Framework Convention on Climate Change

TEC/2024/29/7

Technology Executive Committee

03 September 2024

Twenty-nineth meeting

17–20 September 2024 (20 September TEC-CTCN Advisory Board Joint session)

Draft information note on AI for climate action

Cover note

I. Background

1. As per Activity A.4.1 of its rolling workplan (2023–2027), the TEC is exploring the role of artificial intelligence (AI) and applied machine learning as enablers of climate solutions.

2. At TEC 28, the TEC considered a proposal from a co-lead of the activity group on digital technologies to prepare a short information note on AI for climate action and requested the activity group to develop it based on an outline presented by a co-lead of the activity group with a view to finalizing the note intersessionally or at TEC 29.

3. The TEC activity group that supports the implementation of this activity continued working intersessionally and developed the information note with the assistance of a consultant supported by UNIDO.

4. At TEC 29, the co-leads of the activity group, supported by a consultant, will present the draft information note contained in the annex.

II. Scope of the note

5. The annex to this note contains the draft information note on AI for climate action.

III. Expected action by the Technology Executive Committee

6. The TEC will be invited to consider the draft information note contained in the annex and provide guidance to the activity group with a view to finalizing the draft after TEC 29.

Annex

Draft information note on AI for climate action

Artificial Intelligence for Climate Action in Developing Countries

Executive Summary

This information note is intended to serve as an accessible and visually engaging resource, helping to frame the conversation around AI and climate action and also serves as the introduction to a TEC publication that explores the role of Artificial Intelligence (AI) in supporting climate action in developing countries, with a specific emphasis on Least Developed Countries (LDCs) and Small Island Developing States (SIDS). As these regions face heightened and disproportionate impacts from climate change, and higher barriers to the adoption of potentially beneficial technologies, AI systems can support both adaptation and mitigation, ranging from early warning systems for natural disasters to optimizing agri-food production and improving the efficiency of renewable energy management. However, the deployment of AI can also have counter effects on climate action and sustainable development, such as increased energy and water consumption, data security issues, widening of the digital divide, reinforcement of bias, including gender bias, and facilitate the spread of misinformation. The note aims to raise awareness among policymakers and stakeholders regarding these opportunities and challenges, providing insights into how AI can be responsibly leveraged for climate action. It also introduces the AI for Climate Action Initiative under the UNFCCC Technology Mechanism, highlighting its objectives, recent developments from COP 28, and planned activities aimed at fostering the positive uses of AI while addressing its associated risks.

1. Artificial Intelligence for Climate Action

Climate change is an urgent global priority that demands immediate action. As the window of opportunity to maintain global warming below the critical 1.5°C threshold narrows, the risks of increased losses and damage, as well as more costly and less effective adaptation options, become inevitable if action is not taken. The global stocktake at COP28 recognized that global greenhouse gas emissions need to be reduced by 43% by 2030, compared to 2019 levels, to keep global warming within the 1.5°C limit. It also noted that current efforts by parties are insufficient to meet these targets under the Paris Agreement as the Intergovernmental Panel on Climate Change (IPCC) warned that the world is on track for a 2.8°C increase in temperature.

AI Systems that use Machine Learning (ML) techniques are rapidly emerging as transformative technologies with profound potential across various domains. Among these, environmental sustainability and climate change stand out as areas where these innovations can drive impactful change. Research has shown that AI can act as an enabler of development targets, including environmental sustainability outcomes and addressing climate change challenges, but also as an inhibitor on some of them. The Technology Mechanism of the UNFCCC, through an upcoming paper, is exploring how these systems can help address climate change in developing countries, in particular SIDS and LDCs by surveying its uses on Monitoring and Data Collection; Climate Modeling and Prediction; Resource, Energy and Transport Management; Disaster Risk Reduction; Education and Community Engagement; its risks for climate action, and its potential in advancing the Technology Mechanism work and in helping the implementation technology priorities identified by developing countries.

To effectively utilize AI in climate action, a foundational understanding of AI is essential. This involves clearly defining AI and Machine Learning (ML), and exploring their relevance to climate action strategies. It is also important to stay informed with the latest developments and statistics in AI, and to consider global efforts on its regulatory frameworks such as the UNGA resolution on AI. Moreover, summarizing pertinent national, supranational, and regional regulations provides essential insights into the governance and application of AI, which is vital for shaping its role in enhancing climate resilience and reducing greenhouse gas emissions, especially in developing regions.

