European Commission

The Future of Conflict Early Warning: New Technologies and Policy Impact

Workshop Proceedings

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Contents

Abstract

The workshop "The Future of Conflict Early Warning: New Technologies and Policy Impact" explored advancements in AI, data analytics, and their applications in conflict prevention. Key conclusions include the need for collaboration between policymakers and researchers to develop practical tools for early warning and response. Despite rapid advancements, challenges persist in ensuring data availability, securing funding, and translating data into actionable insights. The integration of AI-driven tools with traditional qualitative analyses was recognised as essential to balance and leverage the strengths of each approach. Overall, the workshop reinforced the importance of continued collaboration, innovative methodologies, and strategic funding decisions to advance conflict prediction and prevention.

Acknowledgements

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The Science4Peace team wishes to thank all the workshop participants who actively contributed to the success of this event, especially to the presenters and experts who provided insightful contents. Thank you to our colleagues for their support in organising the workshop.

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Executive summary

The European Commission's Disaster Risk Management Knowledge Centre (DRMKC), together with the Conflict Prevention Team of the European External Action Service (EEAS) and the Service for Foreign Policy Instruments (FPI) organised the workshop: "The Future of Conflict Early Warning: New Technologies and Policy Impact", on 19 March 2025 at the Berlaymont premises in Brussels.

In recent years, armed conflicts have become more prevalent, severe, and complex, increasingly internationalised and driven by rivalries on the global stage. Existing conflict models do not fully capture this complexity, underscoring the need for new models and tools.

At the same time, rapid advancements in AI have enabled new approaches to data extraction and risk modelling. In this context, it is essential to foster dialogue between researchers and policymakers to develop a common understanding of how emerging technologies can be used in a practical way for preventive actions.

The workshop enabled in-depth discussions between researchers and policy makers to develop a common understanding of key challenges in using data and AI in conflict early warning potential ways to address these challenges.

A survey among participating policymakers helped identifying relevant challenges and use cases and guided the discussion as well as served as an anchor for panellists from the scientific community to offer solutions.

The workshop concluded with the following take-aways:

- **Technological and Methodological Advancements:** Despite rapid advancements in predictive modelling and data analytics, challenges persist in ensuring data availability, securing funding, and translating data into actionable insights. It is essential to integrate quantitative data with traditional qualitative analyses to balance and leverage the strengths of each approach while mitigating their respective blind spots.
- **Collaboration and Engagement:** Overcoming current obstacles requires increased collaboration between policymakers and researchers. Structured engagements should align data outputs with actionable policy decisions, ensuring tools remain relevant and useful. Challenges should be categorised based on who can effectively address them.
- **Documenting Success and Learning:** Learning from past experiences is a crucial task for future research. Analysing the impacts of policy interventions and documenting successful early warning and intervention cases are key to build a stronger case for conflict prevention and help create replicable strategies.
- **Data Availability and Access:** Ensuring public access to critical data resources is vital for addressing challenges of data availability. This includes tackling funding and accessibility challenges of key data sources to support ongoing conflict analysis and prediction efforts.
- **International Conflict Dynamics:** Early warning systems must better account for international dimensions, for example by tracking indicators like diplomatic tensions and military manoeuvres or developing actor-centric models.
- **Innovative Approaches:** The workshop showcased methodological innovations, including probabilistic models to account for uncertainty in risk assessments, large-scale text analysis to identify key events like coups and human rights violations, and the use of Large Language

Models (LLMs) and network analysis to examine complex patterns in international relations. Additionally, discussions highlighted the need to explore new approaches, such as futures and systems thinking, to detect low-probability, high-impact events, or scenario modelling to anticipate impacts and formulate potential policy responses.

- **User-Friendly Interfaces:** Developing user-friendly interfaces is key to assist policymakers in understanding and acting on predictions, while enhancing data literacy among users. LLM-based chatbots can provide simple, actionable insights, complementing interactive dashboards.
- **Trust and Transparency:** Building trust in data, models, and analytical products is essential. Transparency in models and data, alongside mixed-methods approaches that combine quantitative models with qualitative analysis and expert judgment can help to reinforce credibility and trust.

