiative): Employs blockchain technology for tracking carbon credits and ensuring transparent climate finance. (https://climateledger.org/)

Cambodia - Heimdall MRV Results: Cambodia's pilot with *Thanks Carbon's Heimdall system* demonstrated measurable success—using less water while increasing rice yields and reducing emissions. (https://thankscarbon.com/blog/thanksletter-2-cambodia-results-prove-it-less-water-more-rice-lower-emissions/)

C-Cube Climate Practitioners Network (NIUA) Website - Connects climate professionals in India for collaboration and knowledge sharing through the National Institute of Urban Affairs. (https://niua.in/c-cube/climate-practitioners-india-network)

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Carbon Tracker (UK): Offers tools for tracking carbon emissions and managing carbon budgets and targets. (https://carbontracker.org/)

CENSIPAM (Centro Gestor e Operacional do Sistema de Proteção da Amazônia) Website - Monitors and manages environmental data related to the Amazon in Brazil. (https://www.gov.br/censipam/pt-br)

Cervest - AI platform providing climate risk intelligence at asset-level for infrastructure and financial planning. (https://cervest.earth/)

China National Environmental Monitoring Center (CNEMC): Offers data and monitoring on air quality across China. (https://www.cnemc.cn/)

Climate.ai — Platform providing hyper-local AI climate insights for agriculture decision making (e.g., ClimateLens). (https://climate.ai/)

Climate Central - Independent organization using modelling and data to deliver climate science and communications. (https://www.climatecentral.org/)

Climate Change AI - Global non-profit promoting use of AI to tackle climate change via research, grants, and community. (https://www.climatechange.ai)

Climate Network Website - A platform for global climate action and advocacy through various networked organizations. (https://climatenetwork.org/)

Climate TRACE - AI & satellite-based emissions tracking platform to monitor greenhouse gas sources globally. (https://climatetrace.org)

Climate.gov Website - Provides climate data, tools, and information from NOAA (National Oceanic and Atmospheric Administration), USA Government. (https://www.climate.gov/)

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CO2 AI - Sustainability action platform using AI to measure carbon footprints and guide decarbonization. (https://www.co2ai.com/)

Copernicus Climate Change Service (C3S) Website - Offers climate data and information from the European Union's Copernicus program. (https://climate.copernicus.eu/)

Copenhagen Adaptation Plan Document - Details Copenhagen's strategies and actions for climate adaptation from the City of Copenhagen. (https://international.kk.dk/sites/default/files/2021-09/Copenhagen%20Climate%20Adaptation%20Plan%20-%202011.pdf)

Deforestation Prediction Tool (UNEP): Uses AI to predict deforestation risk areas, aiding conservation efforts. (https://www.unep.org/news-and-stories/story/how-artificial-intelligence-helping-tackle-environmental-challenges)

Digital ID for Climate Refugees (UNHCR): Implements digital identity systems to aid climate refugees in accessing services and protections. (https://www.unhcr.org/in/news/announcements/unhcr-welcomes-commitments-id4africa-2024-digital-identity-gains-displaced)

Digital Innovation Hubs for Climate Startups (EU): Provides resources and tools for climate tech startups to innovate and scale. (https://digital-strategy.ec.europa.eu/en/activities/edihs)

Digital MRV Systems (UNDP): Provides digital platforms for measuring, reporting, and verifying climate actions. (https://climatepromise.undp.org/research-and-reports/mrv-practice)

Digital Platforms for Disaster Risk Reduction (UNDRR): Engages communities with digital tools for preparing and responding to climate-induced disasters. (https://www.undrr.org/)

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Digital Public Goods for Climate Action (DPGA): Promotes open-source software and data for climate resilience. (https://digitalpublicgoods.net/)

Earth Blox - Geospatial AI platform for modelling deforestation, land degradation, carbon stocks. (https://earthblox.io/)

Earthwatch Citizen Science Platforms: Engages communities in environmental monitoring and data collection for climate research. (https://earthwatch.org/)

Freshwater Ecosystems Explorer (UNEP): Monitors changes in freshwater ecosystems using geospatial data (www.unep.org/)

Future Earth / AI for Earth - Promotes research interfaces between AI and Earth systems (often via partnerships) (https://www.futureearth.org/)