AI is the field of engineering and science dedicated to building systems that generate outputs for a given set of human-defined objectives. ML is the process of optimizing model parameters through computational techniques, enabling the model's behavior to reflect the data or experience. AI encompasses various subfields or domains, and the classification may vary depending on whether the focus is on the algorithms and techniques or their applications. The current standard on AI by the International Electrotechnical Commission identifies four major fields: computer vision and image recognition, natural language processing, data mining, and planning.

There are several techniques and algorithms used to build AI systems. Given the relevance of ML within the AI field, two important concepts are introduced.

The ML model is a mathematical construct that generates inferences or predictions based on input data, serving as the core of an AI system based on machine learning. The machine learning algorithm determines the parameters of the ML model from data samples, and is often referred to as the algorithm used to train the system. The simplest machine learning algorithm is linear regression, which, given a dataset, calculates a model with two parameters: the intercept (value at 0) and the slope (the line that best fits the data). This model can reliably predict new values for a given input, as long as the underlying domain behaves linearly. However, most real-world applications are far more complex, and modern machine learning algorithms can generate models with billions of parameters, suitable for more intricate tasks. Well-known families of ML algorithms include neural networks, Bayesian networks, decision trees, and support vector machines.

Current standards on AI systems emphasize specific processes that occur throughout the system's life cycle, from inception to continuous validation, re-evaluation, or retirement. Key insights for teams building AI systems include the importance of defining the full system life cycle requirements from the very beginning, clearly articulating the problem the system is intended to solve, and establishing metrics for success.

Large AI systems typically do not rely on a single technology but rather a combination of technologies developed over time. From a functional layer perspective, key components include the relevance of data for training, validation, testing, and operational use; the engineering processes involved; and the necessary resources for computing, storage, and network access.

It is also important to note that AI is increasingly integrated as a component in embedded systems, such as the Internet of Things (IoT) and cyber-physical systems. In these contexts, AI may be used to analyze streams of information from sensors, make predictions, and decide on physical processes, sending appropriate commands to actuators to control or influence those processes, such as a drone automatically avoiding a collision.

Climate action involves coordinated efforts and initiatives aimed at both mitigating the effects of climate change and adapting to its impacts. These efforts include reducing and removing GHG emissions, enhancing environmental resilience, and promoting sustainable development practices across sectors. Mitigation action can involve transitioning to low-carbon and renewable energy sources, advancing energy management systems, implementing carbon capture and storage, promoting reforestation and biodiversity conservation, amongst others. On the adaptation side, the focus is on improving the capacity of communities, ecosystems, and economies to withstand and recover from climate-related disruptions. This includes, but is not limited to, aiding countries, regions, cities, and businesses in strengthening disaster risk management, enhancing water resource management, developing climate-resilient infrastructure, and promoting sustainable agriculture practices.

AI is playing an increasingly crucial role in climate action, with emerging trends and statistics signaling its potential for environmental sustainability and resilience. A 2023 report by Boston Consulting Group notes that 87% of surveyed executives and leaders view AI as a crucial enabler in addressing climate-related challenges. The 2024 AI Index Report by Stanford University offers a comprehensive overview of the current trends shaping the AI landscape. This year's report highlights significant advancements in AI capabilities, a rapidly accelerating pace of research and development, and the broad integration of AI across various sectors. Key areas of focus include the growing importance of ethical AI, the rise of generative models, and AI governance and regulatory frameworks. Noteworthy facts and figures that underscore these developments include:

- Industry leading in frontier AI research: In 2023, the industry led the production of notable ML models, with 51 significant contributions compared to academia's 15. Additionally, there were 21 notable models produced through industry-academia collaborations, marking a new record.
- Soaring costs of frontier AI models: Training costs for cutting-edge AI models have reached unprecedented heights. For instance, OpenAI’s GPT-4 incurred an estimated $78 million in compute costs, while Google’s Gemini Ultra required $191 million.
- Generative AI investment surges: Despite a decline in overall AI private investment last year, funding for generative AI saw a dramatic increase, nearly octupling from 2022 to reach $25.2 billion. Major players such as OpenAI, Anthropic, Hugging Face, and Inflection secured substantial funding rounds.
- Sharp rise in AI regulations in the U.S.: The United States has seen a significant increase in AI-related regulations over the past year, with the number growing from just one in 2016 to 25 in 2023. The past year alone witnessed a 56.3% increase in AI-related regulations.

