AI + Climate Futures in Asia

Counting Climate 2035
The Future of Climate Data Governance in Asia

How might climate data pipelines and governance evolve over the next 10 years?

What are the likely implications for the intersection of AI and climate action in Asia?

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Foresight Brief: #2

Counting Climate 2035: The Future of Climate Data Governance in Asia

This foresight brief is part of a project on AI + Climate Futures in Asia, supported by The Rockefeller Foundation.

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Any errors or omissions are our own.

Access to climate-relevant data sets is essential for climate action, including building AI applications.

Much of the conversation in recent years has focused on building open climate data sets and improving the quality and usability of data.

However, we also need to pay attention to the sources and modalities of data collection and the pipelines through which climate data is shared and governed – who gets access, on what terms, and how value gets distributed while preserving privacy and security.

How these conversations play out will be crucial to shaping whether and how AI can be used for climate action – the effectiveness of the interventions that can be developed and the broader implications for fairness and equity.

This foresight brief presents two hypothetical future scenarios for climate data pipelines and governance. These scenarios were developed through a 2.5-day workshop in August 2023 that brought together leading thinkers and practitioners from civil society, academia, and industry.

A list of participants is provided in the annexe.

The first scenario, Fractured Futures, presents a world in which new private data clubs are formed and AI applications for climate action further narrow commercial interests.

In the second scenario, Hopeful Tomorrows, new centralized institutions for curating and sharing climate data are created; crafted on the principles of social purpose, reciprocity, and care, it supports the development of socially beneficial climate AI.

The final section of this brief summarizes the shared concerns and levers of change that emerge from these scenarios and discussions at the foresight workshop.

The scenarios are not predictions but provocations to consider the implications of current trajectories and imagine alternative possibilities.

We hope this brief can serve as a tool for exploring new pathways toward promoting responsible innovation and the adoption of AI technologies for climate action.

Scenario #1

Fractured Futures

Centralised but Inequitable Data Agency

The growing severity and unpredictability of climate crises have propelled the creation of a new supranational environmental agency, C35. C35 is responsible for collecting, cleaning, and sharing high-value climate-relevant data sets.

Data is derived from multiple sources – from remote sensing and satellite data to social media data and neurological data.

However, data quality remains poor in several parts of the world. The benefits of 6G technology have not permeated equally, and some countries are still dependent on sensors functioning via older networks.

Most high-quality satellites are owned and operated by private companies; the few operated by governments have outdated technology and have fallen into disuse. The growing political instability in the region, combined with the introduction of data localization requirements in many countries, has resulted in selective satellite data collection and processing by these private satellite companies.

There is a greater reliance on synthetic data in low-resource contexts, i.e., data that is algorithmically generated, but this data continues to be of poor quality. There are also concerns that the availability of high-quality prose to train Large Language Models is running out, raising questions about the utility of emerging generative AI applications.


C35
C35
C35
Data Centre
Data Centre
Data Centre
Data Centre
DATA FOR ALL
CSO

Competitive Market for Climate Data

Some of the data sets housed by C35 are freely available, but most need to be purchased. The sale of climate-relevant data sets is a critical source of revenue and sustainability for C35.

This contributes to the creation of a competitive market for climate data – the environmental agency is incentivized to collect and curate data that is commercially valuable, and private actors try and outbid each other for data access.

Large non-profit organizations and philanthropies also compete for this data, but they are at a distinct disadvantage given the resources and expertise that technology companies have at their disposal.

Private Data Clubs

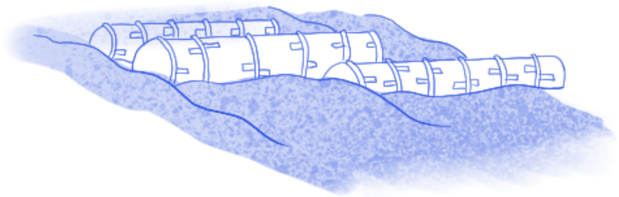
Aside from this supranational agency, numerous Climate Data clubs are active and support climate-related data exchanges and innovation. Unlike earlier centralized and open-access data registries, these new clubs are restricted to a coalition of private actors with similar interests and incentives who come together to share data and AI-based tools within the club.

