Cambridge Centre for Social Innovation

Peaceshaping and Climate Lab

SPOT & STOP

USING TECHNOLOGIES TO PREDICT AND PREVENT CLIMATE RELATED CONFLICT

Working paper summary report by
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Introduction

Cambridge Centre for Social Innovation has commissioned this working paper as part of the Cambridge Peaceshaping, Climate and Conflict Lab. The purpose of the paper is to provide an overview of current research and practice in the field of employing technologies for 'spotting and stopping' climate-related conflict risks. It surveys examples of how such approaches are currently used, and critical perspectives from the research community. This summary outlines key insights from the full working paper, which can be read on the Centre for Social Innovation web pages.

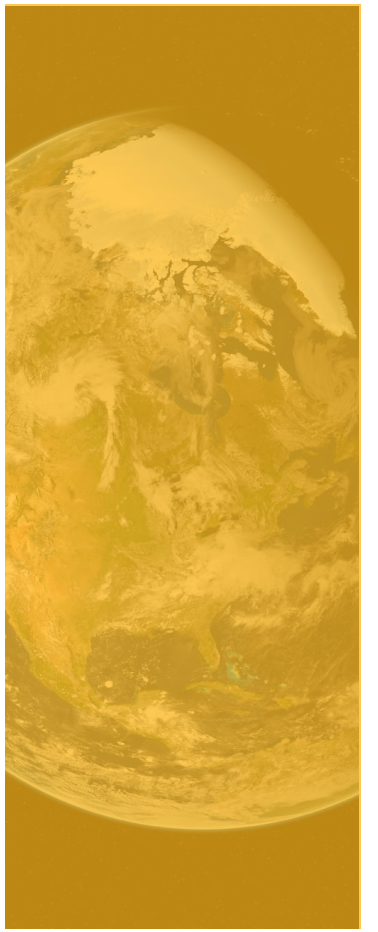
The CPCL addresses the intersections of climate, conflict and peace to investigate how to foster resilient and sustainable practices of, and collaborations for, peacebuilding. As an interdisciplinary space, the CPCL prioritises bridge-building and collaborative action to respond to the impacts of climate change on human conflict. In doing so, it aims to provide a relevant and cross-cutting environment for understanding the contemporary context within which we must confront these evolving challenges.

Technological ‘spot and stop' approaches seeking to inform decision-making on responses to climate vulnerabilities are growing in number and sophistication. However, academic research into the connections between climate and conflict presents an ambiguous picture. While some studies identify correlations, others claim weak or no evidence of causal relationships. Conflicts are most commonly attributable to other risks, but climate factors can exacerbate more salient drivers of instability and fragility. 'Spot and stop' technologies can struggle to reflect these complex linkages.

Combining technological approaches with local and indigenous knowledge can help build a picture that accounts for contextual nuances.

"As technology accelerates, so too must our understanding of how climate change impacts peace and security. It is a famously complex problem, one that demands the kind of measured approach taken in this working paper. Any effort to use emerging technologies to predict and prevent — to spot and stop — climate related conflict must be informed as much by their limitations as by their capabilities. This paper is a much needed and clear-eyed contribution.”

Peter Waring, Geospatial Technology Consultant with the United Nations.



Climate as a risk factor in conflict

Climate factors

Using 'spot and stop' tools to anticipate how climate variables may contribute to risks of intrastate or interstate conflict relies on climate data inputs.

However, climate data is limited and uncertain. This is partly due to inconsistencies in the granularity and coverage of data. Predictions are difficult because of the interconnectedness of conflict risk factors and because historic patterns will not necessarily hold in the future.

To avoid reductive interpretations of data, it is also important to consider context-specific vulnerabilities to climate and other risks.

An integrated view

Climate variables	Intervening variables	Contextual factors
Temperature and precipitation	**Secondary effects**	**Vulnerabilities**
Climate changes and weather extremes can cause drought, flood, and wildfires, leading to crop and livestock failure. This can result in livelihood and food insecurity, as well as competition for scarce resources.	Adverse effects on resources and livelihoods can drive broader patterns of migration, economic downturn, and inter-group tensions over resources. These factors contribute to fragility and instability.	Other stressors, which increase the likelihood of conflict, typically play a larger role than climate itself. These include political instability, economic inequality, ethnic fractures, and exclusion.

