

A satellite-style image of Earth, showing the Middle East, North Africa, and parts of Europe and Asia. The image is dark and serves as a background for the text.

AI and Climate Change

Opportunities, Challenges, and Recommendations

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What is AI?

Artificial intelligence (AI): Any computer algorithm that makes predictions, recommendations, or decisions on the basis of a defined set of objectives.*

Machine learning (ML): AI algorithms that infer patterns from data.
(Have become especially popular/effective in recent years.)

Strengths

- Performing simple tasks quickly and automatically
- Finding subtle patterns in large datasets
- Optimizing complex systems

Weaknesses

- Sensitive to bad or biased data
- Don't have "common sense"
- Often cannot explain why an answer is true

*OECD AI Principles.

Tackling Climate Change with Machine Learning

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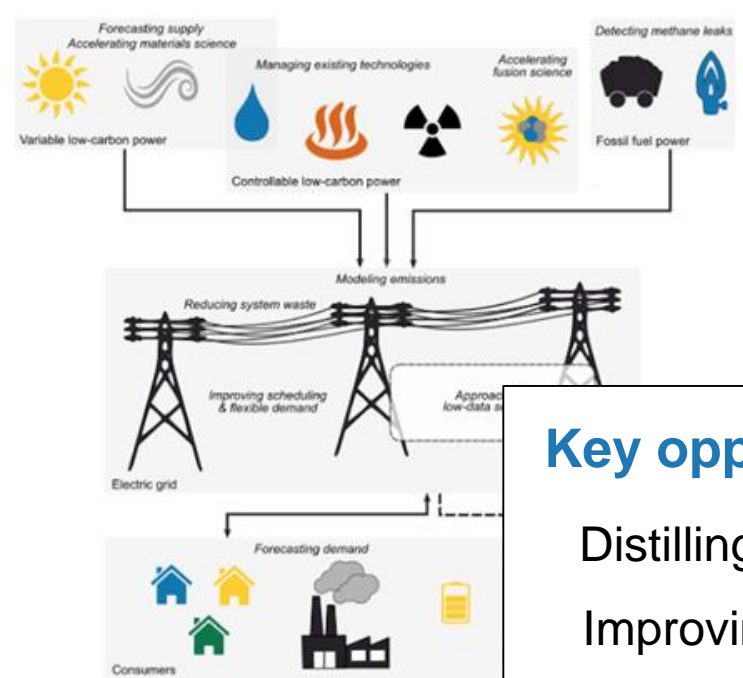
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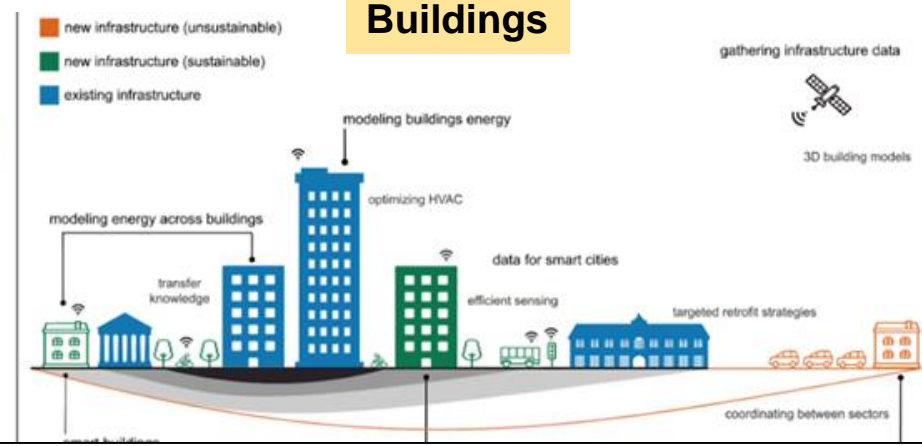
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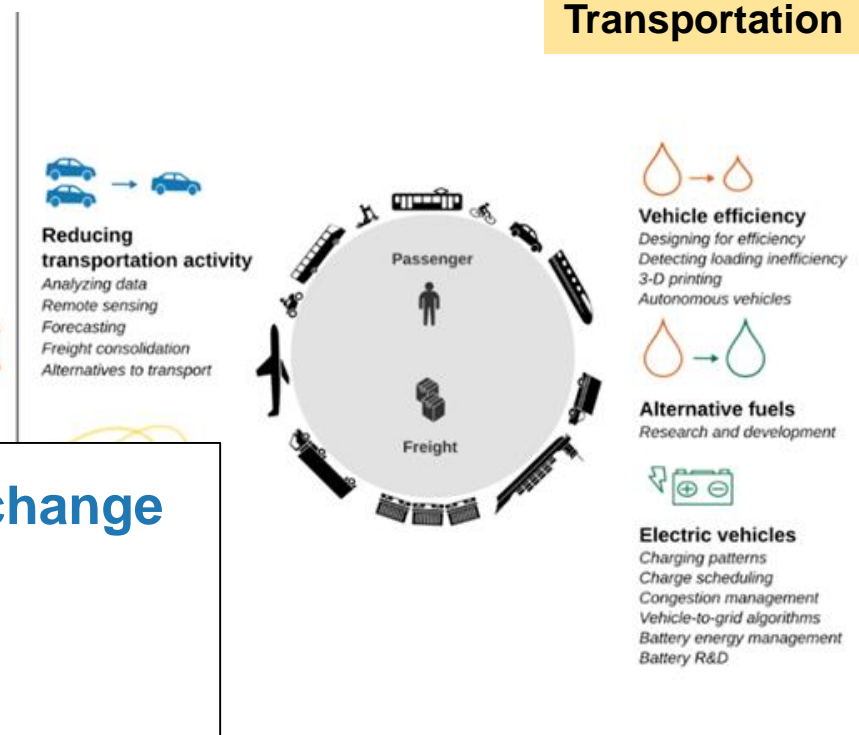
Electricity systems