In sum, the workshop highlighted the importance of continued collaboration, innovative methodologies, and strategic funding decisions to advance the field of conflict prediction and prevention. Participants acknowledged the serious challenges facing the field, such as funding cuts and program discontinuations. However, they also expressed cautious optimism about the potential for technological innovation to help address these challenges.

Participants

The event welcomed 124 registered participants, including 42 online and 82 in person. The workshop audience consisted of professionals from European Union (EU) institutions—primarily the European Commission and the European External Action Service (EEAS)—as well as representatives from non-governmental and international organizations such as the Office of the High Commissioner for Human Rights (OHCHR), the Organization for Security and Cooperation in Europe (OSCE), and the United Nations Development Programme (UNDP). Members of the scientific and academic community were also present, including speakers from the University of Cambridge, University of Pittsburgh, University College London, Peace Research Institute Oslo, the Armed Conflict Location and Event Dataset, and The Hague Centre for Strategic Studies. In addition, representatives from several EU Member States, including Belgium, Bulgaria, the Czech Republic, Finland, France, Germany, Latvia, Luxembourg, Romania and Spain, participated in the workshop.

1. Opening Statements

The workshop continues the tradition of bringing together scientists and policymakers [1] to advance conflict forecasting methods, with a focus on improving early warning mechanisms through cutting-edge research, artificial intelligence, and data-driven forecasting.

The collaboration between key stakeholders reflects a shared commitment to ensuring that scientific advancements inform decision-making at the highest levels, strengthening the science-policy interface and making research a practical tool for action.

Discussions highlighted the ongoing challenges of conflict risk assessment, which requires the integration of scientific analysis, intelligence, and policy insights. The current security landscape is shaped by various factors, including the return of interstate conflicts, climate change, and rapid technological shifts. The importance of artificial intelligence and big data in analysing alternative data sources was highlighted, along with challenges related to data access and data sustainability.

Several speakers emphasised the need for an integrated approach to conflict risk, which intersects with other crises such as food insecurity, migration, and climate-related disasters. The workshop provided an opportunity to reinforce dialogue between scientists, policymakers, and practitioners, combining expertise, policy needs, and technological advancements to enhance the capacity to anticipate, prevent, and respond to conflicts more effectively.

The importance of advancing conflict prevention through a strong intersection between science and policy was emphasised. Early warning tools must be continuously adapted and made more accessible to decision-makers, with a focus on designing user-friendly and adaptable models that can shift from early warning to early action. The development of more granular, subnational conflict risk models and specialised methodologies to assess specific threats was also highlighted.

The ultimate objective is to ensure that scientific insights translate into concrete actions, requiring the refinement of predictive models and making them practical and applicable for policymakers and practitioners. The responsible and ethical application of technological advancements, such as AI and big data analytics, is crucial to ensure that communities most at risk benefit from these developments. The EU's foreign policy instruments must integrate these technologies while keeping in mind their long-term implications.

Looking ahead, the discussion on the future of EU capabilities over the next decade is already taking shape. The ongoing review of the EU's financial framework for 2028 and beyond will define the resources and priorities available for conflict prevention. These considerations should guide discussions on how best to leverage emerging technologies for peacebuilding.

Overall, the workshop aimed to foster collaboration between scientific research and policy implementation, leveraging emerging technologies to prevent conflicts, save lives, and foster long-term stability.

2. Practical Perspectives: Current Use and Limitations of Data in Conflict Early Warning

The session opened with a discussion on bridging the gap between research and policy to enhance data-driven conflict prevention. As conflicts grow increasingly complex—driven by political, economic, environmental, and technological factors—there remains scepticism about AI and data-driven approaches due to concerns over data quality, accessibility, bias, and real-world applicability. The session aimed to explore how advanced technologies can be transformed into practical tools for early warning and response.

