

# **TECH-DRIVEN CLIMATE ACTION IN GHANA: MAKING A CASE FOR THE USE OF ARTIFICIAL INTELLIGENCE**

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## Introduction

Climate change is no longer a distant threat but a present reality that affects every. Across the world, people are bearing the brunt. As confirmed by the recent **State of the Global Climate report**, the hottest year on record was 2023. Beyond this temperature indicator, the entire report as well as **observed adverse impacts and severe future projections** of climate change in Sub-Saharan Africa signal that climate inaction risks exacerbating **the disproportionate devastation** being suffered in countries such as Ghana where the **majority of citizens have acknowledged climate change as making life worse**. It has therefore become critically urgent to intensify climate action with inspiration drawn from the age-old pragmatic expression that necessity is the mother of invention.

The search for innovative and data-driven solutions to the climate crisis has revealed that there is a **growing movement around using artificial intelligence (AI) to tackle climate change issues**. Both **Africa's AI Blueprint** and the **National AI Strategy of Ghana** reflect the recognition that AI has the potential to predict climate variability, monitor and fight climate change, and address other environmental concerns. Taking cognizance of the wide range of capabilities of digital technologies such as AI, **Penplusbytes**, a civic tech nonprofit in Ghana with climate change and wellbeing as a key thematic area, has ignited a **conversion** and spirited **advocacy** on the occasion of the **Green Ghana Day** for tech-driven climate action. This article therefore explores the ways Ghana can leverage AI in mitigating and adapting to the effects of climate change.

## Monitoring Greenhouse Gas (GHG) Emitting Activities

Greenhouse gas emissions are responsible for the climate crisis. Accurate data and reliable information on carbon and methane emissions are therefore essential for climate action. AI is being used and has significant capabilities to improve methane and carbon emissions monitoring to understand the sources of greenhouse gas emissions. The **Environmental Protection Authority** of Ghana can therefore leverage AI in monitoring greenhouse gas emitting sectors and activities. The use of satellites, drones, and ground sensors can boost the collection of data for real-time monitoring and accurate measurement of the sources and levels of greenhouse gas emissions. These technologies can be specifically used in the country to improve monitoring deforestation and degradation of forests through galamsey, illegal logging, and other activities driving vegetation cover loss; monitoring fuel combustion activities of industries and vehicle emissions; and monitoring methane emissions from refuse dumps and landfill sites as well as pollution from other sectors. These are the major greenhouse gas emission sources adversely shaping the climate vulnerability of the country.

Although **Ghana's 0.03% contribution to global emissions** appears to be negligible, the risk of the country's greenhouse gas emissions cannot be underestimated because its impact on local communities and citizens has not been insignificant. With the enhanced capabilities to integrate, process, and analyze vast amounts of data from the various greenhouse gas emission sources, AI-enabled emissions monitoring can therefore serve as the basis for holistic assessment of the country's climate change profile and support evidence-based projections of future temperature, air quality, rainfall patterns as well as the associated risks of these and other environmental parameters or climate variables. The use of AI can therefore enhance understanding of the intricate relationships and complex dynamics within Ghana's climate system. This has the potential to accelerate climate change mitigation interventions among the country's climate change experts, policymakers, and other stakeholders including citizens.

## Mitigating the Impacts of Climate Change

To mitigate the impacts of climate change, the reduction of greenhouse gas emissions is crucial. **The loss of 18000 hectares of Ghana's primary forest in 2022** is a serious dent in the country's target of reducing carbon emissions with forests that serve as carbon sinks. In this regard, the annual Green Ghana Day to restore the country's lost vegetation cover and increase the size of its forests is laudable. This initiative, however, can be enhanced with AI-powered geospatial technologies such as drones, remote sensors, and ground robots for real-time integrated tracking of the health and size of the trees that have been planted. The potential of AI to process and analyze coordinate data of trees and the country's forest areas, in general, can improve the detection of vegetation variations and tree losses by the **Forestry Commission of Ghana** to inform afforestation and reforestation efforts in areas that need such remedial interventions. Through this, AI can accelerate the creation of carbon sinks to absorb carbon dioxide from Ghana's ecosystem and help reduce the impacts of climate change.