Buildings

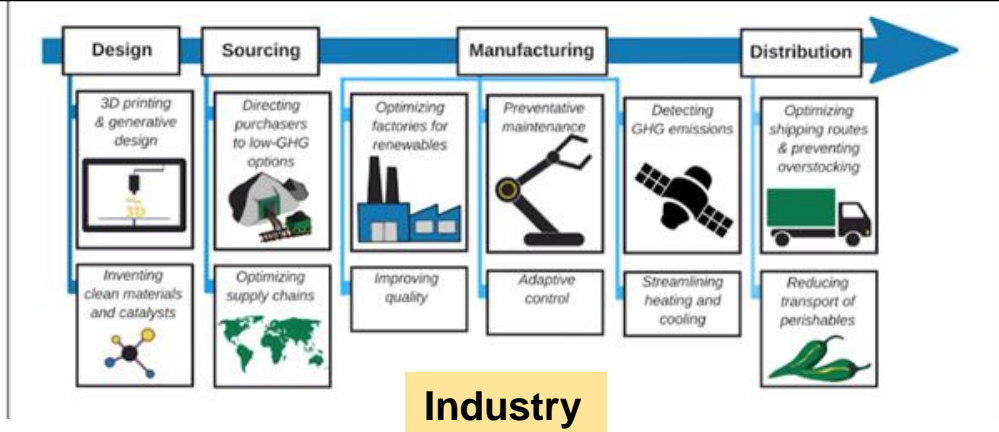
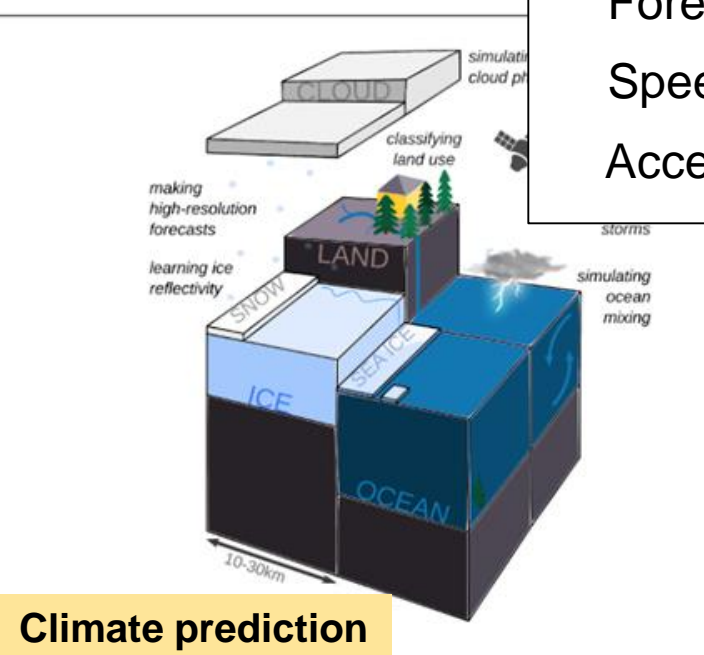