2.1. AI for Peace - From Prediction to Action

The increasing role of AI in conflict early warning is widely recognised, but its application to real-world policy and action remains a challenge. The year 2024 has been marked by unprecedented global turmoil, with conflicts increasing in both scale and intensity. Statistics highlight a rise in civilian casualties, the growing impact of technology in warfare, and an increasing number of active conflicts, making the need for effective early warning systems more urgent than ever.

Several key trends in conflict prediction were discussed. Machine learning has shown promise in forecasting political violence, but it struggles to predict the onset of new conflicts, particularly in previously peaceful societies. Current predictive models work best in regions already experiencing instability, but understanding how conflicts emerge in stable areas remains a challenge. Improved data collection, enhanced transparency in AI models, and a stronger integration of predictive analytics with human expertise are needed to support decision-making.

The gap between early warning and early action remains a persistent challenge, with policy responses often being reactive rather than preventive. Funding shortages for anticipatory action and resistance to algorithmic decision-making among policymakers hinder the effectiveness of predictive models. A deeper integration of AI in conflict prediction is necessary, ensuring ethical considerations, transparency, and contextual adaptability.

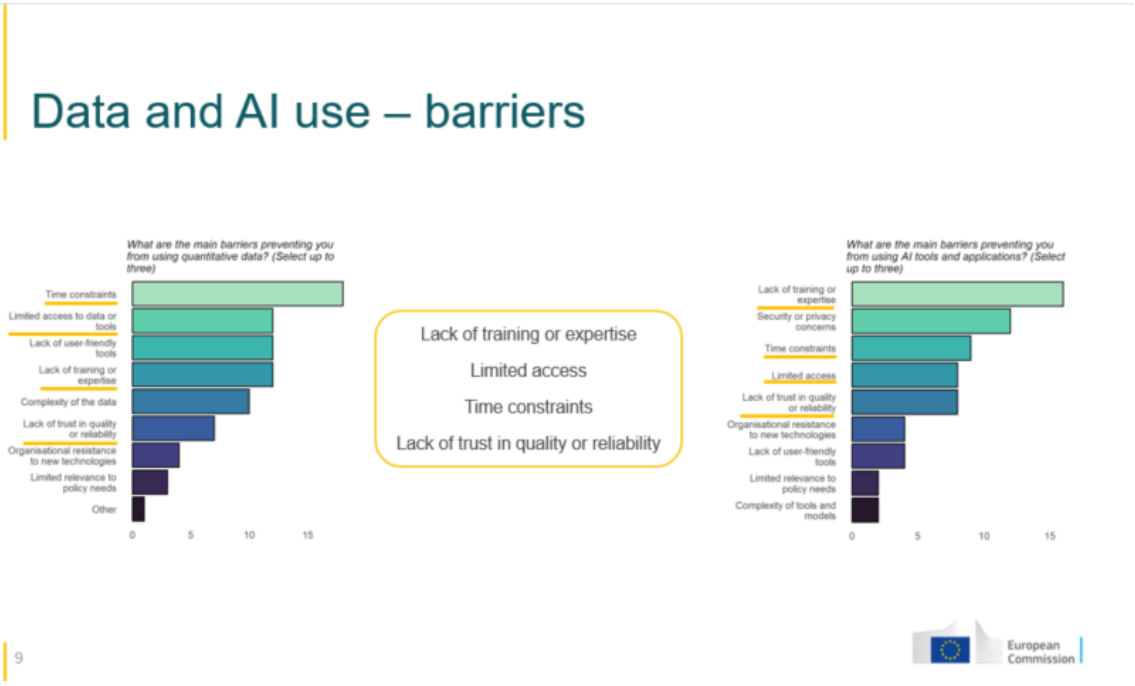
2.2. From Data to Action: Aligning Conflict Early Warning Tools with Policy Needs

The European External Action Service (EEAS) and the Joint Research Centre (JRC) presented their approach to conflict analysis and early warning, which includes the use of tools such as, country briefs, and horizon scanning. Their work consists of two main elements: identifying countries at risk of instability and violent conflict, and developing systematic, integrated, and coordinated EU joint conflict analyses to inform early action. The objective is to prevent conflicts before they escalate, aligning with EU values of peace promotion and recognising the economic and security benefits of prevention.