A series of coordinated cyberattacks a few years earlier had exposed the fragility of the centralized and open-access model, especially when linked to national identity and payments systems, with many people and companies across the globe getting locked out of multiple services simultaneously. Many of these data registries, linked to national identity systems, were scaled without establishing appropriate governance mechanisms and adequate testing and evaluation.

Companies came to realize that the misuse of data registries—especially given growing political authoritarianism, could hurt consumer spending and technology adoption, which further motivated them to create their own private data clubs.

Some of these clubs were contracted by governments to predict and manage climate refugee flows, perpetuating earlier practices of the misuse of these data architectures to monitor and target refugee populations.

Many civil society organizations and community actors have formed similar clubs to document corporate compliance with climate targets.



However, as they are constrained by a lack of capital and expertise to process data, their efforts have minimal impact. Open-data repositories created by civil society organizations have also been used to conduct surveillance on climate activists; however, the number of these organizations has been dwindling.

Commercial Applications

Many companies now offer AI-based climate solutions, most of which are directed towards helping companies reduce their environmental footprint. Companies are conscious of the business impact of the climate and are hence investing in greening their supply chains.

New AI applications to support more efficient resource and utility management are widely used, and AI has also helped accelerate a switch to renewable sources of energy. The net impact of this on climate change has been positive but is still far short of global targets.

With global temperatures closing in on the 2°C threshold and the rate and scale of natural disasters increasing, there is a growing market for disaster prediction tools. Companies looking to secure their supply chains and insurance companies form the main customer base for these products.

Advancements in generative AI have made these tools much more sophisticated – they are now trained on multi-modal data and are able to make both near-term and long-term predictions. Many of these tools are also available in the B2C market, but the most accurate tools are too expensive for most. Insurance companies also use analytics to identify regions that are extremely vulnerable to climate change and declare them as no-insurance zones.

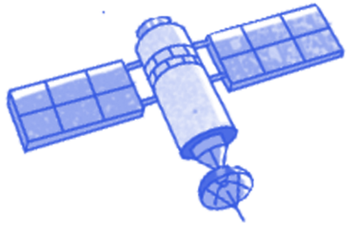
Limited Attention of Adaptation

Very few AI-based interventions focus on the adaptation needs of communities most impacted by climate change. While many pilots were underway a few years ago, they have been mostly discontinued.

Governments encouraged private-sector pilots and market-based solutions to address climate action, but the lack of a viable business model led many companies to lose interest. Some of these pilots were led by philanthropic investments, but because of little ownership by local governments, these did not continue once philanthropic funding began to dwindle.

Evidence on the outcomes of these pilots was also not systematically collected. Access to and the adoption of digital technologies in many vulnerable communities has always been limited, and not much has changed for them.

Environmental Impacts



The environmental impact of AI is partially managed by building underwater data storage, but the impact on biodiversity has not been evaluated. This has been a recurring theme with AI investments in this space, i.e., while there may be a focus on a siloed problem – such as climate weather modelling – the broader impact on biodiversity and ecology is not considered.

Nonetheless, a switch to cleaner energy resources brings down the environmental impact of AI. To build and run larger models, companies need special permission and have to pay a hefty tax.

Some within civil society are sceptical of the net gains of these advances, especially as Big Tech is dominating the green AI narrative. The concentration of interdisciplinary expertise in data science and climate science in Big Tech companies also makes it difficult for civil society organizations to test this claim. Furthermore, recent evidence suggests that AI is contributing to an increase in production and resource extraction, as the processes for these are becoming more efficient.