Transportation

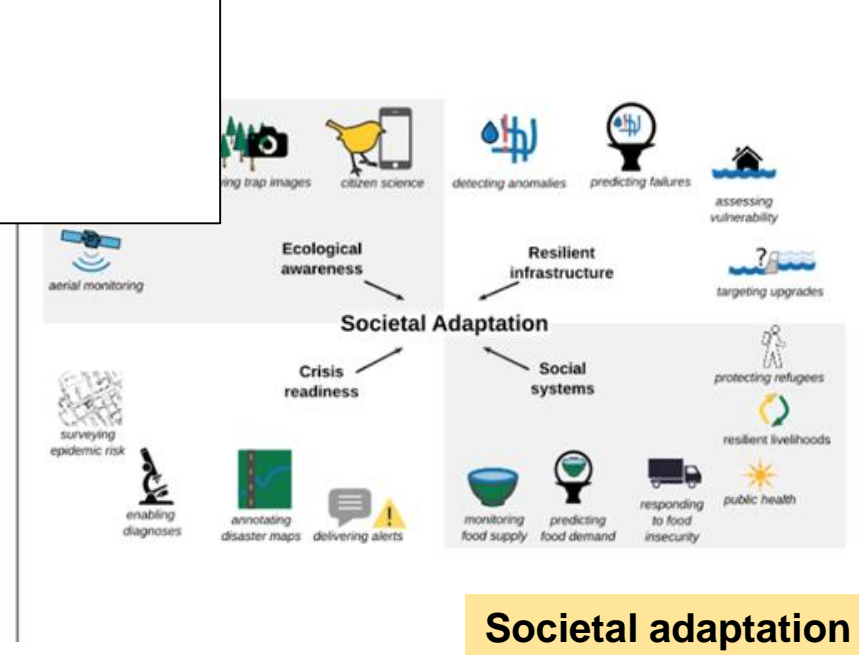


Key opportunities for AI in tackling climate change

- Distilling raw data into actionable information
- Improving operational efficiency
- Forecasting
- Speeding up time-intensive simulations
- Accelerating scientific discovery



Industry



Societal adaptation

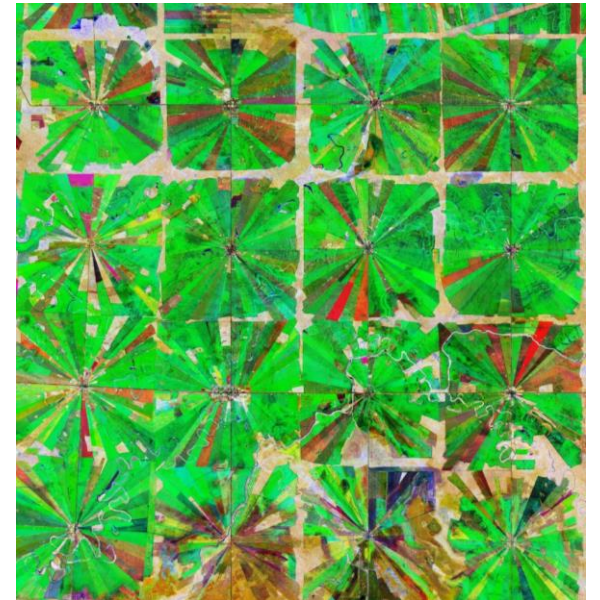
1. Distilling raw data

Need: Distilling raw data into actionable information

Role for AI: Automatic labelling, e.g. satellite images or textual data

Examples

- Mapping deforestation and carbon stock
- Gathering data on building footprints/heights
- Evaluating coastal flood risk
- Parsing corporate disclosures for climate-relevant info