Understanding these complex relationships is essential to 'spot and stop' risks.

Hotspots

"Of the 25 countries deemed most vulnerable to climate change, 14 are mired in conflict" (ICRC, 2020). Researchers have identified areas such as Lake Chad and the Sahel Region as potential 'hotspots' (Scheffran & Battaglini, 2011). Compound risk factors mean such hotspots are more susceptible to destabilisation and conflict as drought and/or flooding frequency increases, exacerbating livelihood and food insecurity and prompting mass displacement.

Pictured: Lake Chad, Cameroon. USGS

Data and Technologies for 'spotting' climate related conflict risk

Agendas

The growing availability of climate data and wider technological developments have prompted a proliferation of tools designed to identify and predict elevated risks of conflict relating to climate factors.

Predictions need to be approached with caution to avoid oversimplification of risk dynamics and to mitigate the potential for inappropriate interventions. Data-informed approaches integrate data with knowledge from multiple sources and disciplines in order to account for intervening variables and contextual factors

Processing data

Sources: data sources include satellite monitoring, remote sensors, and (increasingly) data generated by individuals through internet use. Data on water and temperature are most commonly used, but data on agricultural activity, movement of people, demography and socio-political indicators are also pertinent.

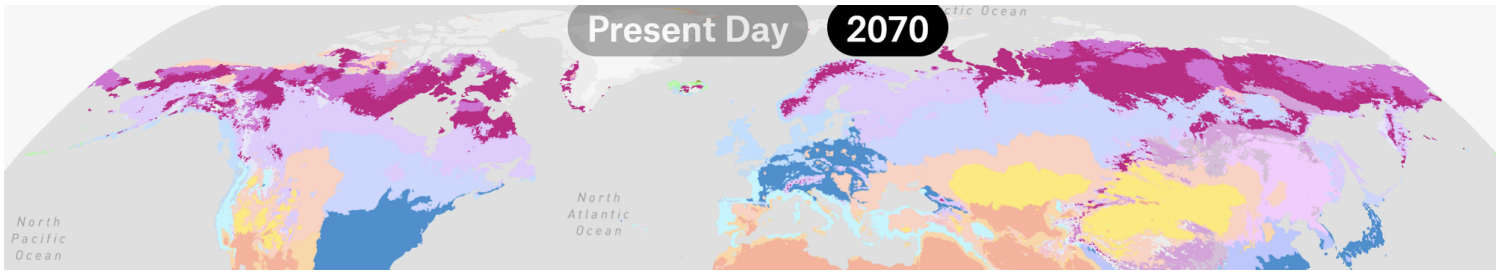
Analysis: data is analysed through modelling approaches, (e.g., agro-hydrological modelling), which can reveal historic patterns and potentially help predict future risks. Data visualisation through dashboards enables users to interpret patterns and assess risks.

Challenges and considerations

Granularity of data: Different measures (regional/national, or monthly/annual) can give contradictory results.

Coverage of data: Many places lacking data (e.g., from weather stations) are at higher risk of conflict, including informal settlements where people are more vulnerable. Useful data may also be withheld due to sensitivity or commercial interests.

Comparability of data: Data sets use differing parameters and definitions (e.g., of conflict) making triangulation between projections harder.



The visual journalism project “Climate Zones: How will your city feel in the future?” maps 70 global cities through to 2070 to propose how the climate in these cities would change over time. (Taylor 2024)

Pictured: data visualisation from 'Climate Zones'

Local knowledge and participatory approaches

Agendas

Increasingly, the deep contextual understanding of those at the forefront of climate and conflict vulnerabilities is being recognised as valuable for identifying mediating factors that influence risk levels and for informing the design of appropriate interventions.

Technologies can be used to support participatory methods, including community-led risk monitoring and bottom-up planning of responses to threats.