AI is being applied in developing countries to enhance climate resilience and support the Sustainable Development Goals (SDGs) through innovative technologies. Examples include AI models that provide early warning systems for natural disasters, optimize agri-food systems, and improve the efficiency of renewable energy systems. These initiatives are part of broader efforts by the UNFCCC to make technology accessible and beneficial across diverse regions, focusing particularly on SIDS and LDCs. The UN’s AI for Climate Action initiative, highlighted during COP28, aligns with a broader agenda by various UN bodies to leverage AI for improving early warning systems, enhancing disaster response, and promoting sustainable energy usage, as noted by UN News.

The United Nations General Assembly (UNGA) is one of the six principal organs of the United Nations, serving as the main deliberative, policymaking, and representative body of the UN. Comprising all 193 member states, the UNGA provides a platform where global issues are discussed, and resolutions on matters of international importance are passed. It plays a crucial role in shaping international norms and regulations, particularly on emerging issues like AI.

In March 2024, the UNGA adopted a landmark resolution on AI, “Seizing the opportunities of safe, secure and trustworthy artificial intelligence systems for sustainable development,” marking a significant step towards the global governance of AI technologies. The resolution emphasizes the promotion of “safe, secure, and trustworthy” AI systems that contribute to sustainable development. It also highlights the importance of international cooperation to regulate AI’s development and deployment, ensuring it aligns with ethical standards and supports global objectives like the SDGs. Moreover, it underscores the need to address AI’s potential risks, such as bias, security threats, and unequal access to technology, while promoting its benefits across various sectors and regions worldwide. The resolution is seen as an essential milestone towards harmonizing global efforts to ensure that AI technologies align with the UN’s SDGs, supporting both developed and developing nations in their technological advancements and sustainable practices.

Globally, countries and regions are increasingly adopting regulations and frameworks to manage AI’s deployment responsibly. In addition to the UNGA resolution, the European Union’s proposed AI Act is one of the most comprehensive regulatory frameworks to ensure the ethical use of AI, classifying AI systems based on their risk and establishing requirements for transparency, accountability, and safety. The proposal for this regulation was made in April 2021, and the European Parliament adopted a legislative resolution on it in March 2024. These regulations highlight the global effort to balance innovation with ethical considerations in AI deployment. Similarly, in Asia, countries like Singapore and Japan have introduced AI governance frameworks that emphasize ethical AI use, data privacy, and fairness. These efforts underscore the global initiative to balance innovation with ethical considerations in AI deployment.

In the developing world, including SIDS and LDCs, AI regulatory frameworks are often in nascent stages, though many countries are beginning to explore guidelines tailored to their specific needs and contexts. These emerging regulations aim to balance the promotion of innovation with safeguarding against potential risks, recognizing the unique challenges posed by the digital divide and limited resources in these regions. Understanding these regulations and frameworks sets the context for exploring the opportunities, risks, and challenges of using AI for climate action, particularly in the most vulnerable regions.

2. Artificial Intelligence for Climate Action in Developing Countries: Opportunities, Risks, and Challenges

AI for climate action brings significant opportunities and notable challenges and risks. To what extent developing countries can benefit from it and its risk can be addressed is a fundamental question behind this note and the related work of the Technology Mechanism of the UNFCCC.

LDCs and SIDS are among the regions most severely affected by climate change, facing disproportionate challenges due to their heightened exposure to rising sea levels, extreme weather events, shifting agriculture patterns, and resource limitations. Climate change adaptation in these contexts involves developing strategies to enhance resilience against these impacts, focusing on safeguarding communities, infrastructure, and ecosystems. This includes strategies such as building coastal defenses, improving water management systems, and developing climate-resilient agriculture. Mitigation efforts in developing countries, particularly SIDS and LDCs, extend beyond reducing GHG emissions through sustainable practices and transitioning to low-carbon technologies. These countries also face the challenge of pursuing development pathways that may require forgoing the use of certain resources or avoiding cheaper but more environmentally damaging options. Additionally, they encounter unique barriers such as limited financial resources, insufficient technological access, and capacity constraints, making global cooperation and targeted support essential. Climate adaptation and mitigation efforts must be carefully designed to address these limitations while ensuring that the SDGs are also met. AI technologies hold promise in supporting both adaptation and mitigation strategies in these regions. However, its potential use in developing countries, in particular LDCs and SIDS, requires that these technologies are tailored to local needs and contexts while navigating the country's specific challenges, including the digital divide and the potential risks of AI systems, such as increased energy and water consumption, data security issues, reinforcement of bias, including gender bias, and the spread of misinformation