2. Improving operational efficiency

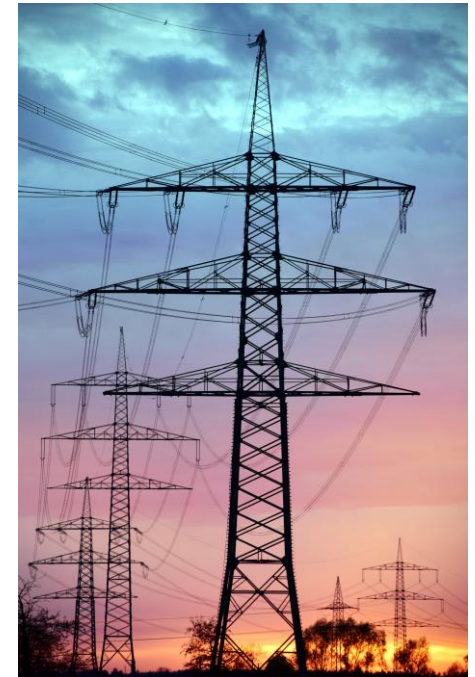
Need: Improving efficient operation of complex, automated systems

Role for AI: Optimization and control

Examples

- Managing the electric grid
- Operating heating/cooling systems efficiently
- Optimizing rail and multimodal transport

Note: Beware of misaligned objectives and rebound effects



3. Forecasting

Need: Proactive planning and scheduling

Role for AI: Predictions from time-series data

Examples

- “Nowcasting” for solar / wind power
- Forecasting electricity demand
- Predicting crop yield from satellite imagery



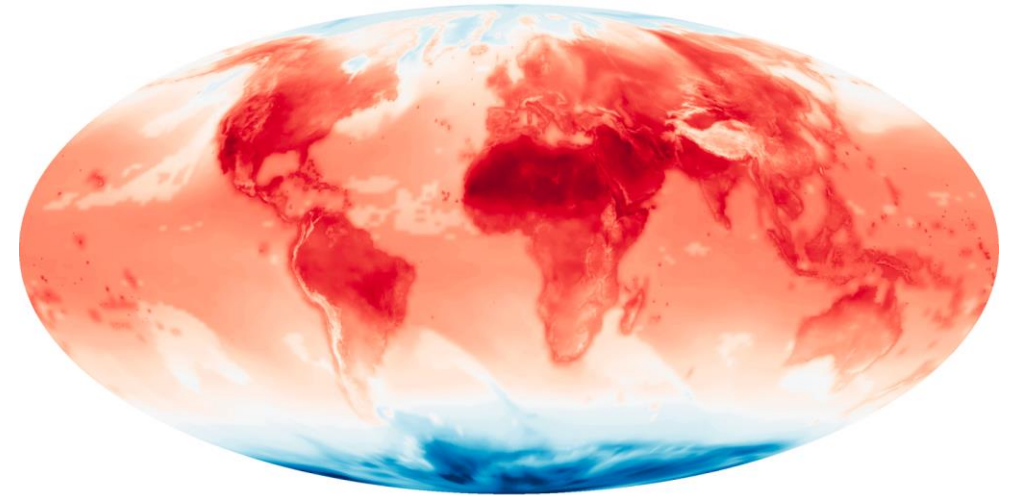
4. Speeding up simulations

Need: Fast physical models

Role for AI: Approximating the output of time-intensive simulations

Examples

- Higher resolution predictions from climate models
- Simulating portions of car aerodynamics