Failure to incorporate local sensitivities into 'spotting and stopping' approaches has prompted criticisms of 'securitised' approaches and one-sided data collection and utilisation.

Approaches

Integrating indigenous knowledge
Indigenous knowledge can improve predictions as it is informed by observation of locally specific indicators such as plant and animal behaviour.

Citizen science
'Citizen science' can be used to record and crowdsource environmental data, especially when national monitoring programmes have been disrupted (e.g., in conflict or natural disaster).

Qualitative methods
To understand links between resource insecurity and conflict, it is important to consider the socio-cultural meanings attached to social and environmental changes by those who live there.

Challenges and considerations

Traditional indigenous ways of knowing the environment may increasingly be affected by climate change in unprecedented ways, bringing into question the limitations of indigenous knowledge in extreme circumstances.

It is important to be sensitive to local perspectives. Ethical issues are connected to historically-rooted power imbalances between actors that collect data and make decisions based on it and those who are deemed most at risk.

"It is crucial to recognise the complexity of the climate-conflict-peace nexus, including the local historical, socio-economic, and geopolitical sensitivities of a particular context. It is important not to over-rely on technological methods but to integrate local and indigenous perspectives into 'spotting and stopping' approaches."

Lucy Caines, Research Associate, Cambridge Peaceshaping and Climate Lab

Approaches to 'stopping'

Agendas

Predicting the risk of conflict is only useful when actions are taken to prevent it, or at least to mitigate its effects. Interventions can be made pre, during and post-conflict to protect lives and livelihoods.

Most preventative efforts involve monitoring databases to feed into risk assessments and early warning systems.

Additionally, the early warning and response capacity of local institutions can be damaged by conflict, making communities more vulnerable to climate hazards.

Approaches

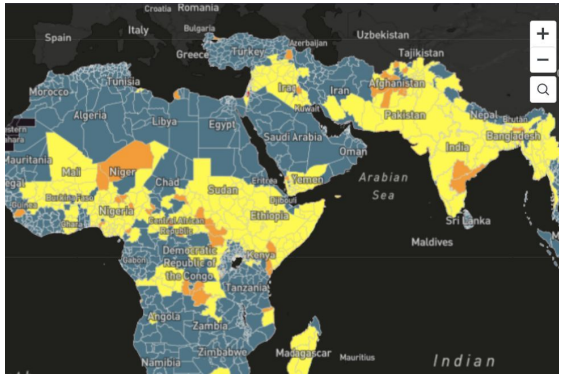
Pre-conflict	**Institutions.** Risks could be mitigated by setting up appropriate institutions. e.g., water allocation mechanisms where hydrological patterns are disrupted.
	Pre-emptive aid. This can include funding resilience building programmes as well as providing essential supplies such as food, water and finance.
	Capacity planning for organisations. Allocating appropriate resources for humanitarian and disaster relief organisations. E.g. for search and rescue, firefighting, and humanitarian organisations as well as military units.
	Damage reduction. This can be done by early warning systems, communicating risks, or through dispute resolution and mediation in response to climate related tensions over resources.
During conflict	**Using technologies to guide interventions.** Technology can be used to guide humanitarian and other interventions, monitor the climate impacts of conflicts, and track weaponisation of the environment.
Post-conflict	**Supporting displaced people.** These can centre on rebuilding sustainable livelihoods and acknowledging the need for 'conflict sensitive' climate adaptations.
	Peacekeeping missions. Whether led by peacekeeping troops, civilian groups, or other actors, missions often consider climate related enablers of peace and threats to stability.

"Spotting is becoming ever more achievable. Stopping remains a considerable challenge. We will need all our creativity. Rebuilding sustainable livelihoods will be key to 'stopping' efforts."

Prof. Neil Stott, Co-director, Cambridge Centre for Social Innovation

'Spot and stop' case studies

Spot and stop approaches remain relatively nascent in terms of current utility, in part because of the constraints of ‘spotting’ technologies, but also due to difficulties of implementing interventions in situations of potential and ongoing conflict. However, significant developments in the field have been enabled by recent technologies.