GDACS (Global Disaster Alert and Coordination System) Website - Provides real-time alerts about natural disasters from various global sources.
(https://www.gdacs.org/)

Geospatial Digital Twins for Urban Planning (Singapore): Uses digital replicas of cities for sustainable urban planning. (https://wgicouncil.org/digital-twinning-a-country-singapore/)

Global Carbon Project Website - Provides data and analysis on global carbon emissions and their impact. (https://www.globalcarbonproject.org/)

Global Climate Action Portal (UNFCCC NAZCA / GCAP) - Platform tracking climate commitments by states, cities, organizations. (https://unfccc.int/climate-action/tracking-and-recognition/global-climate-action-portal)

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Global Forest Watch - World Resources Institute (WRI): Provides real-time forest monitoring tools and data to combat illegal deforestation. (https://www.globalforestwatch.org/)

Global Methane Tracker (IEA): Tracks methane emissions globally to inform policy and support mitigation efforts. (https://www.iea.org/reports/global-methane-tracker-2023)

Green Digital Cities (C40 Cities): A network of cities using digital tools to enhance sustainability and reduce carbon footprints. (https://www.c40.org/)

Grid Resilience and Innovation Partnerships (GRIP) Program Website - Supports innovation and resilience in the U.S. electrical grid from the Department of Energy. (https://www.energy.gov/gdo/grid-resilience-and-innovation-partnerships-grip-program)

Gro Intelligence - AI analytics for agriculture, climate, food systems forecasting and resilience. (https://www.weforum.org/organizations/gro-intelligence/)

INDIAai - India's national AI portal featuring policies, case studies, AI ecosystem resources. (https://indiaai.gov.in/)

India Meteorological Department (IMD) Website - Delivers weather forecasts, warnings, and climate data for India. (https://mausam.imd.gov.in/)

Indigenous Knowledge Systems (Amazon Basin): Preserves and integrates indigenous knowledge for climate resilience using digital platforms.
(https://www.amazonconservation.org/)

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Intelligent Transport Systems (ITS) Singapore: Provides information on advanced transport technologies and systems in Singapore. (https://www.lta.gov.sg/content/ltagov/en/getting_around/driving_in_singapore/intelligent_transport_systems.html)

IOM-Microsoft Climate Action Workstream - Partnership deploying AI & satellite models to identify climate-vulnerable communities. (https://environmentalmigration.iom.int/iom-microsoft-partnership-climate-action-workstream)

Japan Climate Network (JCN) Website - Provides information and resources on climate change issues and advocacy in Japan. (https://jcnerr.org/)

Japan Meteorological Agency (JMA) Website - Provides weather, climate, and seismic information from Japan's national meteorological agency.
(https://www.jma.go.jp/jma/indexe.html)

Jupiter Intelligence - Provides climate resilience analytics and risk modelling to governments and enterprises. (https://www.jupiterintel.com/)

Kayrros - Environmental intelligence leveraging AI and satellite data for insights on land use, emissions, etc. (https://www.kayrros.com/)

Local Climate Action Platforms (Climate-KIC): Supports local governments and communities in implementing climate action plans via digital platforms. (https://www.climate-kic.org/)

Los Angeles County Climate Action Plan - Outlines climate action strategies and goals for Los Angeles County's long-term planning. (https://planning.lacounty.gov/long-range-planning/climate-action-plan/)

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MeteoSwiss Website - Provides weather forecasts and early warning systems from Switzerland's national meteorological service. (https://www.meteoswiss.admin.ch/#tab=forecast-map)

MIT Climate Portal - Educational and research hub of MIT climate science, initiatives, models. (https://climateproject.mit.edu/)

National Satellite Meteorological Center (NSMC) of China Website - Offers satellite-based meteorological and environmental monitoring data from China.
(http://www.nsmc.org.cn/nsmc/cn/home/index.html)

National Weather Radio (NWR) Website - Offers emergency weather alerts and information from the National Weather Service in the U.S. (https://www.weather.gov/nwr/)

Omdena - AI in Climate Change - Platform building AI solutions (e.g. for extreme weather, supply chain, risk). (https://www.omdena.com/ai-in-climate-change)

Open Data for Climate Resilience (World Bank): Grants access to climate data to support policymaking and community adaptation. (https://data.worldbank.org/topic/climate-change)