Scenario #2

Hopeful Tomorrows

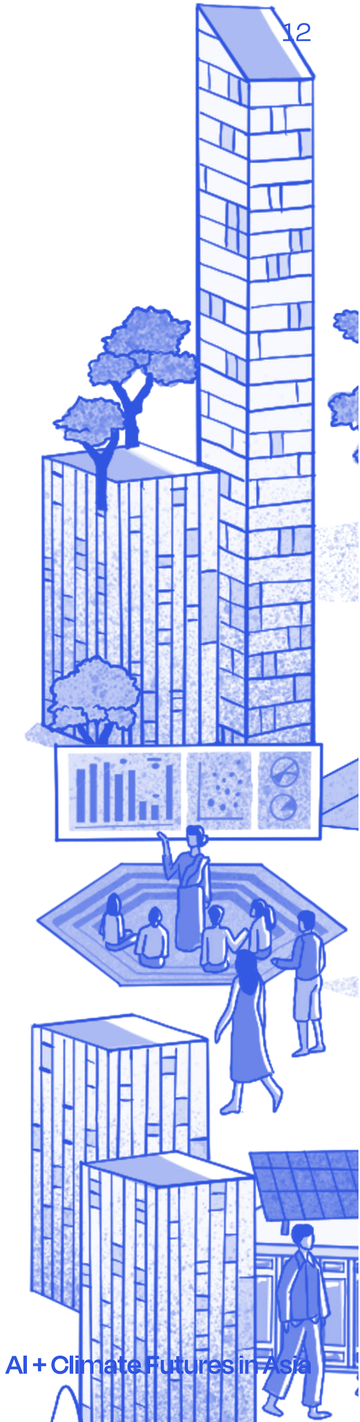
Innovation through Regulation

Data collection and technology use for climate action are ubiquitous and sophisticated, but the modalities of collection and application have drastically changed.

A climate-induced pandemic a few years ago devastated the region; young children were the most impacted and many developed chronic illnesses. Public outrage at the mismanagement of climate change rapidly grew, and economic boycotts and violent uprisings became more common. Continued disruptions to economic activity and markets shook world leaders and global corporations, spurring them into action.

Consequently, a comprehensive action plan based on indigenous knowledge systems was developed, and new rights were accorded to non-human forms of life.

Companies were required to develop a roadmap based on this action plan, and heavy fines were imposed for non-compliance. High taxes on fossil fuel use made it increasingly difficult for companies to remain profitable. The stringency of these mandates led to a new wave of technological innovation. Technology companies were mandated to develop open-source technologies to enact this plan as well as provide academic and research centres with computational resources and expertise.




TERMS OF USE OF IN-
DIGENOUS DATA
BLUESKY
RESEARCH
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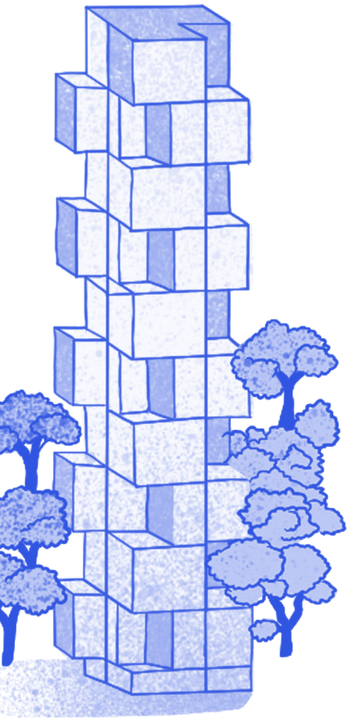


New Centralised Agency for Climate

Early wins from this new approach to climate innovation contributed to greater trust and solidarity among countries and communities. As a result, a new centralized institution for climate data exchange and sharing is established under the leadership of the Global Alliance on Indigenous Data.

Data access and exchange within these data institutions are based on the Collective Benefit, Authority to Control, Responsibility, Ethics (CARE) principles of collective benefit, responsibility, and reciprocity.

Terms of Data Access and Use

Different actors have varying levels of access and usage rights to the data, contingent on the intended use and the user's identity. The terms of access are set by the communities most impacted by climate action.

AI-based systems are used to forecast the impact on communities and identify the level of climate risk. AI-based tools are also utilized to test the efficacy of the proposed solutions across multiple parameters, including the impact on the rights of people and the planet.

Individual data ownership rights have been formalized by law, and any actors accessing or using individual data are required to act as custodians of that data.