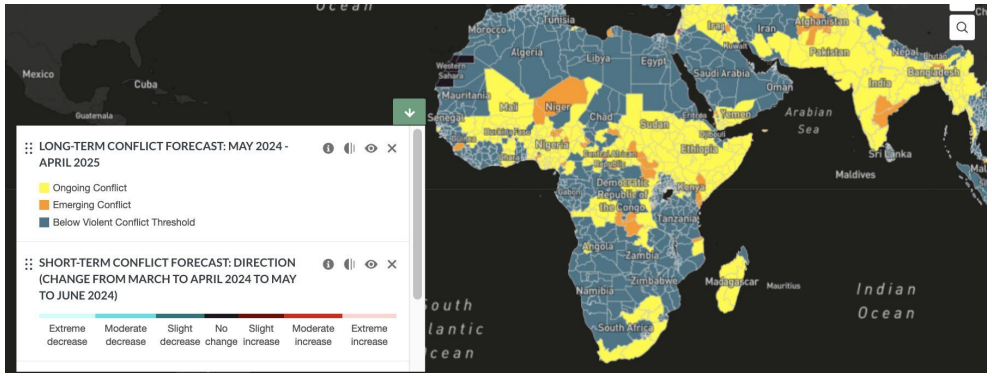


Water Peace Security
A web-based tool to predict water-related conflict hotspots.

Anticipation Hub
Learning, guidance and advocacy in anticipatory action.

EcoPeace Middle East
An organisation to promote cooperative efforts.

Case study - Water Peace & Security partnership



Water Peace Security: Global Early Warning Tool

WPS is an interactive web-based mapping tool. It uses machine learning to identify likely water-related conflict hotspots within twelve months. It also provides a time series prediction of the number, intensity and direction of conflicts in the next two months.

It combines data on rainfall, drought and crop failures with wider political, economic and social indicators, using satellite and remote sensing data and official monitoring from governments, researchers and international bodies.

Since 2018

Open-access web-based tool

Funded by Dutch and German Governments

Developers claim 86% accuracy

Existing work

WPS was launched in 2018. Users include actors from the government, development, diplomacy, military and disaster relief sectors.

Users study water-related conflict forecasts and contextual vulnerability indicators across space and time, allowing them to 'spot' conflict risks and inform decision-making and dialogue on potential actions to 'stop' water-related conflict and build peace.

WPS includes e-learning modules and a 'serious game' to support users.

Potential for development

The tool uses an open-source API to allow others to integrate their own data.

There is potential for this tool to be used more extensively, for example, in participatory approaches to capacity building and awareness raising. It can also support collaborations between stakeholders through dialogue informed by a greater understanding of water-related threats.

Expanding such tools beyond water to integrate other risks is another potential development.

Case study - Anticipation Hub

Anticipation Hub

The Anticipation Hub is a platform for knowledge exchange, learning, guidance, and advocacy around anticipatory action. Anticipatory action aims to empower communities and organisations to act earlier to prevent or mitigate humanitarian impacts before they fully unfold.

Partners include the Red Cross Red Crescent Movement, universities, research institutes, (i)NGOs, UN agencies, governments, donors, and network initiatives.

Since 2020

Virtual and in-person activities

Funded by German Federal Foreign Office

Initiatives in 60 countries

Existing work

The Hub informs the work of organisations such as the International Red Cross and Red Crescent Movement, Start Network, the World Food Programme, the Food and Agriculture Organization of the United Nations, and the United Nations Office for the Coordination of Humanitarian Affairs.

Action supported by the hub has been effective in situations of drought, flood, epidemic, extreme temperatures and population movement.

The Hub includes an 'Anticipatory Action in Conflict Practitioners' Group'. The group brings together practitioners and researchers to improve early-action programming in situations of conflict.

Potential for development

Currently most anticipatory action happens in non-conflict settings. However, those affected by conflict are often more vulnerable to climate hazards, which can in turn aggravate conflict vulnerabilities.

Further research to understand conflict sensitivity could help to extend anticipatory action efforts to conflict settings. For example, by developing tools like early action protocols and forecast-based-financing. This could also help in ensuring anticipatory action does not exacerbate conflict risks.