A survey of policymakers revealed that while most respondents use quantitative data regularly, the adoption of AI tools remains low due to barriers such as limited access to relevant data and tools, lack of training and expertise, and concerns about data quality and reliability. Policymakers face challenges such as time constraints, limited access to tools, and a lack of user-friendly solutions. There is a strong demand for automation and better integration of data tools into their workflow, including reports and briefings.

The session concluded by emphasising the need for more accessible, user-friendly, and time-efficient tools to support policymakers in early warning and conflict prevention. Addressing these gaps is essential to enhance data-driven decision-making and strengthen AI adoption in conflict analysis.

Figure 1. Main barriers to data and AI use



Source: workshop presentation: From Data to Action: Aligning Conflict Early Warning Tools with Policy Needs

3. Tech Innovations in Conflict Early Warning: Text Mining, Event Extraction, and Next-Generation Models

This session explored the recent technological and methodological advancements in conflict early warning. The focus was on how innovations in artificial intelligence, text mining, and event extraction are reshaping the way we predict and respond to conflicts. The session emphasised how these advancements can have practical applications in real-world scenarios.

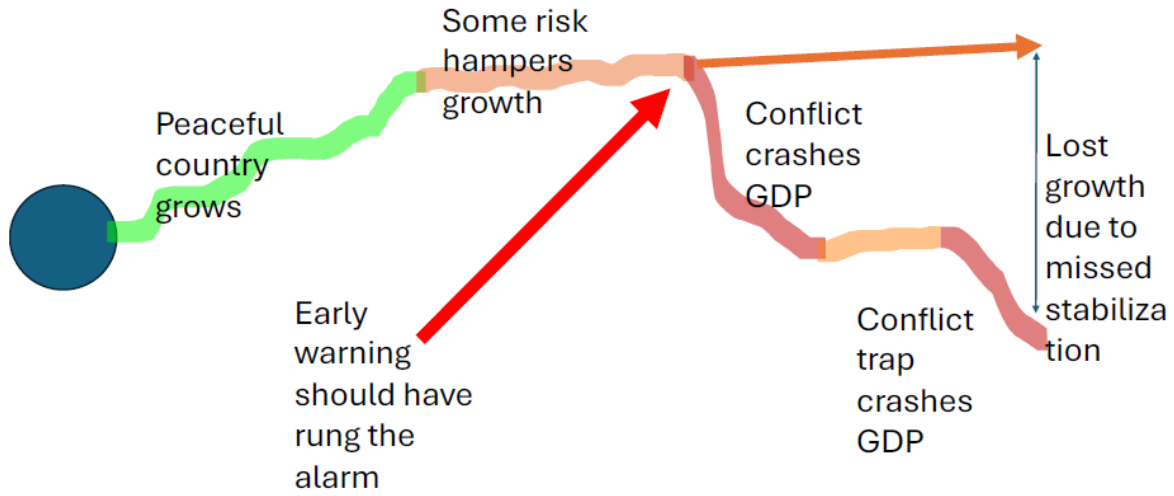
3.1. Forecasting Conflict and Political Instability using News Text: An Overview

The economic implications of conflict prediction are significant, as instability can deter investment and trade, reducing economic growth. The conflict trap suggests that once conflict occurs, it sets off a chain reaction that prevents a return to stable economic conditions. A study conducted with the International Monetary Fund (IMF) [2] found that $1 invested in conflict prevention can save up to $103 in future costs, highlighting the economic value of early intervention.

AI can play a crucial role in event detection and early warning by analysing vast amounts of news data to identify key events and anomalies. Natural language processing (NLP) tools can detect and predict events such as coups by analysing millions of news headlines and extracting patterns from them. The technique of "few-shot learning" allows AI models to detect early signals of instability by comparing new news headlines to established patterns of past events.

However, building reliable databases for both events and policy responses remains a challenge. The lack of comprehensive and accurate data on policy measures limits the effectiveness of early warning systems. Continuous development in both data collection and AI modelling is necessary to improve conflict prediction and intervention strategies.