In developing countries, particularly LDCs and SIDS, AI is already being applied to a range of climate-related challenges, demonstrating its potential to support climate action. Key areas of application in these regions include:

Early warning systems for natural disasters: AI models can analyze weather patterns and provide accurate forecasts, enabling early warnings for hurricanes, floods, and droughts. For instance, in some LDCs, AI-powered systems have been deployed to predict and prepare for severe weather events, helping to mitigate their impact on vulnerable communities. Also, AI-driven flood monitoring systems in Southeast Asia and the Pacific Islands have proven effective in issuing timely alerts. Some SIDS also use AI for disaster management, although the level of adoption varies.

Example 1: **UN Early Warnings for All Initiative (EW4All)**

Brief Description

The Early Warnings for All initiative, co-led by the World Meteorological Organization (WMO) and the United Nations Office for Disaster Risk Reduction (UNDRR), with collaboration from the International Telecommunication Union (ITU), and the International Federation of Red Cross and Red Crescent Societies (IFRC), is a high-level initiative to help to ensure that everyone on Earth is protected from hazardous weather, water, or climate events through life-saving early warning systems by the end of 2027. With human-induced climate change leading to more extreme weather conditions, the need for early warning systems is more crucial than ever. Systems that warn people of impending storms, floods or droughts are not a luxury but a cost-effective tool that saves lives and reduces economic losses.

Early warning systems have helped decrease the number of deaths and have reduced losses and damages resulting from hazardous weather, water or climate events. But major gaps still exist, especially in SIDS and LDCs. The United Nations Secretary-General, António Guterres, in 2022 called for a global effort to ensure that early warning systems protect everyone on Earth by 2027.

Climate Change Mitigation and/or Adaption Impacts and Results

Microsoft, Planet Labs and the University of Washington Institute for Health Metrics and Evaluation (IHME), are employing AI, satellite imagery, and predictive modeling to accurately estimate the population sizes of communities that are at greatest risk from climate change, as well as tracking population growth over time. Gaining a clear understanding of where people live is foundational to taking preparatory measures and providing essential resources.

Together with teams at the UNDRR and other partners contributing to the Early Warnings for All initiative, Microsoft are working with Ethiopia's Ministry of Irrigation and Lowland and the Ethiopian AI Institute to assist in identifying communities at risk of disaster impacts, often linked to climate change. Building on this initiative, Microsoft aims to expand our efforts to the needs of additional Early Warnings for All priority countries.

Microsoft has already witnessed the transformative potential of AI and satellite imagery in identifying at-risk communities. In collaboration with our non-profit partner SEEDS in India, Microsoft applies AI and high-resolution satellite imagery to pinpoint homes that are vulnerable to destruction in cyclone-prone areas. This enables SEEDS, their partners, and local governments to focus their disaster preparedness and response outreach efforts on the most high-risk regions, thereby saving lives and reducing damage.

Recent catastrophic events in Libya and Morocco have also underscored the critical importance of swiftly comprehending the magnitude and specifics of affected populations and regions. Time is of the essence in such situations. Through firsthand experience, Microsoft has recognized the power of utilizing high-resolution satellite data provided by Planet Labs PBC combined with artificial intelligence to help those who are impacted. Microsoft committed to assisting response and recovery efforts by sharing this valuable information.

Optimizing agri-food systems: In agriculture, AI can assist in optimizing planting schedules, monitoring crop health, and predicting pest outbreaks. This is particularly relevant for LDCs and SIDS, where food security is often threatened by changing climate conditions. AI-driven precision agriculture has shown potential in improving yields and reducing resource use, enhancing food security in these regions. In Sub-Saharan Africa, AI tools optimize irrigation and farming practices, improving crop yields in regions affected by unpredictable climate conditions. ML models analyze weather patterns and soil data to provide precise guidance to farmers, enhancing food security.