Another equally important area in AI that has the potential to contribute to decarbonization is the power sector. Ghana depends heavily on fossil fuels for its energy needs. It is therefore not surprising that the power sector (electricity generation) remains a major source of greenhouse gas emissions in the country. With the capability to predict weather relevant to solar and wind power generation, AI can be leveraged to enhance Ghana's energy transition drive. AI-powered grid coverage analysis and machine learning can enhance the generation of heat and wind maps to improve the identification of sites that are most suitable for the installation of solar panels and wind turbines.

With the current electricity crisis the country faces, popularly referred to as dumsor, renewable energy production is a great necessity at this point to increase the country's energy mix even as this can also contribute to the phasing down of the use of fossils. All these decarbonization efforts when powered by AI can accelerate the country's drive to achieve **the goal of reducing greenhouse gas emissions by 64 metric tons by 2030**. Ghana has also established a **Carbon Market Office** and received its **first payment of \$4.8 million for reducing carbon emissions**. Leveraging AI in the country's greenhouse gas emission reduction agenda therefore has the potential to significantly boost Ghana's participation in the international carbon market to trade carbon credits and mobilize finance to support its **Nationally Determined Contributions** towards combatting climate change.

## Adapting to the effects of climate change

The capacity to anticipate or predict extreme weather and slow onset events such as flood, drought, extreme heat, and poor air quality is critical to taking appropriate measures in advance to prevent or minimize the loss and damage impacts these climate shocks and hazards can cause. AI-powered sensors and drones have enhanced capabilities to monitor and analyze climate data to enable the prediction of extreme weather events and their impacts in real time. This can improve the accuracy of the **Ghana Meteorological Agency's** weather forecast to engender and cement public trust in their work. Also, AI can improve the early disaster warning systems, damage estimates, and response efforts of the **National Disaster Management Organisation** by helping to identify areas at risk of disasters such as flooding and earthquakes, aid adequate disaster preparedness, and optimize crisis management to save lives and protect properties.

AI-enabled predictive models by machine learning algorithms on climate change impacts can also support the **Land Use and Spatial Planning Authority** to effectively plan climate-resilient settlements and develop targeted strategies to protect vulnerable communities and infrastructure from the effects of climate change. Another potential application of AI in the land use-climate change nexus is the agricultural sector in Ghana. AI can aid in monitoring and predicting soil and crop health, other conditions such as soil moisture levels as well and crop disease risks which are becoming more prevalent due to climate change. With the capabilities to provide real-time localized weather information to farmers, sensors and AI models can help farmers make planting and harvesting decisions as well as devise strategies to reduce both on-farm and post-harvest losses. These AI-powered strategies can therefore support proactive crop management, automate and optimize fertilizer application and irrigation systems, improve crop yields, and advance food security to make Ghana's agricultural sector and food system resilient to climate change.

## Conclusion

With climate change impacts expected to worsen in the coming years not just globally but locally as well, Ghana needs innovative solutions to mitigate and adapt to these impacts. Artificial intelligence has emerged as a promising technology with a wide range of capabilities that can help tackle climate change. Although the government has demonstrated policy awareness of AI's potential in this respect as reflected in the National AI Strategy of Ghana, concrete actions are needed in the adoption of AI to track and reduce greenhouse gas emissions and accelerate the country's climate change mitigation and adaptation efforts. Leveraging AI to digitalize and enhance Ghana's entire climate change **monitoring, reporting, and verification system** can boost the mobilization of finance to support projects aimed at helping people and communities mitigate and adapt to the effects of climate change in the country.

AI, nevertheless, is not a panacea when it comes to climate change because of the severity and scale of its impacts. However, with accurate and sufficient climate-related data and strategic deployment, AI can make a substantial contribution to tech-driven climate action in Ghana.

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