FORESIGHT WORKSHOP

AI + Climate Futures in Asia

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Project by

digital futures lab

Contents

Context

Climate change and AI are two of the most significant factors shaping the future of Asia. However, the interaction between these two transitions and their impact on other sectors needs to be better understood.

Asia is one of the most vulnerable regions in the world to climate change. Many of its low-lying coastal cities are exposed to flood risk. 13 countries out of 20 most vulnerable to climate change impacts are in the East Asia-Pacific Region and 7.5 million people in the region could fall into poverty due to climate impacts by 2030.

An increase in heat and humidity across the region is expected to impact livelihoods and well-being. Under a scenario of 1.5˚C global warming by the end of the century, heat stress in Southern Asia is estimated to lead to the loss of 5.3 per cent of working hours in 2030, corresponding to around 43 million full-time jobs.

Key sectors like agriculture and food systems are especially under threat from extreme weather events. The risk of increasing incidence of disease and health issues as a result of floods, heatwaves, droughts, and increasing pollution exacerbates the threat to life for vulnerable populations.

Asia Pacific is also an emerging hub and market for AI research and deployment. AI technologies can support more efficient and innovative resource use, forecast potential climate risks, and advance research and discovery. AI can be useful for gathering information for large-scale analysis and improving operational efficiencies. Pursuing a green transition could also transform the digital sector through, for example, a switch to alternative energy sources. **But, these digital and green transitions could also negatively affect each other.**

AI production and use can increase energy consumption and resource extraction. AI-based recommender systems can nudge people toward better behavioural practices, but this can undermine individual agency and privacy.

The use of AI also raises questions about data access and governance. Better-resourced nations may be better positioned to develop and leverage AI technologies, increasing inequity across countries.

As the region undergoes these twin transitions – of climate change and rapid technology uptake, the future is complex and uncertain. The pace and outcomes of these transitions will depend on a complex interplay between political, social and economic factors.

Anticipatory strategies that can align AI trajectories with positive climate action are needed.

About this Workshop

This foresight workshop brings together 18 participants including the regional expert network, to deliberate the future of two issues

I

Climate Data Pipelines and Governance

The effective and responsible use of AI is dependent on access to quality data and its governance. Governments in the region are entering data-sharing agreements and focusing on creating open data ecosystems for access to a wide range of data. But the use of climate data also raises complex issues around usability, ethics, and privacy.

How might climate data pipelines and governance evolve over the next 10 years and what are the likely implications for the intersection of AI and climate action in Asia?

II

AI, Agriculture and Climate Action

Our mapping of AI interventions in the region identified agriculture as a priority area for most governments - while there has been a steady increase in investments and applications in the sector, complex socio-technical challenges around adoption and use persist.

How might the deployment of AI transform agricultural practices (if at all) and what are the likely implications from the perspective of mitigating and adapting to climate change?

Strategic Foresight

This workshop will rely on strategic foresight methodologies to anticipate future trajectories and outcomes.

Strategic Foresight is the discipline of exploring the future to anticipate changes, to develop possible transition pathways and to withstand shocks, and to help us act in the present to shape the future we want.

It can help build anticipatory policies and interventions, future-proof emerging initiatives, and develop new innovative ideas and policies that are robust across a range of futures