Example 2: Early Warnings System for Crop Phenotyping and Food and Nutrition Security

Brief Description

The cooperation between LDRI and GIZ's FAIR Forward project aims at allowing smallholder farmers to use AI technology for crop yield prediction and monitoring in Kenya. The AI Early Warning System developed by LDRI and FAIR Forward significantly enhances harvest management for smallholder farmers by delivering timely and accurate crop yield predictions. By integrating data from weather stations, satellite imagery, and soil sensors, the system provides precise, localized information, enabling farmers to anticipate adverse conditions and implement proactive measures. This results in reduced crop losses due to climate variability and optimized resource use. The incorporation of local languages, including KiEmbu, Luhya, Kikuyu, and Kiswahili, ensures that the advice is accessible to a diverse range of farmers, improving the system's effectiveness across different linguistic groups.

Climate Change Mitigation and/or Adaption Impacts and Results

The Early Warning System enables farmers to make informed decisions, thereby minimizing crop losses and optimizing resource use in the face of climate variability. By offering precise, localized information, the system helps farmers anticipate and mitigate potential climate threats. For instance, monitoring 400 farms across 6 agro-ecological zones in Kiambu and Embu counties has demonstrated the system's capability to accurately predict crop yields and identify potential crop failures. The integration of local languages—such as KiEmbu, Luhya, Kikuyu, and Kiswahili—ensures that the system's advice is accessible and actionable for a diverse range of farmers, increasing its effectiveness across different linguistic communities. Additionally, the project has created two open, quality datasets, including a land-use/farm boundary estimation dataset and a temporal image-based dataset, which enhance the system's ability to provide actionable insights. The development of algorithms for analysing earth observation data further supports crop-specific early warning mechanisms and predictive climate-change recommendations.

Plans are underway to expand the system to Uganda and Tanzania, with adaptations for new crops and regions, further supporting the agricultural community across East Africa. This initiative addresses both immediate agricultural needs and contributes to long-term food security and economic stability in the region.

Water management systems: AI technologies can be used to monitor water resources, predict water demand, and optimize distribution systems. In SIDS and LDCs, where access to clean water is often limited, AI-driven water management solutions have been employed to enhance water use efficiency and support better decision-making in response to climate-related water challenges.

Example 3: <u>Artificial Intelligence for Water Management in the Red River Delta</u>

Brief Description

This project focuses on the use of AI techniques for the water management of the Red River Delta area in Vietnam (Figure 1). In this area, the complex river network is characterized by the presence of a system of dams designed to address sometimes conflicting objectives: (i) generating hydropower to foster the local economy and social activities, (ii) regulating the flood events occurring downstream during the rainy season, (iii) supplying water for agriculture in the low flow season and (iv) contrasting SeaWater Intrusion (SWI) in the estuaries of the rivers. Constraints are in place to ensure the dam's safety by not exceeding a maximum or minimum water level.

Figure 1. The Red River Delta area in Vietnam

With the aim of developing adaptive water management systems, this work studies the feasibility of using AI techniques to identify policies for the current and projected climatic conditions. In particular, our project focuses on optimizing water supply for agriculture and energy production in the low-flow season while contrasting SWI in the Red River Delta. The aim to use optimization methods like Genetic Algorithms (GAs) and AI planning algorithms to automatically generate control policies for water resource management of the Hoa Binh reservoir, the first hydroelectric reservoir on the Da River while considering different criteria and constraints.

Climate Change Mitigation and/or Adaptation Impacts

The project aims to enhance water management systems to address climate change, urbanization, and population growth, focusing on both mitigation and adaptation. Efficient water management will reduce water stress and ensure a reliable supply for agriculture, industry, and domestic use, which is crucial as climate change exacerbates scarcity. It will also mitigate sea-level rise effects and saline intrusion into freshwater sources by controlling water releases and storage, maintaining balance in river deltas and estuaries. Additionally, the project enhances renewable energy production by optimizing water usage for hydropower, reducing reliance on fossil fuels and lowering carbon emissions. It supports local economies by ensuring a steady water supply for various uses, fostering social development, and reducing vulnerability to climate-induced economic disruptions.

Renewable energy management: AI is being used to optimize the integration and operation of renewable energy systems, such as solar and wind power, by predicting energy demand and adjusting supply accordingly to ensure energy access despite fluctuations in renewable energy sources like solar and wind. In some SIDS, AI are embedded in these systems to manage microgrids and ensure efficient energy distribution, reducing reliance on fossil fuels and promoting sustainability.

Marine and coastal ecosystem protection and management: AI is also used to monitor and protect coastal and marine ecosystems by tracking changes in coral reefs, fish populations, and other vital resources. In SIDS, where livelihoods are closely tied to the health of marine environments, for example ML models combined with satellite imagery have been used to track illegal fishing in several regions globally. However, large-scale implementation across all SIDS is not uniformly established.

