# Artificial Intelligence for Climate

## A Comprehensive Use Case Mapping

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CLIMATE LEADERS COALITION

*An initiative of* THE B TEAM *Australasia*

# AI for Climate:
# Use Case and Solution Mapping Framework

## 1. Mitigation and Urgent Action

Reducing the causes of climate change through data-driven insights and sustainable practices

**Climate Measurement and Research**

Accurately collect, measure and analyse climate data to provide critical insights for climate action

**Emissions Management and Reduction**

Identify and implement effective strategies for reducing greenhouse gas emissions

**Resource Efficiency and Eco-Design**

Optimising resource use and creating products and systems with reduced environmental impact

## 2. Adaptation and Resilience

Building the capacity and durability of natural and human systems to respond to climate change impacts

**Environmental Conservation and Forecasting**

Combine protective measures with predictive forecasting to preserve ecosystem health and biodiversity resilience

**Infrastructure Resilience**

Strengthening the resilience of infrastructure to better withstand and recover from climate-related events

**Policy and Economic Incentives**

Inform the creation of policies and economic incentives that promote adaptation and resilience to climate change

## 3. Restoration and Engagement

Supporting the recovery of ecosystems and promoting active societal involvement in sustainability initiatives

**Ecosystem Restoration**

Restore damaged ecosystems, returning them to their natural state or improving their ecological function

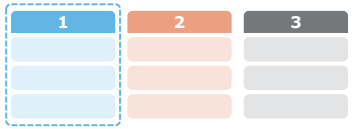
**Societal Transformation**

Driving societal change towards more sustainable behaviours and practices

**Governance and Public Engagement**

Enhance governance processes and increase public involvement in sustainability decisions

Framework Navigator

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# AI for Climate:
# 1. Mitigation and Urgent Action

## Climate Measurement and Research

**Precision Emissions Measurement**
AI enhances the accuracy of environmental emissions measurements, which are crucial for climate change models.

**Satellite Data Analysis**
AI processes large datasets, such as remote-sensing data from satellites, to monitor environmental changes.

**Wind Power Prediction**
Google Deepmind predicts wind power output 36 hours ahead of actual generation, improving energy and cost predictions.

**Aerosol Analysis**
AI is applied to advance the science of aerosols to apply them in Solar Geoengineering / Solar Radiation Management.

**Climate Event Projection**
Complex climate event modelling of regional areas can be achieved at a fraction of the cost, enabling greater rural coverage.

**Climate Modelling Enhancement**
AI enhances climate modelling by filling data gaps, improving accuracy and reliability.

**Socioeconomic Climate**
AI strengthens links between socioeconomic and climate models for better simulations.

**Climate Model Emulation**
AI could be used to emulate climate models to identify critical decision thresholds more efficiently and cheaply.

**Product Emission Profiles**
Creating emission profiles for products to drive sustainable procurement decisions.

## Emissions Management and Reduction

**Product Emissions Tracking**
Detailed tracking of emissions for individual products or actions, contributing to a better understanding of their carbon footprint.

**Supply Chain Emissions**
AI can pinpoint key areas for reducing emissions across the entire supply chain (scope 1, 2, and 3 emissions).

**Carbon Capture**
Assess storage locations, monitor leakage, and optimise the industrial processes and materials used for carbon capture.

**Aviation Route Optimisation**
Optimising transport and aviation routes to reduce aero-emissions and road transport-related emissions.

**On-Farm Emissions Monitoring**
More granular on-farm (methane) emissions monitoring to streamline reporting and incentivise low-carbon practices.

**Decarbonisation Insight**
Providing independent, trusted decarbonisation insights or verifying industry-led applications.

**Low-Emissions Breeding**
Accelerating the development of low-emissions (methane) breeding traits.

**Data Centre Efficiency**
Reducing energy demands associated with data centres through more efficient processors with advanced cooling systems.