Precision Agriculture with IoT (India): Implements IoT devices for efficient and sustainable resource use in agriculture. (https://precisionag.org/)

PRISM: Platform for Real-time Impact & Situation Monitoring (WFP) - Open-source climate risk / vulnerability platform combining geospatial as well as social data. (https://innovation.wfp.org/project/prism)

Project Drawdown's Climate Solutions: A platform mapping and measuring climate solutions across various sectors. (https://www.drawdown.org/)

Smart Water Management (Israel): Features digital infrastructure for efficient water resource management to address water scarcity. (https://www.smartwatergroup.com)

Sustainable Digital Finance (UNEP): Develops governance frameworks to align digital finance with sustainable development goals. (https://www.unepfi.org/publications/)

Sustainable Development Solutions Network (SDSN): Leverages digital tools to promote sustainable solutions and achieve the SDGs. (https://www.unsdsn.org/)

Terrafuse AI - Provides climate risk forecasts (e.g. wildfire, extreme heat) using AI and remote sensing. (https://terrafuse.ai/)

Thanks Carbon - Heimdall MRV Platform: Learn more about *Thanks Carbon's Heimdall*, an AI and satellite-based monitoring, reporting and verification (MRV) service for climate-smart agriculture and emission monitoring. (https://thankscarbon.com/en/service/haimdall)

Transforming Climate Adaptation with Artificial Intelligence (IIT Kharagpur, India): Researchers demonstrate how Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL) improve heatwave prediction, streamflow analysis, and irrigation management, enhancing hydro-climatology and agricultural resilience. (Transforming Climate Adaptation with Artificial Intelligence)

UNESCO Report (UNESDOC): A comprehensive report on climate change, education, and sustainable development, offering global perspectives and policy recommendations. (https://unesdoc.unesco.org/ark:/48223/pf0000381137)

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United Nations Framework Convention on Climate Change (UNFCCC): Artificial Intelligence for Climate Action / #AI4ClimateAction - UN's portal under the Technology Mechanism on AI for mitigation/adaptation.
(https://unfccc.int/ttclear/artificial_intelligence)

Urban Observatory Newcastle - Provides data and insights on urban climate and environmental conditions from Newcastle University's Urban Observatory.
(https://newcastle.urbanobservatory.ac.uk/)

Urban Intelligence for Extreme Heat Mitigation and Adaptation: Explores the role of AI and urban intelligence tools in mitigating extreme heat and supporting adaptive urban design strategies.
(Urban Intelligence for extreme heat mitigation and adaptation)

Vietnam - Heimdall Monitoring, Reporting and Verification (MRV) System: The Vietnamese government is adopting AI-driven monitoring, reporting, and verification (MRV) tools through *Thanks Carbon's Heimdall platform* to track methane emissions and support sustainable rice farming.
(https://thankscarbon.com/en/news/vietnamese-government-goes-full-scale-mrv-with-the-help-of-thanks-carbon/)

Virtual Singapore Website - A digital twin technology platform providing 3D models and data for urban planning and simulation in Singapore.
(https://oecd-opsi.org/innovations/virtual-twin-singapore/)

WIPO GREEN - Marketplace connecting green technologies and seekers; uses smart matching and tech transfer networks.
(https://www3.wipo.int/wipogreen/en/)

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4. Responses in Full

1. **Dr. Sharda Kosankar, Principal Scientist, CSIR-NEERI, Nagpur, India**
2. **Md Selim Reza, System Analyst, IRD, Ministry of Finance, Bangladesh**
3. **Sohail Akhtar, Senior Scientist, PCSIR Lab Complex, Karachi, Pakistan**
4. **Shreedutt Kamat, State Project Officer - Resilience, UNDP, India**
5. **M. Mudassir, City Program Coordinator, UNDP, Maharashtra, India**
6. **Shourya Mehta, Independent Consultant, India**
7. **Soohyung Kim, Economic Affairs Officer (Technology & Innovation), APCTT**
8. **Pankaj Kumar Shrivastav, Programme Management Officer, APCTT**
9. **Satyabrata Sahu, Senior Programme Management Assistant, APCTT**

Responses:

1. Dr. Sharda Kosankar, Principal Scientist, CSIR-National Environmental Engineering Research Institute, Nagpur, India

Artificial Intelligence has proven to be an indispensable asset in advancing my research on climate technologies. It has facilitated high-resolution analysis of large-scale environmental datasets, enhanced predictive climate modelling, and improved the accuracy of scenario-based simulations.