Disaster risk management and urban resilience planning: AI is increasingly being utilized to map housing stock characteristics in regions vulnerable to natural disasters, such as SIDS. It automates the creation of detailed maps that identify building footprints, material types, and structural conditions leveraging high-resolution aerial imagery and ML techniques, including advanced computer vision models. These AI-driven tools are essential for conducting effective vulnerability assessments and enhancing disaster risk management and urban resilience planning. In areas prone to natural hazards, AI enables the rapid assessment of damage following a disaster and helps identify at-risk structures before such events occur. This supports more resilient urban planning and disaster preparedness efforts.

Example 4: Mapping Housing Stock Characteristics from Aerial and Street View Images using DL for Climate Resilience in the Caribbean

Brief Description

The Caribbean region is among the most vulnerable globally to climate risks due to the increasing frequency and severity of natural hazards like tropical cyclones, landslides, and floods. SIDS often sustain the highest levels of damage, particularly in the housing sector. Accurate and up-to-date information on the spatial distribution and characteristics of buildings is crucial for effective vulnerability assessment and disaster risk management. However, traditional house-to-house surveys are expensive and time-consuming, creating significant obstacles.

To address this, a project was initiated to develop a workflow that rapidly generates critical baseline housing stock data using high-resolution drone images and DL techniques. Leveraging CV, particularly the Segment Anything Model and CNNs, this project automates the generation of exposure data maps. The goal is to enable government agencies to swiftly and cost-effectively identify damaged buildings following a disaster and proactively detect at-risk structures before a disaster occurs. This initiative, under the Digital Earth for Resilient Housing and Infrastructure in the Caribbean, seeks to improve the climate resilience of the housing sector in small island developing states in the Caribbean. Future expansions of this methodology are planned for countries in Asia and the Pacific.

Climate Change Mitigation and/or Adaptation Impacts and Results

The project has produced building footprint and roof type classification maps for Dominica (see example in Figure 4), Saint Lucia, and Grenada, which are essential for climate risk and vulnerability assessments. Additionally, building characteristics such as material type, completeness, and condition have been extracted from street-view photos to further support these assessments.

Figure 2. An AI-generated map of building footprints in Salisbury, Dominica. Drone image is taken from OpenAerialMap

Figure 2 illustrates the sequence of roof material classification and changes in a Caribbean housing sector pre- and post-disaster in Colihaut, Dominica. The four images provide a comparative visual analysis that highlights the impact of disasters on roof materials and the effectiveness of the classification approach in both pre- and post-disaster contexts.

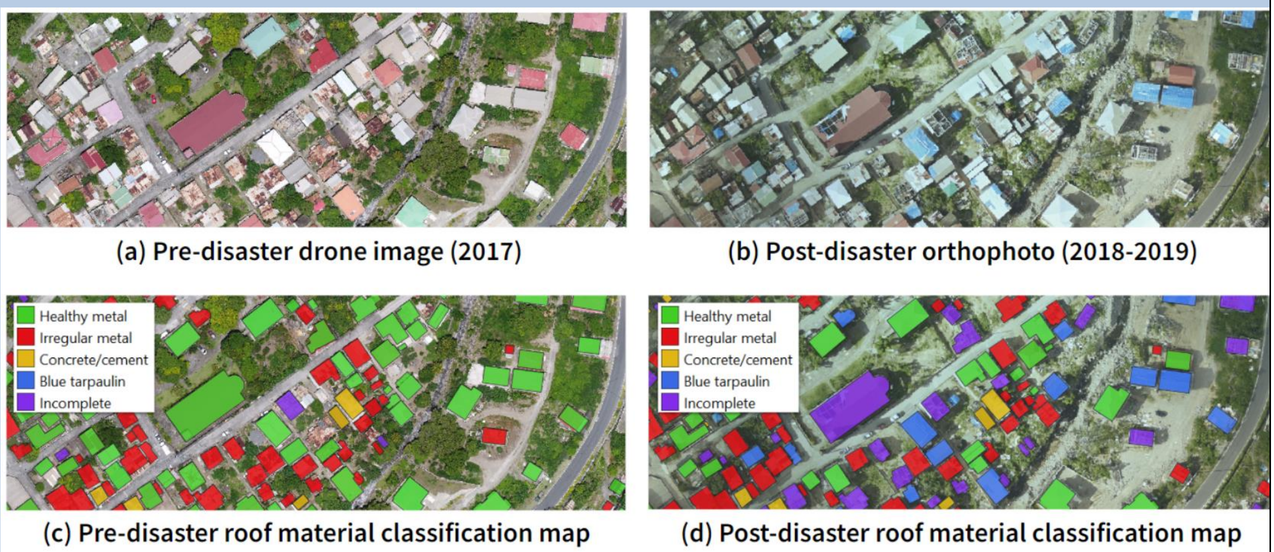

Figure 3. Pre- and post-disaster roof material classification maps in Colihaut, Dominica