New granular mechanisms for continuous consent have been developed, and people can easily opt in and out of data collection and processing activities. The high degree of societal trust means that people rarely opt out.

Reliable and effective data stewardship models have also been established for different sectors, protecting individual and societal interests while using data.

The Global Data Governance Research Institute collaborates worldwide to build contextualized data stewardship models with the aim of vesting control and agency in individuals and collectives. These institutions have become considerably more stable, as they are now financed by a tax imposed on data intelligence companies.

Active community participation in these institutions was also made possible through continued support for data literacy initiatives by philanthropic organizations.

Prioritizing Community Rights and Capacities

The new institute builds on learnings from the failures of the open-data movement. A study commissioned by the new institute demonstrated that open-access environmental data had been misappropriated by commercial actors to drive the exploitation of natural resources for commercial gain. The study also highlighted that the communities most impacted by climate change often did not have the resources to make the best use of this data for their common good.

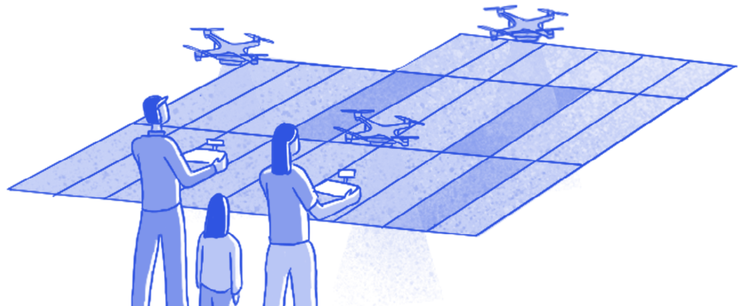
Acknowledging that open access to data is not enough, the institute facilitates training sessions for students, activists, and other interested stakeholders to build technical capacity for data processing. It has also established a network of research centres that provide digital infrastructure for developing locally adapted AI-based tools.

A key step in realizing the new climate action plan involved supporting communities with the tools and resources they needed to develop localized solutions.

Many local, community-managed innovation centres have been set up across the region to support decentralized solutions based on advances in no-code and edge computing. Data collection at the community level also helps fill persistent data gaps; combined with improved satellite technology, this contributes to more sophisticated analyses of micro-climatic conditions.

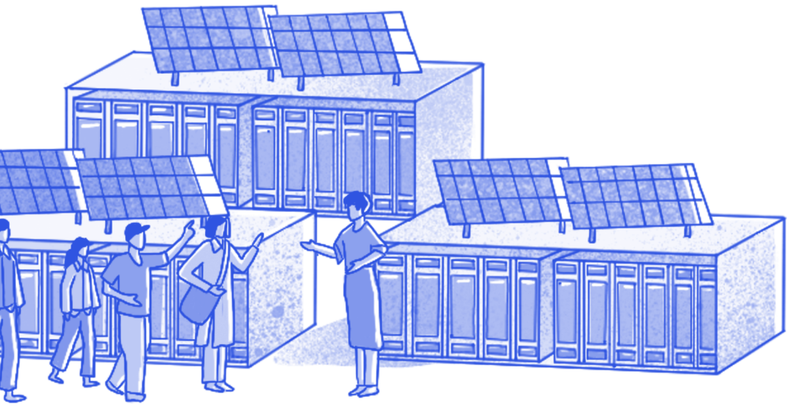
In many parts of the world, communities begin to use mapping technologies to reclaim their land rights. The use of drones helps build evidence of indigenous land stewardship over centuries, and AI helps them create maps based on multi-sensory and multi-species inputs, including bio-acoustic mapping.

This technology also supports the process of re-establishing forest rights. This has a catalytic effect on the protection of biodiversity and restoration of the natural environment.



1 The term “non-rationalist” here is used in contrast to de-contextualized forms of knowledge like data points, whereas “non-rationalist” would include relational data and spiritual or sacred knowledge.

2 The digital counterpart of a physical object, system or process, used for purposes such as simulation, testing, monitoring, and maintenance.