Case study - EcoPeace Middle East

Jordan River Valley

EcoPeace Middle East

An organisation that brings together Jordanian, Palestinian and Israeli environmentalists to promote environmental peacebuilding.

The aim is to promote cooperative efforts to protect the shared environmental heritage, through regional integration, sustainable management and water security. The organisation wishes to advance sustainable development and create the conditions for lasting peace in the region.

Since 1994

Nominated for 2024 Nobel Prize

Offices in Amman, Ramallah and Tel-Aviv

Existing work

EcoPeace's work to date includes educational work with local constituents as well as top-down advocacy projects. For example, its 'Green Blue Deal' urges governments and organisations to cooperate for sustainable development.

The Jordan EcoPark was established as a model for ecological preservation in the Jordan Valley.

EcoPeace also created the Middle East North Africa (MENA) Regional Forum to provide a safe space in the region to network, share ideas, ask questions and exchange information about climate challenges and opportunities.

Potential for development

EcoPeace is currently initiating projects for facilitating “Day After” plans, which focus on post-conflict reconstruction, and sustainable redevelopment of infrastructure in Gaza to allow international integration.

This includes initiating an Aid Hub in the West Bank and a humanitarian and economic corridor connecting Jordan, the West Bank and Gaza. The aim of the proposed corridor is to enhance regional cooperation, economic development, and humanitarian aid distribution.

EcoPeace are also planning the launch of a Young Professionals programme for 2024-25 with training on climate and diplomacy for young leaders.

Ethical considerations

Reasons to be cautious

While data and technologies can be part of solutions, they can also cause problems. Processes used to collect data can sometimes cause harm, and misinterpretation can lead to unintended consequences.

At worst, technologies and data can be mis-used. It is important for any agency or project seeking to 'spot and stop' climate vulnerabilities to be sensitive to possibilities of (inadvertently) aggravating conflict vulnerabilities or social inequality. This means taking due care over how data is collected, managed and used, and how interventions are designed.

Insights for practitioners

Ethical data collection

Data collection and storage is costly - both financially and as a source of carbon emissions. The benefits of gathering data and potential impacts on affected communities need to be carefully evaluated.

Individual level data collection, e.g., tracking movements of displaced people, entails particular ethical sensitivities, especially when vulnerable groups are involved. It is imperative to exercise safe and ethical research procedures and avoid extractive data collection practices.

Avoid misinterpretation and maladaption

False confidence in data can trigger maladaptive interventions. Poorly-informed actions to mitigate climate risks - for example, to secure resources like water - can adversely affect lives and unintentionally reinforce the risk of violence.

Integrating multiple sources and forms of data can help. In particular, interpretation of data and design of responses should include perspectives of those affected. Approaches from social sciences and complex systems analysis can be useful in comparing and analysing multiple perspectives.

Avoid mis-use of technology and data

Environmental factors such as food, water and other resource availability can be weaponised in conflicts, as seen in recent conflicts in Iraq, Somalia, Haiti and Gaza. Efforts to use technology and data to improve resource management are also creating potential susceptibility to cyber-attacks. Data on potential risks may also be mis-used politically, e.g., to justify military interventions.

Extreme caution should be exercised regarding data protection, especially in areas at risk of conflict.

Acknowledge power imbalances

Historical power imbalances exist between those collecting data and those concerned. This includes imbalances between the Global North and South, which are mirrored in the collection and use of data.

It's crucial to address barriers that perpetuate power imbalances. These include access to data infrastructure, data literacy, and issues around surveillance and privacy.

"Incorporating ‘conflict sensitivity’ into climate adaptation initiatives has been identified as a priority, alongside a broader emphasis on climate justice."

Lucy Caines, Research Associate, Cambridge Peaceshaping and Climate Lab

Directions for future research and development

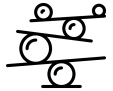
Agendas

'Spotting' technologies take advantage of growing data volumes and computational power to process it, to help predict climate disasters, related conflicts, and the need for humanitarian intervention. Meanwhile, approaches to 'stopping' conflicts and mitigating climate impacts are being developed in response to changing needs.