**Maximising ROI for Abatement**
Using AI to predict ROI for abatement efforts, dynamically improving forecasts to meet decarbonisation targets.

**Standardised AI Tools for Scope 3**
Developing standardised AI tools to manage Scope 3 emissions, enhancing data integrity and transparency.

## Resource Efficiency and Eco-Design

**Solar Efficiency**
AI supports research and development efforts to create more efficient solar-panel and battery materials.

**Industrial Efficiency**
AI helps in the exploration of alternative materials and chemical compositions to reduce industrial emissions.

**Smart Irrigation**
AI controls smart irrigation systems to protect crops during adverse weather.

**Geothermal Storage**
Accenta's geothermal storage system significantly boosts building energy efficiency by smartly predicting energy sources.

**Precision Agriculture**
Optimising water, fertiliser and pesticide use to climate conditions using AI-enabled precision agriculture tools.

**Energy Forecasting**
Forecasting energy supply and demand to inform decisions around load management and simulate 'what if' scenario impacts.

**Renewable Energy Management**
Managing variability in renewable energy sources to optimise energy deployment based on weather conditions.

**Optimising Product Design & Operations**
Using AI to enhance product design and operations, improving efficiency and reducing emissions.

**Smart Energy Management**
Using AI to optimise energy consumption across batteries, renewables, and the grid for improved efficiency.

**Circular Practice**
Using AI to enable circular practices, e.g. repurposing water waste from data centres for heating homes and pools.

**Dynamic Electricity Pricing**
AI enables dynamic pricing of electricity to reduce consumer expenses relating to utilities.

**Climate-Water Forecasting**
Integrating climate and water forecasting capabilities to predict water supply and demand under different climate scenarios.

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# AI for Climate:
# 2. Adaptation and Resilience

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## Environmental Conservation and Forecasting

**Carbon Sink Monitoring**
Monitor Natural Carbon Sinks - analyse satellite images to detect deforestation and estimate ecosystem carbon sequestration.

**Climate Impact Analysis**
AI helps in identifying areas most likely to be impacted by climate change.

**Crop Yield Prediction**
AI predicts crop and fishery yields through machine learning.

**Wildfire Detection**
AI to review satellite images to spot forest wildfires and even to predict their likelihood.

**Crop Disease Detection**
AI detects crop diseases early to prevent widespread damage.

**Hazard Prediction**
Detecting natural hazards early (using satellite, aerial, meteorological, etc. data) and predicting their impact to guide deployment of emergency support.

**Carbon Sequestration Measurement**
Measuring carbon sequestration potential of land (soil) and oceans (seagrass).

**Water Quality**
Assessing impact of changing climate conditions on water quality (e.g. spread of harmful algal blooms, bacteria levels).

**Environmental Mapping**
AI empowers environmental mapping and prediction through IGN's remote sensing, Soilgrids' soil profile analysis, and advanced technologies like satellites and drones, enhancing conservation planning, sustainable agriculture, and strategic decision-making for biodiversity and food security.

**Water Bacterial Monitoring**
Monitoring bacterial levels in water with increasing temperatures.

## Infrastructure Resilience

**Grid Balancing**
AI enables more efficient, real-time balancing of the electric grid, ensuring a stable supply of electricity.

**Flood Risk Management**
AI managing flooding risk in the Niger and Volta River Basins.

**Climate-Resilient Infrastructure**
Simulating optimal infrastructure investments considering the climate change constraints.

**Infrastructure Vulnerability**
Pre-emptively monitor for maintenance issues and predict infrastructure vulnerability.

**Post-Disaster Assessment**
Assessing infrastructure damage following an extreme weather event to support the deployment of post-disaster responses.

**Outage Detection**
Using social media data and satellite imagery to identify power and communication outages during natural hazard to direct first responders.

**Emergency Chat Assistant**
Virtual AI chat assistants for delivering real-time emergency information during or in preparation for a natural hazard event.

**Solar Network Monitoring**
Using big data from residential rooftop solar to monitor for and detect potential threats to the national energy network.