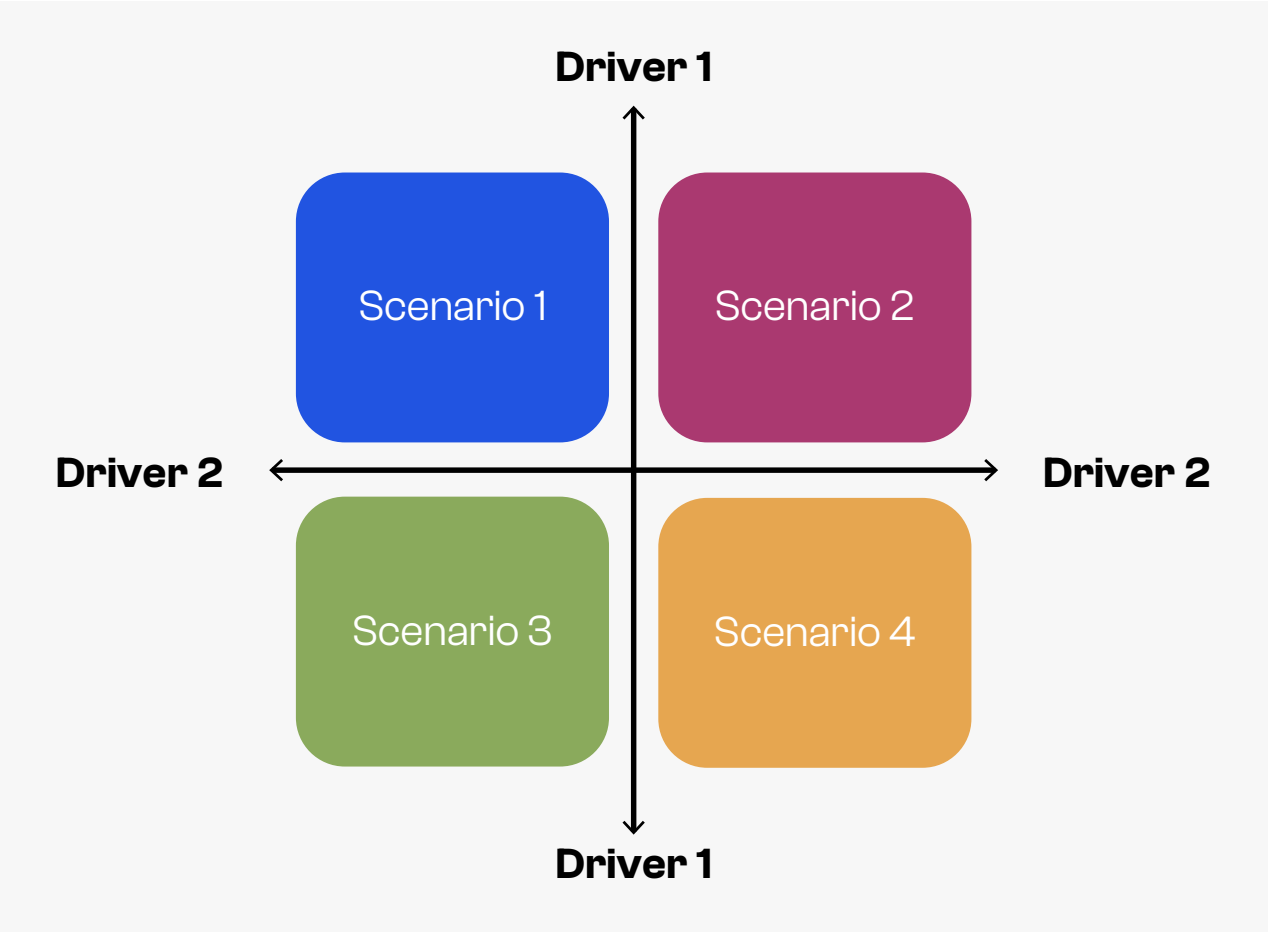
The purpose of foresight as a method is not to predict the future, but to anticipate positive opportunities and negative factors that can shape our collective futures.

2x2 Scenario Building Method

For this workshop, we will be using the 2x2 scenarios method to imagine possible futures for the two themes listed above. Scenarios are a set of alternative descriptions of how the future might look, constructed for the purpose of taking action in the present. Scenarios are also useful to unpack how key issues, partners and stakeholders might act in different contexts.

The 2x2 scenario-building method entails the following steps:

1	**Scan the horizon for emerging signals of change.**	Over the past 6 months, DFL supported by the expert network, has built a signals database to capture emerging signs of change. These signals were then analysed to identify critical trends and drivers of change. These will be presented to workshop participants on Days 1 and 2 of the workshop.
2	**Cluster these signals into trends or drivers or change.**	
3	**Identify two trends of drivers that represent 'critical uncertainties'.** i.e. drivers that are likely to be pivotal in shaping the 'problem space' but whose impact and trajectory are uncertain)	These are the contexts for which we most need anticipatory policies. This activity will be done as a group during the workshop.



4	**Scan the horizon for emerging signals of change.**	Over the past 6 months, DFL supported by the expert network, has built a signals database to capture emerging signs of change. These signals were then analysed to identify critical trends and drivers of change. These will be presented to workshop participants on Days 1 and 2 of the workshop.
5	**Cluster these signals into trends or drivers or change.**	

Thematic Focus

Future of Climate Data Pipelines and Governance

Access to high-quality data is key to developing AI-based applications for mitigating and adapting to climate change. But, availability and access to such climate data is limited for a number of reasons. These include:

- Low quality and unequal geographical distribution of data collection tools (satellite, remote sensors etc.)
- Lack of data standardisation, resulting from different collection metrics, temporal coverage, and other processes across actors.
- Limited capacity and incentives for data sharing across government departments
- Lack of access to data held by private sector companies (eg. emissions data, mobility data)

The collection and use of climate relevant-data also pose a number of societal risks, some of which include:

- Climate data can include sensitive personal data. Applications built on so-called non-personal data can also have an impact on people's rights and access to opportunity.
- The availability and usability of climate-relevant data is likely to reflect existing economic inequities, concentrated in wealthier geographies both within and across countries. Many of these data gaps are also likely to be among communities most vulnerable to climate change. This raises issues around data equity and climate justice.
- Immense resources and expertise is required to collect and process climate data. These capacities are increasingly concentrated in the private sector and data collection and sharing is driven largely by commercial interests. For example, while images from government satellites are accessible, higher spatial resolution datasets are usually available with commercial players.

A number of initiatives are underway in this region to overcome some of these challenges and create new innovation opportunities. Some of these initiatives are discussed below:

Open data platforms

Open data initiatives already have considerable political support in the region. Indonesia for example is a founding member of the Open Government Partnership and Vietnam has set a target of developing 50 open and linked data sets in different economic sectors to support AI development by 2030.

India is also developing a platform for highly-curated high-value data sets.

But the uptake and usability of these platforms have been limited - reasons include the challenges mentioned above, along with additional issues of discoverability and relevance.