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Through AI-enabled tools, we have been able to assess carbon sequestration potential, detect subtle land-use transitions, and model pollutant dynamics with greater precision than conventional approaches allow. A key lesson learned is that the robustness of AI applications is fundamentally contingent on the quality and standardization of datasets. Equally important is fostering interdisciplinary synergies between climate scientists, computer scientists, and policymakers, ensuring that AI remains an augmentative tool that complements empirical observations, traditional ecological knowledge, and ground-truthed field data.

The integration of AI into climate action within my work has been catalysed by a confluence of supportive policies, institutional initiatives, and collaborative partnerships. At the policy level, national frameworks such as the National Action Plan on Climate Change (NAPCC) and its subsidiary missions have provided strategic impetus for the adoption of advanced digital technologies. Capacity-building initiatives, including specialized training programs, academic-industry workshops, and international exchanges, have strengthened the technical competencies required for effective AI deployment. Furthermore, strategic partnerships with governmental agencies, premier research institutions, and civil society organizations have enabled data sharing, co-development of AI-driven platforms, and piloting of innovative applications for ecosystem monitoring, biodiversity conservation, and climate risk assessment. Together, these measures have not only facilitated the practical utilization of AI in advancing climate action but have also underscored the necessity of collaborative and policy-enabled pathways for scaling such technologies.

2. Md Selim Reza, System Analyst, IRD, Ministry of Finance, Bangladesh

Dear Members, Thank you for the opportunity to contribute. In my experience, Artificial Intelligence (AI) can significantly support climate action and resilience:

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- **Climate Prediction & Early Warning:** AI analyses data to forecast extreme events like floods and cyclones for timely preparedness
- **Smart Agriculture & Resource Management:** AI optimizes water and fertilizer use, promoting sustainability.
- **Energy Efficiency & Renewable Integration:** AI improves energy grids, forecasts renewable output, and enhances storage solutions.
- **Environmental Monitoring:** AI tracks pollution, deforestation, and ecosystem changes in real-time.
- **Policy & Decision Support:** AI aids governments in planning climate adaptation and resilience strategies.

Faith Perspective:

Qur'an: "Do not commit corruption on the earth after it has been set in order." (7:56) - urging responsible environmental stewardship.
Hadith: "The world is green and beautiful, and Allah has appointed you as His stewards over it." (Muslim) - emphasizing human responsibility to protect nature.

AI, when applied ethically and in collaboration with stakeholders, can help us fulfill this stewardship while building resilient, sustainable communities.

3. Sohail Akhtar, Senior Scientist, PCSIR Lab Complex, Karachi, Pakistan

AI is a practical tool working in many domains of social welfare, safety issues and public security. By using AI powered tools, datasets and prediction models on climate disasters and weather anomalies, countries can get advanced information about upcoming natural catastrophes. Also

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AI could be beneficial for farmers and agricultural sector in protecting crops and soil from natural disasters.

4. Shreedutt Kamat, State Project Officer - Resilience, UNDP, India

Hello everyone, just sharing an experience of using AI in the DRR arena. AI is increasingly being used in the Disaster Risk Reduction arena for projecting floods , inundation scenarios based on rainfall data as well as dam discharges. In the current season, the Government of Maharashtra through its State Emergency Operations Centre Made effective use of AI for projecting flood scenarios. The State Government used AI for predicting future scenarios of flooding in the basin of the Sina river in Satara .This was based on real time receiving of data and warnings from multiple agencies like the CWC/ IMD/ Water Resources collected through IOT based automatic weather station (AWS) / sensors and shared through API integration. The said information was then put through a model using AI that created a simulation on a Geographic Information System (GIS) platform showing areas and population that would be affected downstream in Solpaur district along the Sina river along with a time frame for the same. Through superimposing the information on a Geographic Information System (GIS) map with layers of habitation, population, the exact locations of the communities that would be affected were known which enabled timely location based warning dissemination, evacuation and pre-positioning of rescue forces thereby saving lives.