5. Accelerating scientific discovery

Need: Faster design of climate-relevant technology

Role for AI: Suggestions for which experiments to try

Examples

- Identifying candidate materials for batteries, photovoltaics, and energy-related catalysts
- Improving charging protocols for electric vehicle batteries



Overall considerations

AI is **not a silver bullet** and is also relevant sometimes

High-impact applications are **not always flashy**

Even when working with data, **sometimes simple methods work**

Can be used to **get the wrong answer fast**, not a substitute for thinking

AI **intrinsically neither good nor bad** for climate change – negative-impact applications too

Partnership btw stakeholders with complementary expertise is crucial

CLIMATE CHANGE AND AI

Recommendations for
Government Action

Global Partnership on AI Report

In collaboration with Climate Change AI and
the Centre for AI & Climate





Data and digital infrastructure

Ensuring the availability of data and infrastructure on which AI algorithms depend.

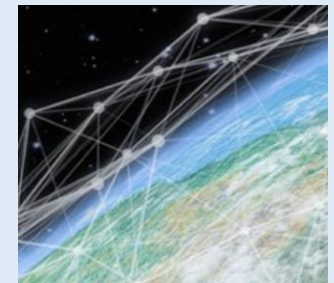
Considerations

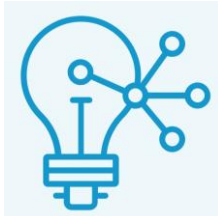
- Relevant data may not exist and are unequally distributed.
- Incentives and standards for data sharing are nascent.
- Data quality is often low and standards are lacking.
- Computing infrastructure is often a bottleneck.

Selected recommendations

- Establish **data task forces** and **platforms** for data collection and sharing in climate-critical sectors.
- Support the **availability of compute and data storage** for researchers, civil society, and smaller scale enterprises.

Case Study: The UN Satellite Centre (UNOSAT) FloodAI system delivers high-frequency flood reports, based on satellite data, which have improved disaster response in Asia and Africa.





Research and innovation funding

Ensuring and directing funding for research and innovation in relevant technologies.

Considerations

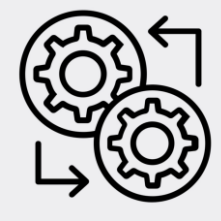
- AI funding often methodological, climate funding often sector-specific.
- Potential for neglect of less flashy low-hanging fruit.
- Imbalanced funding geographically, and priorities often driven by Global North.

Selected recommendations

- Ensure funding on AI-for-climate projects is **impact-driven**, not tech-driven (also considering **pathways to deployment**).
- Accommodate AI where relevant within wider climate **"grand challenges"**.

Case study: Kuzi, by Kenyan company Selina Wamucii, uses AI to predict locust outbreaks in East Africa.





Deployment and systems integration

Ensuring promising research and development is impactfully deployed and scaled.

Considerations

- Reliability or security guarantees are needed in some sectors.
- Organizational culture & legacy infrastructure may slow adoption.
- Some opportunities fall outside traditional incentive structures.

Selected recommendations

- Develop **cross-sectoral innovation centers** to incubate projects, facilitate collaborations, and hone scaling models.
- Develop and maintain non-commercial **public interest applications**.

Case study: The UK's National Grid ESO has used AI to double the accuracy of its forecasts of electricity demand, enabling better integration of renewables.





Capacity building

Supporting the growth of literacy, talent, and tools needed for AI-for-climate projects to be deployed responsibly, effectively, and equitably.

Considerations

- Capacity needed across wide range of entities / geographies, e.g., gov (national and local), private sector, civil society
- Need for cross-functional & cross-sectoral coordination
- Risk of system capture or potentially high costs

Selected recommendations

- Implement **AI literacy and “upskilling”** programs for governments, climate-relevant industries, and civil society
- Fund or facilitate (i) **secondment programs for AI experts** within climate-relevant sectors, and (ii) the creation of **trusted AI-for-climate solutions providers & auditors**

Case study: US-based startup Fero uses AI to reduce the use of new material in steel recycling, averting 450 kt CO₂ / yr.



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