Figure 2. Economic costs of conflict risk



Source: workshop presentation: Forecasting Conflict and Political Instability using News Text: An Overview

3.2. From Risk to Prevention: Human Rights-Based Early Warning and Predictive Analysis

Human rights play a critical role in conflict early warning and prevention. Integrating human rights considerations into conflict prediction models provides a broader perspective that includes social, political, and economic factors that can drive conflict. Human rights provide a valuable lens for identifying early warning signs at the stage just before a conflict escalates.

New technologies, such as media monitoring tools powered by language models, help track trends in issues like hate speech, discrimination, and incitement to violence, enabling the identification of rising tensions in real-time. The Cassandra Model, a pilot initiative, links human rights indicators to conflict risk factors using machine learning to analyse historical data and identify patterns that precede conflicts.

However, challenges remain, including gaps in disaggregated data and the need for data verification and transparency. AI-driven insights must be contextualised and thoroughly validated before they can be trusted for decision-making. The importance of explainability in models is also emphasised, as policymakers must be able to understand how and why a model arrives at a particular conclusion.

Figure 3. Human rights violations as a potential early warning sign of conflict

Source: workshop presentation: From Risk to Prevention: Human Rights-Based Early Warning and Predictive Analysis

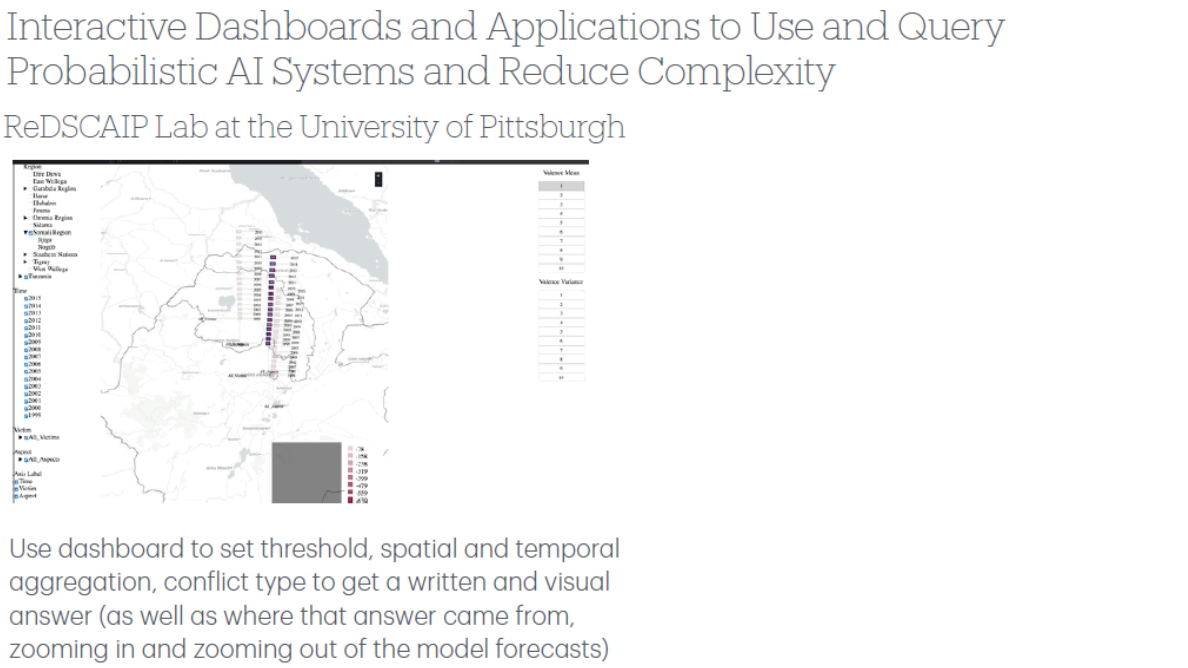
3.3. AI Without Artificial Certainty: An Overview of the Benefits of Forecasting Conflict Fatalities With Uncertainty

Incorporating uncertainty into conflict fatality forecasts is essential, as traditional models that produce single "point predictions", such as a fixed number of fatalities, fail to account for the inherent uncertainty in such forecasts. By introducing probabilistic models, which allow for the representation of uncertainty and multiple potential outcomes, these models could answer more nuanced questions for policymakers. For example, rather than providing a single estimate for fatalities, probabilistic

models can offer a range of possibilities, including the likelihood of fatalities exceeding specific thresholds over time and across different geographic regions.