Digital Public Goods and Infrastructure

There is growing policy attention and investment in building digital public goods for climate change - a set of open-source tools, including data repositories, that can be accessed and adapted by a wide range of stakeholders to build climate-relevant interventions.

The use of digital public infrastructure - a technology stack consisting of an identity layer, payments layer, and data exchange layer - to build innovative climate adaptation and mitigation is also being explored.

For example, in Pakistan, the rollout of the Asaan Mobile Account platform allowed flood-affected people, especially those who were underbanked, to receive emergency funding. Anyone with a digital national ID can open a bank account with the platform.

Evidence from early experiments with DPGs and DPIs highlights the criticality of building a robust governance framework that upholds people's privacy and data rights and ensures accountability.

Data cooperative and stewardship institutions

Community-driven approaches to data governance are gaining prominence in the climate context.

Cooperatives or trusts, where members of a community have control over the creation and use of data, are meant to foreground ownership of the data within the communities that generate them. This shifts the axis of control away from companies and agencies to those who are producing the data, where they can determine the technical and legal aspects of data use.

Studies exploring the use of such approaches highlight opportunities as well as challenges in implementing them in low-resource and developing contexts. For example, the feasibility of

data trusts for small shareholder farmers in India is less certain in the light of an inadequate level of digital literacy and lack of digital infrastructure to make informed decisions about the data they own.

Future Of AI + Agriculture

Considering Asia's dependence on agriculture for economic growth and its vulnerability to climate change, the sector is a priority in national climate action strategies. It is also increasingly seen as a priority area for AI for social good initiatives. The Asia-Pacific region has the largest agricultural production and accounts for almost 60% of the global population. It also contributes significantly to greenhouse gas emissions from agriculture, which have increased by 144% over the last five decades.

Potential Opportunity Areas

Farm Advisories

Several companies are building ML applications to help farmers plan for climate variability. These include products to support crop health management, soil testing, yield forecasting, and pest management. Within the agriculture and food systems space, these types of information-sharing and advisory applications are dominant across the region.

R&D for food

With threats to food security due to climate change, countries are experimenting with different forms of proteins and cultivated meats. For example, AI algorithms can analyze vast amounts of data such as nutrition composition, to identify the optimal conditions for cultivating meat cells. This information can then be used to fine-tune the production process, reducing the time and resources required to produce lab-grown meat.

Carbon sequestration and Carbon Markets

A few ML-based solutions are being piloted to improve measurements of soil and tree carbon sequestration – with the use of machine learning and computer vision, hyperspectral imaging can be improved and real-time assessments provided. Early experiments are also underway to incentivise farmers to adopt regenerative practices that sequester carbon by providing them access to carbon credits.

Challenges

As R&D for AI–based tools in the agriculture sector grows, a number of persistent challenges need to be addressed. These include:

- Variation in agro-climatic zones means that hyper-localised data is required - off-the-shelf applications or those built for another context may not work across contexts.
- Satellite data is not of adequate quality and needs to be supplemented by granular data collected from the ground, which can be a laborious and expensive process.
- Limited digital access and fluency, combined with the finances needed to adopt and use AI-based technologies, limits uptake by farmers. The small size of agricultural landholdings is a further impediment.
- The collection and processing of agricultural data is resource-intensive and there is a risk of capture of this market by commercial players.

Additional Readings

Scenario building

- UK Government, Evidence and scenarios for global data systems: The Future of Citizen Data Systems (2020)
- OECD, Global Scenarios 2035: Exploring Implications for the Future of Global Collaboration and the OECD (2021)
- Eliot Beeby, Four 'Alternative Future Scenarios' for Regenerative Agriculture (2023)
- UK Government, Scenarios Report: The Future of Smart Data (2023)

Climate data pipelines and governance

- Kabeer Arora et al., Building a Climate Data Ecosystem for Disaster-Resilient Infrastructure and Societies, T20 Policy Brief (2023)
- David Jensen, Harnessing the power of big data & frontier technologies for climate action, UNEP
- Viktor Sebestyen, The Applicability of Big Data in Climate Change Research: The Importance of System of Systems Thinking (2021)

AI, Agriculture and Climate Action

- Elbehri, A. and Chestnov, R. (eds)., Digital agriculture in action - Artificial intelligence for agriculture. FAO and ITU (2021)
- WEF, Artificial Intelligence for Agriculture Innovation (2021)

About the project

Commissioned in early 2023 by The Rockefeller Foundation, this project explores the intersection of Artificial Intelligence and Climate Action in Asia.

It examines opportunities, challenges and risks across three domains – agriculture and food systems, energy transitions, and disaster response in nine countries - Bangladesh, China, India, Indonesia, Malaysia, Singapore, Thailand, The Philippines and Vietnam. We assembled a network of regional experts to help guide our investigation and provide context specific insights.

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For additional reports and outputs from this project visit **climateai.asia**

About DFL

Digital Futures Lab is an interdisciplinary research collective that interrogates the complex interaction between technology and society in the global South. Through evidence-based research, public engagement and participatory foresight, we seek to realise pathways toward equitable, safe and just digital futures.

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