**Financial Risk Assessment**
Improving modelling capabilities for assessing financial risk of low-probability natural hazards.

**AI for electrification and equipment optimisation**
Implementing AI overlays to drive electrification and optimise equipment, supporting decision-making and workforce augmentation.

## Policy and Economic Incentives

**Climate Policy Impact**
AI helps in assessing the effectiveness of climate policies by analysing their impacts, leading to improved climate models and mitigation strategies.

**Urban Climate**
AI provides city-level climate indicators to local governments.

**Carbon Pricing**
AI improves carbon price forecasts, aiding climate finance decisions.

**Climate Investment Coordination**
Supporting coordinated investment decisions for climate adaptation, particularly for energy infrastructure.

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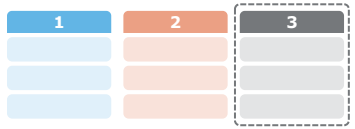


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# AI for Climate: 3. Restoration and Engagement

## Ecosystem Restoration

**Ecosystem Restoration**
AI-driven initiatives like Morfo's drone-based seed dispersal and Coralmaker's coral skeleton production accelerate and scale conservation, transforming ecosystem restoration with increased efficiency and precision.

## Societal Transformation

**Consumer Carbon Insight**
Consumers can use AI to comprehend the emissions linked to their purchases and actions, supporting a more carbon-conscious lifestyle.

**Carbon Footprint Reduction**
AI provides insights that help consumers prioritise actions to minimise their personal carbon footprint.

**Migration Pattern**
AI predicts large-scale migration patterns to prepare for population movements.

**Food Insecurity Monitoring**
AI identifies and monitors food insecurity risks to aid vulnerable communities.

**Personal Carbon Calculator**
AI powers personalised tools for estimating individual carbon footprints.

**Climate Education**
AI makes tailored recommendations for climate education and eco-friendly purchases.

## Societal Transformation (Continued)

**Agri-Climate Advisor**
Personalising climate insights and advice for farmers (e.g. forecasting financial and farm performance under different climate scenarios).

**Climate Hazard Exposure**
Predicting population-level exposure to climate hazards (e.g. mortality and morbidity risk).

**Heat Stress Monitoring**
Real-time monitoring of heat stress at work to support early intervention.

**Disease Outbreak Detection**
Detecting infectious disease outbreaks and monitoring for changes in disease profiles arising from changing climate conditions.

**Climate Niche Monitoring**
Monitoring for regions at risk of exceeding the 'human climate niche' (i.e. unliveable climate conditions to sustain human activity).

**Healthcare-Climate Modelling**
Integrating healthcare and climate modelling capabilities to improve granularity of health-related impacts of natural hazards (e.g. impacts on specific vulnerable communities).

**Climate Decision Nudging**
Using AI to overcome (or 'nudge') human biases in climate action decisions (e.g. tendency to discount impact of long-term or uncertain events).

## Governance and Public Engagement

**ESG Monitoring**
AI assists producers in monitoring their progress towards ESG (Environmental, Social, and Governance) goals.

**Welfare Program Management**
AI manages permit allocation for social welfare programs efficiently.

**Responsible AI in Emergencies**
Exploring responsible AI considerations for increasing social media use in emergency management (e.g. right to opt out, digital inclusion barriers to accessing support).

**Tailored Climate Insights**
Using LLMs/AI chat assistants to provide tailored climate insights relevant to different business or policy decision-making contexts.

**Environmental Decision Support**
AI-driven platforms like the World Environment Situation Room and Microsoft Planetary Computer process environmental data to bolster international cooperation, manage methane emissions, and track deforestation risks, becoming pivotal hubs for data analysis and supporting global environmental decision-making.

**Citizen Science Amplifier**
AI amplifies Citizen Science, with tools like Pl@ntNet and Wild Me using machine learning to identify flora and fauna, enriching data collection, public engagement, and conservation efforts.

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