Key benefits of these models include the ability to simulate scenarios, understand the risks of severe outcomes, and inform decision-making with greater flexibility. In conflict forecasting, this becomes crucial in managing asymmetric risks, where the potential consequences of conflict escalation are much more severe than the potential benefits of peaceful outcomes. The presentation also discussed the importance of user-friendly interfaces that allow policymakers to interact with complex probabilistic models, making it easier for them to integrate forecasting into their decision-making processes. Overall, probabilistic forecasting enhances the capacity to anticipate and manage conflicts by providing clearer insights into uncertainty and its potential impact on future events.

Figure 4. Screenshot of interactive dashboard to visualise forecasts with uncertainty



Source: workshop presentation: AI Without Artificial Certainty: An Overview of the Benefits of Forecasting Conflict Fatalities With Uncertainty

3.4. AI-Driven Conflict Early Warning: Transforming Data into Actionable Policy

Developing AI-driven conflict forecasting tools that are directly applicable to policymaking is a significant challenge. Early attempts at forecasting violent conflict with tools like random forest models received little attention from policymakers, revealing a disconnect between the technical complexity of the models and the practical needs of decision-makers.

Uncertainty is a central concern for many users, and policymakers want to understand not only the likelihood of conflict but also its broader consequences, such as social and economic impacts. However, addressing these needs is difficult due to challenges in data availability and the complexity of forecasting the impact of conflict.

Stakeholders often do not have a clear idea of what they need from forecasting tools, and there is a significant demand for the ability to develop scenarios and simulate the cost of inaction in conflict situations. Ongoing efforts to improve data sources, enhance the quality of forecasts, and develop more user-friendly interfaces for decision-makers are essential. Continuous dialogue between model developers and users is necessary to ensure that forecasting tools meet the practical needs of policymakers.

3.5. Q&A Session

The discussion focused on the reliability of data used for conflict prediction models, the role of forecasting tools as decision support rather than replacements for human judgment, the integration of policy lessons into models, and the need for improved data structures and accessibility.

One key issue was the quality of media data used on conflict monitoring and forecasting and how to improve the information underlying conflict prediction models. While news sources provide vast amounts of information, they should not be treated as perfect ground truth. Machine learning models rely on averaging diverse sources to mitigate biases, and forecasting tools should be seen as complementary aids rather than substitutes for human expertise. The idea that flawed data necessarily leads to flawed models was challenged, as different models can extract useful insights even from noisy inputs. Models are complementary to human decision making, and effective collaboration between data producers, modellers, and policymakers is crucial for refining these systems.

Another point raised was the challenge of linking early warning with early action by incorporating lessons learned from past interventions. While studies exist on the effectiveness of certain policies like power-sharing agreements and job programs, there is no systematic way to integrate this knowledge into predictive models. A call was made for structured databases of past policy interventions, as this would help researchers study which policy responses work best. Advances in actor-based and geospatial modelling were highlighted as promising developments, but further investment and data-sharing are necessary to fully leverage these approaches.

The conversation also touched on the type of data needed to improve models. Ideally, structured datasets with dates, locations, and descriptions of enacted policies would be available. However, even rough textual data could be processed with modern tools to extract meaningful insights.

Concerns were raised about the usefulness of complex dashboards and whether natural language queries could make insights more accessible. While efforts are being made to develop such interfaces, challenges remain in disambiguating place names and structuring responses effectively. Additionally, a broader discussion emerged about whether existing forecasting models focus on the right indicators. Metrics like fatalities may not always capture the full picture of conflict dynamics, which involve many other critical factors. Improving data quality and developing more nuanced modelling approaches were seen as essential steps forward.