Researchers should seek to interrogate and improve the reliability of spotting tools and the effectiveness of stopping approaches. To achieve this, it is important to understand their limitations as well as the complex intervening and contextual factors which affect the likelihood of conflict outcomes.

This review suggests three areas of innovation for future research and development, corresponding to three categories of social innovation: social justice work, social stabilisation, work and social regeneration work (Stott, forthcoming).

Social innovation typology

Social justice	Social stabilisation	Social regeneration
		
Participatory and inclusive approaches	**Recognise complex systems**	**Embrace environmental peacebuilding**
Citizen science and co-design can help integrate different knowledge types, to better understand the links between climate, conflict, and peace. Participatory approaches can help address barriers that perpetuate power imbalances such as access to data infrastructure, data literacy, and ethical issues around privacy. Inclusive approaches to 'stopping' can empower local and marginalised actors through access to information, resources and community co-production of interventions.	Early warning systems can be used with local stakeholders and wider partners to inform conflict-sensitive adaptation, timely action, and to reduce risk of maladaption. Recognising the multi-causal and multi-directional links between climate, conflict and peace is key to effective interventions. A complex systems view acknowledges the social and climate implications of interventions over different time horizons.	'Environmental peacebuilding' combines sustainable, equitable and futureproofed approaches to rebuilding sustainable livelihoods and economies, as a basis for peacebuilding. Risks can be mitigated by monitoring and reducing tensions relating to resources or climate injustices. Joint (political and social) actions on environmental challenges can offer a route to broader cooperation between groups and states, because they can lead to the creation of institutions with wider value in peacebuilding.

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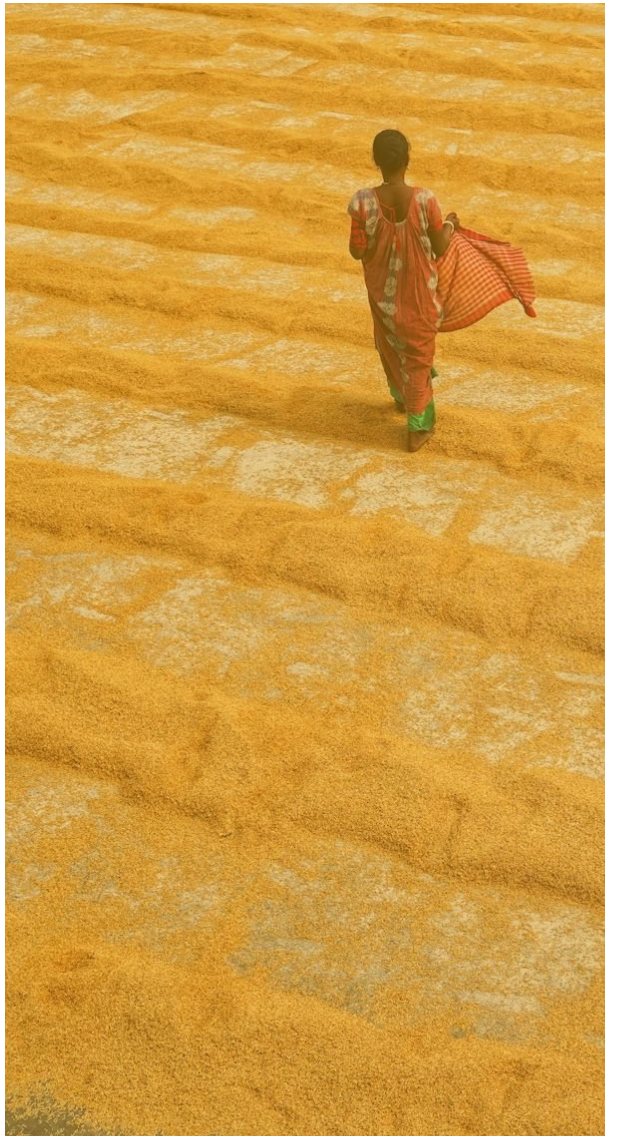


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