5. M. Mudassir, City Program Coordinator, UNDP, Maharashtra, India

Artificial Intelligence (AI) played a transformative role in enhancing the quality and precision of the Multi-Hazard Risk and Vulnerability Assessment (HRVA) for the cities of Nashik, Nagpur, and Chhatrapati Sambhaji Nagar under ongoing joint DRM PROGRAM between the Govt

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of Maharashtra & UNDP. AI-based models were applied to downscale climate datasets from CMIP6 to city-level projections, improving the accuracy of temperature, rainfall, and wind forecasts under different emission scenarios. Machine learning techniques were used to analyze 30 years of rainfall and hazard data to detect patterns in flood recurrence and extreme events, strengthening the probabilistic flood and climate risk models. Deep learning–based image classification supported the identification of land-use and land-cover changes influencing urban flooding, while AI-assisted multi-criteria analysis helped develop ward-level social vulnerability indices with reduced subjectivity. These insights were integrated into GIS and Decision Support Systems (DSS) for real-time monitoring and early warning. Key lessons include the importance of high-quality, locally calibrated datasets, the need for interpretability of AI models for institutional adoption, and the value of combining AI with human expertise for contextual understanding. The HRVA demonstrated that AI, when embedded within existing urban systems, can significantly enhance data-driven resilience planning and climate adaptation at the city scale.

Policies and partnerships under the **UNDP–Government of Maharashtra Climate Resilience Initiative** and guidance from the State **Disaster Management Authority (SDMA), Maharashtra** provided the enabling framework to integrate AI into the Hazard, Risk and Vulnerability Assessment (HRVA) work. Capacity-building support from **UNDP, partner organisation, and various govt line departments** helped strengthen technical skills in GIS, data analytics, and AI-based modeling. Collaboration with Indian Meteorological Department (**IMD), Irrigation, Public Works Department (PWD), District Disaster Management Authority (DDMA), and academic institutions** facilitated access to climate and remote-sensing datasets essential for AI-driven analysis. These partnerships and policies fostered an ecosystem for applying AI in multi-hazard risk assessment, climate adaptation planning, and developing data-driven, resilient urban systems.

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6. Shourya Mehta, Independent Consultant, India

Thank you for your important query on the use and lessons of Artificial Intelligence in climate action. Based on my internship experience at UN APCTT and an in-depth analysis of the "AI for CC Final Report," I am pleased to share practical experiences, case studies, and recommendations that I hope will contribute meaningfully to Nepal and the Asia Pacific's inclusive scaling-up efforts.

i. **How AI Has Supported My Work in Climate Action**

(Experiences & Lessons)

AI has proven instrumental in several domains of climate resilience and mitigation:

Early warning and modeling: AI-driven prediction models (using deep learning and data assimilation) now enable highly localized flood and drought forecasts, crucial for disaster-prone regions. Generative AI is accelerating high-resolution climate simulations and scenario planning for policymakers.

- **Clean energy optimization:** Machine learning algorithms significantly improve renewable energy output forecasts, grid efficiency, and demand-side management, demonstrated in solar, wind, and battery storage optimization projects. These applications have resulted in real-world drops in energy and operational costs, along with decreased emissions.

- **Climate-resilient agriculture:** Precision agriculture powered by AI sensors and predictive analytics is transforming yield optimization, resource management, and pest/disease forecasting, benefiting smallholder farmers in Asia and Africa alike.

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- **Infrastructure planning:** AI advances in asset monitoring (e.g., satellite-driven dashboards) are enabling predictive maintenance and risk assessment for key infrastructure, especially in mountainous and flood-sensitive environments.

Key Lessons based on the above:

- Data availability is critical. Consistent investments in open data collaboration, cleaning, and validation underpin successful AI climate solutions.
- Ethics and trust matter. Responsible deployment demands fairness audits, transparency, and oversight, especially where AI impacts vulnerable populations.
- Capacity-building accelerates adoption. Interdisciplinary training, partnerships, and local empowerment drive sustainable scaling of AI projects.

ii. **Policies, Capacity Building, and Partnerships (Regional Enablers)**
Successful AI-enabled climate action requires supportive policy, robust partnerships, and stakeholder empowerment:

- **Policy framework:** Clear guidelines on responsible AI use covering fairness, explainability, privacy, and human oversight are necessary. International harmonization and adaptive local regulations speed up deployment and build trust.

- **Capacity-building:** Regular workshops, vocational programme, and awareness campaigns, especially involving youth, women, and marginalized stakeholders, help foster inclusive access and ownership of AI technologies.