New AI Applications

As a result of the new types and mechanisms of data collection and the increasing trust in data-sharing systems, there is a proliferation of AI-based climate applications. The suitability and development of AI is determined by community goals and aspirations. Many of these are based on diverse, non-rationalist[1] knowledge systems, contributing to a wide variety of more locally relevant solutions.

The governance frameworks regulating climate data access also end up ensuring that most AI applications are linked to clear and demonstrable social benefits.

Common applications include the development of customized seeds based on indigenous knowledge systems. AI is employed for sense-making from unstructured and multi-modal data, leading to the development of early warning and recommendation systems for vulnerable communities.

Furthermore, there are systems designed to assess loss and damage, accounting for both inter-generational and inter-species damage.

Most parts of the world have built digital twins[2], helping policy-makers and communities better plan and anticipate disasters. As these systems are based on holistic and diverse knowledge systems, they are found to be more effective in weather forecasting and climate adaptation.

The opacity of AI systems continues to remain a challenge, particularly as the types and forms of data increase. The high level of societal trust, however, renders this less of a problem than was the case previously.

Managing the Environmental Impacts

The switch to low-carbon, low-tech solutions has considerably reduced the environmental impact of emissions as well as the dependency on water and power. Green data centres, which consume less power, generate less heat, and therefore require minimal cooling, have been established.

The setting up of these data centres is undertaken through consultative practices. This was necessitated by a series of vandalism and arson cases by protestors in the late 2020s, when community land and resources were acquired for data centres in many parts of the Global South.

Discussion

These two scenarios concerning the future of climate data pipelines and governance suggest a few shared concerns about the deployment of data-driven technologies for climate action. Potential levers of change can also be extracted from the scenarios.

Shared Concerns

Commercialization of Climate Data

The use of data and technology to serve narrow commercial interests at the expense of the rights and agency of people, and to the detriment of meaningful climate action, is a pressing concern considering technology actors' increasing investments in the climate space.

Persistence of the Digital Divide

Unequal access to emerging technologies will likely exacerbate climate injustice, as the realities of many – particularly the most vulnerable – remain uncounted or invisible to technological development. The emerging solutions are likely to benefit only a few.

Dependence on Private Actors

The continued dependence on private actors to support critical public functions is problematic. Incentives for private actors are misaligned with public interest, and continued dependence can contribute to the hollowing-out of state capacity.

Lack of Evidence

There is little evidence regarding the impact of emerging climate-tech solutions. Moreover, there are no reliable metrics for evaluation. Without these, claims regarding positive or negative outcomes cannot be verified. Climate-tech solutions must be grounded in climate science.

Political Priorities

The direction of technological development and its outcomes need to consider political priorities, the regulatory environment, and social norms. Even well-designed technology interventions can inadvertently contribute to harmful social outcomes if they fail to consider the social context and are not anchored in appropriate governance frameworks.

Levers of Change

Political Will and Public Policy

Political will and public policy can shape the direction of technological development and make markets and innovation work in the public interest. Regulation can also foster socially beneficial innovation. This includes embedding ecological ways of thinking and values into political decision-making, whereby all resource allocation and technology experimentation is focused on protecting and promoting ecological linkages and the balance between people and the planet.

Trust and Solidarity

Establishing social trust is necessary for supporting data sharing and appropriate technological development. Trust and solidarity are more important than the features of data or technology architectures.

Centring Communities

Those most impacted by climate action should be at the centre of climate-tech development. This includes both meaningful participation in key decision-making and governance fora as well as contributing to the building of decentralized climate-tech interventions. This requires investing in adequate digital infrastructure, meaningful community consultation for technology development, and offering support to communities for developing localized solutions, particularly women.

Preservation of Local Knowledge Systems

The type of intelligence that is being prioritized in the development of AI systems and the goals for which it is optimized need to be reconsidered. The task of technology development should be to support and promote local and indigenous knowledge systems, not replace them.

Purposeful Data Sharing

The critical question does not concern whether data is open, but rather the purposes for which it is utilized. The current focus on data accessibility and reusability needs to be supplemented with a clear articulation of social purpose, shared value, and common accountability.

Annexe
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About the Project

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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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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