While these examples showcase the potential of AI in supporting climate action, some of them also offer insights regarding the importance of ensuring that AI technologies are accessible, contextually relevant, and implemented in a way that considers local conditions and capacities. AI presents promising opportunities for climate action, but there are associated risks and challenges:

Energy consumption: AI systems, especially those powered by DL and LLMs, are highly energy-intensive. The extensive computational power required by these models can significantly strain electricity grids, particularly in developing countries where energy infrastructure may be limited. Data centers that support these AI operations often consume large amounts of electricity and water, contributing to environmental degradation and countering climate action efforts.

Data availability, access, and security: AI solutions are heavily dependent on high-quality, comprehensive data. However, many LDCs and SIDS face significant gaps in data infrastructure, leading to a scarcity of reliable climate data. In addition, they may lack financial resources for the access to satellites high resolution hyperspectral imaging that could be used for these systems. These limitations can hinder the development of effective AI models for climate action. Moreover, data access and security are growing concerns, as the integration of AI into climate strategies introduces risks related to data privacy, potential misuse, and the protection of sensitive information.

The digital divide: The persistent digital divide remains a substantial barrier in many developing countries. Limited access to advanced digital infrastructure, inadequate internet connectivity, and a shortage of technical expertise, and lack of robust national systems to protect endogenous innovation can limit the development, deployment, and effectiveness of AI solutions in these regions. This divide exacerbates inequalities and can leave vulnerable communities further behind, hindering the equitable application of AI for climate action.

Gender bias and social inequities: AI systems, if not designed with inclusivity in mind, can unintentionally perpetuate existing biases and social inequities. For instance, AI models trained on biased datasets may overlook or misrepresent the needs of women and marginalized communities, leading to solutions that fail to address their specific challenges. In the context of climate action, this could mean that AI-driven initiatives might prioritize the needs of more privileged groups while neglecting those who are more vulnerable to climate impacts. This challenge underscores the critical need for inclusive and equitable AI development processes, where diverse perspectives are actively integrated. By doing so, we can help ensure that AI technologies contribute to reducing disparities rather than reinforcing them, making climate action efforts more effective and just for all communities.

Addressing these challenges requires a balanced approach that includes energy-efficient AI designs, enhanced data collection infrastructure, inclusive AI strategies, and international cooperation and standards.

3. Artificial Intelligence and the UNFCCC

The Technology Executive Committee (TEC) and the Climate Technology Centre and Network (CTCN), as the policy and implementation arms of the UNFCCC Technology Mechanism, have launched the #AI4ClimateAction Initiative. This initiative seeks to leverage AI technologies to drive transformative climate solutions, with a particular focus on mitigation and adaptation efforts in developing countries, especially in LDCs and SIDS. It focuses on fostering positive uses of AI and enhancing global awareness of its potential and challenges. Activities planned include promoting AI innovations for climate action and addressing risks. This initiative draws on key decisions from COP 28 and aligns with the UNGA resolution on AI to ensure global cooperation and effective implementation.

At COP 28, Parties noted the initiative and requested the TEC and the CTCN to implement the initiative in a manner that gives special attention to the capacity needs for its use, and to enhance awareness of artificial intelligence and its potential role in, as well as its impacts on, the implementation of the outcomes of technology needs assessments and the joint work program of the Technology Mechanism for 2023–2027.

The #AI4ClimateAction Initiative has a workplan that includes several activities across three work streams that span from 2024 to 2017:

1. Support the implementation of the Technology Mechanism Joint Work Program and the implementation of Technology Needs Assessments Outcomes

2. Enhance the capacity of stakeholders from LDCs and SIDS regarding the use of AI for climate action in a way that is responsive to gender and vulnerable communities

3. Raise awareness of AI for climate action, including on challenges and risks posed by AI such as energy and water consumption, data security, and the digital divide in this context.