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- **Multi-stakeholder partnerships:** Initiatives such as the UN's AI for Earth, C40 Cities, and the Global Partnership on AI are advancing collaborative pilot projects, open data standards, and accelerated technology transfer. These platforms have yielded shared toolkits and policy best practices suitable for adaptation by Nepal and similar contexts.

iii. Real Value for Nepal and Asia Pacific. Nepal may realize major benefits by:

- Adopting AI-powered climate risk early warning systems tailored to local hazards (e.g., landslides, glacier melt).
- Leveraging partnership platforms for open data and AI skills development.
- Piloting smart agriculture, energy, and infrastructure projects with local customization for sustainability and resilience. Harmonizing national AI strategies with global ethical and governance standards.

I remain committed to region-wide collaboration and knowledge sharing, ensuring fair and responsible AI deployment to advance climate goals for all. Further case studies, capacity-building resources, and technical details are available upon request.

7. Soohyung Kim, Economic Affairs Officer (Technology & Innovation), APCTT

Hi everyone, Just wanted to share an interesting case from Korea called Haimdall, developed by a climate tech startup called Thanks Carbon. It's basically an AI + satellite–based MRV (Monitoring, Reporting, and Verification) system for tracking and reducing methane emissions from rice paddies - one of the biggest agricultural sources of greenhouse gases. *(Note: This project is not affiliated with APCTT - it's just being shared here as an example of an innovative climate technology.)*

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What it does: Haimdall combines satellite imagery, AI models, and on-site validation to monitor how farmers manage irrigation (like *Alternate Wetting and Drying* methods). It estimates methane emissions per field and verifies compliance with low-carbon farming practices.

Key outputs:
1) Field-level methane emission reports and compliance records
2) Verified data for carbon credit generation
3) Tools for low-carbon supply chain traceability - letting food companies label their rice or products as "low-carbon ingredients."

Why it matters: Methane from flooded rice cultivation is a major contributor to agricultural GHGs. Using satellites and AI allows large-scale monitoring at lower cost, while also giving farmers a new income stream through carbon credits. It's a practical model of digital climate-smart agriculture.

Where it's being used: They've already piloted or launched projects in Cambodia, Vietnam, and Bangladesh. Please refer to the links below:
Vietnam: https://thankscarbon.com/en/news/vietnamese-government-goes-full-scale-mrv-with-the-help-of-thanks-carbon/
Cambodia: https://thankscarbon.com/blog/thanksletter-2-cambodia-results-prove-it-less-water-more-rice-lower-emissions/

If you want to know more about the project and company, check it out here: https://thankscarbon.com/en/service/haimdall

8. Pankaj Kumar Shrivastav, Programme Management Officer, APCTT

Dear Members of the Community, Many thanks for raising points on how AI is transforming climate action breakthroughs using modelling, early warning systems, resource optimization, and environmental monitoring, among others.

I would like to contribute two points not covered here for members' consideration:

1. The Ethics of AI

193 countries adopted the UN Recommendation on the Ethics of Artificial Intelligence, covering the critical areas in which accountability mechanisms need to be strengthened. The Policy Area 5: Environment and Ecosystems in the Recommendation suggests:

"85. Member States should introduce incentives, when needed and appropriate, to ensure the development and adoption of rights-based and ethical AI-powered solutions for disaster risk resilience; the monitoring, protection and regeneration of the environment and ecosystems; and the preservation of the planet. 84. Member States and business enterprises should assess the direct and indirect environmental impact throughout the AI system life cycle, including, but not limited to, its carbon footprint, energy consumption and the environmental impact of raw material extraction for supporting the manufacturing of AI technologies, and reduce the environmental impact of AI systems and data infrastructures".

2) Limitations to scaling up AI for Climate Action Initiatives

Members have cited numerous advantages of applying AI. However, scaling up of AI solutions is currently marred by a number of limitations:

a) Data shortages - for example sparse, untrustworthy, and non-standard climate data, poor digitization of past data, and sparse environmental monitoring installations contributing to the accuracy of AI models.

b) Digital infrastructure deficiencies, for instance unreliable internet access, inadequate computational resources, unreliable power supply, limited modern equipment which have created a huge digital divide particularly for rural and remote communities to access AI-driven solutions.

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c) Financing - Projections indicate that there is a $2.7 trillion adaptation finance gap compared to only an available $28 billion in public funding. This significantly limits the upscaling of viable AI pilots particularly for smallholder farmers and excluded groups.

The above barriers may be removed by targeted investing in data-sharing platforms, renewable-powered computing infrastructure, dedicated climate-AI financing mechanisms, and public-private partnerships for equitable digital access.

This, in my opinion, will help humanity use AI more fully for climate resilience.

Some references on the above for your consideration:

1. Recommendation on the Ethics of Artificial Intelligence - https://unesdoc.unesco.org/ark:/48223/pf0000381137

2. UNFCCC. (2025, July). *AI and climate action: Opportunities, risks and challenges for developing countries*. UNFCCC.

3. Climate Policy Lab. (2025, March). *The digital divide in climate tech: Unequal access to AI-driven solutions*. Climate Policy Lab.

4. Climate Insider. (2025, February). *The integration of AI in climate tech: Where are we in 2025?* Climate Insider.

5. Stockholm Environment Institute. (2023, November). *Three major gaps in climate-adaptation finance for developing countries.* Stockholm Environment Institute.

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9. Satyabrata Sahu, Senior Programme Management Assistant, APCTT

Hello everyone. It is important to have insights into some critical applications of AI to address climate change mitigation and adaptation. The following studies have highlighted the potential of AI for climate resilience in the Asia-Pacific countries.

- AI can strengthen urban resilience, especially against extreme heat, but must be adapted to local contexts. Researchers from Tsinghua University highlighted its role in cities like Singapore,

- Seoul, and Kuala Lumpur through innovations in heat monitoring, predictive analytics, and climate-adaptive design. Integrating AI with digital twins helps simulate heat islands, optimize infrastructure, and improve smart buildings. Success depends on aligning these technologies with regional policies and socio-economic realities. (For more details refer to Asia-Pacific Tech Monitor, Jul-Aug 2024, pp. 20-27. (05_Urban_intelligence_for extreme heat mitigation and adaptation.pdf)

- Researchers at IIT Kharagpur, India explored how AI, ML, and DL can transform hydro-climatology through three Indian case studies: predicting heatwaves, assessing streamflow variability, and improving soil moisture monitoring and irrigation. These approaches enhanced prediction accuracy and resource efficiency, showing AI's potential to strengthen climate models and agriculture. The study recommends fostering innovation, regional collaboration, and capacity building to support sustainable development across the Asia-Pacific. (For more details refer to Asia-Pacific Tech Monitor, Jul-Aug 2024, pp. 28-36. (06_Transforming climate adaptation with artificial intelligence.pdf)

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- A study by Queensland University of Technology explored AI-driven urban forestry, using the Ant Colony Optimisation algorithm to strategically plant trees in a park to improve thermal comfort. Simulations during peak heat showed reduced temperatures and increased shading, demonstrating AI's potential to enhance urban microclimates. The findings offer valuable guidance for policymakers and urban planners aiming to build sustainable, climate-resilient cities. (For more details refer to Asia-Pacific Tech Monitor, Jul-Aug 2024, pp. 37-45. (07_Artificial intelligence in urban forestry.pdf)

- Researchers from Islamic University of Madinah, Jubail Industrial College, University of Jeddah, and King Abdulaziz University, Saudi Arabia, investigated the role of AI, big data, high-performance computing (HPC), and edge computing in improving renewable energy forecasting, climate adaptation, and AI governance. Case studies demonstrated advancements in solar and wind energy forecasting, showcasing adaptive model selection, attention-based learning, and hybrid deep learning techniques for enhanced predictive reliability. The findings highlighted the potential of AI-driven smart grids and governance frameworks in optimizing energy efficiency. (For more details refer to Asia-Pacific Tech Monitor, Jan-Mar 2025, pp. 16-35. (05_AI-driven high-performance data analytics.pdf)

Many thanks to all who contributed to this query!

The Community of Practice on Climate Technologies aims to foster technology cooperation and transfer through enhanced knowledge exchange and cross-border collaboration in Asia Pacific.

If you have further information to share on this topic, please send it at apctt@un.org.

This Consolidated Reply is a systematic compilation of all responses received and additional desk research. It has been compiled by the CoP Moderator Vinita Kumari, Consultant to APCTT.

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