4. Panel discussion: Bridging Science and Policy: Maximising Research Impact

The panel discussion focused on bridging the gap between science and policy in conflict early warning and prevention. The representatives from various organizations, including the International Crisis Group, the European External Action Service, Armed Conflict Location & Event Data, the German Federal Foreign Office, and the Peace Research Institute Oslo, discussed the challenges and opportunities in using new technologies to navigate the current international environment and mitigate the impact of funding cuts.

One of the key challenges highlighted was the need to address shrinking budgets, particularly in relation to data collection, which is foundational for any quantitative early warning system. Research and innovation play a crucial role in helping to prioritise and allocate limited resources more effectively. Interdisciplinary collaboration is also essential to ensure that the latest research can be more effectively translated into policy and practice.

The panellists emphasised the importance of reliable conflict data, which is valuable but difficult to obtain due to manipulation by actors on the ground. Machine learning can speed up conflict analysis, but it must be used cautiously due to data limitations and other modelling challenges. The true value of conflict data lies in its ability to provide experts with diverse information to assess, interpret, and prioritise risks for policymakers. The panellists emphasised the importance of documenting successful cases where early warning led to action, helping to build a stronger case for conflict prevention.

Ensuring that conflict prevention remains a priority within the EU's financial framework is increasingly challenging, particularly in the face of funding gaps and resource constraints. Early warning tools are critical in helping prioritise where action is most needed and where the EU can bring added value. Particular attention is needed for monitoring interstate conflicts, which are on the rise, as well as for anticipating low-probability, high-impact escalations. Risk factors such as water access and resource management are especially important to track in this context.

Usability remains a key issue. The discussion also highlighted the need for early warning systems to be more user-friendly and accessible for policymakers. Many desk officers lack data literacy, making it crucial for early warning tools to be intuitive and easily digestible.

A key lesson from operational experience is that forecasting alone is not sufficient. Policymakers also need context: who is involved, where the conflict is happening, how many people are affected, and what types of violence are occurring. Tools need to address these follow-up questions rather than stopping at basic event prediction.

Close collaboration between data scientists and conflict analysts is essential to ensure that models reflect real-world dynamics. Analysts with deep regional knowledge help refine predictions, making them more useful before they are presented to policymakers.

The definitions used to categorise conflict also need to be updated. Traditional classifications—such as state vs. rebel groups—are no longer sufficient in capturing contemporary dynamics, which often involve non-state actors targeting civilians. Without adapting models to reflect these realities, important conflict dynamics risk being overlooked.

To become truly effective, forecasting systems must be not only accurate but also perceived as trustworthy and useful in decision-making processes. There is potential for forecasts to support not just early warnings but also resource allocation. However, significant gaps in sustainable funding remain. Despite growing reliance on such tools, long-term investment is still lacking, especially when

compared to the private sector's investment in AI. Without adequate infrastructure and financial support, the full potential of these systems cannot be realised.

Shifts in funding and data collection challenges are impacting conflict forecasting. Incorporating uncertainty into models and closer collaboration with data providers can improve reliability. Trust in forecasts varies, with some decision-makers relying more on human-collected intelligence, and data access is increasingly restricted, highlighting the need for sustainable data strategies.

Long-term funding remains a concern, and forecasting must evolve beyond fatality counts to capture conflict dynamics. Economic and private-sector data offer valuable insights but face privacy and access hurdles, calling for stronger partnerships.

Lessons from climate and pandemic forecasting emphasise the importance of clear communication of uncertainty. Conflict forecasting must balance transparency with political sensitivities, maintaining confidentiality where needed. Integrating quantitative data with qualitative analysis and improving data verification are essential.

Finally, the effectiveness of early warning depends not only on technical accuracy but also on political will and institutional readiness to act on forecasts. These tools primarily support coordinated government interventions rather than individual decisions.

5. Global Dimensions: Bringing International Conflict into Early Warning Systems

This session addresses a growing challenge in conflict early warning: the increasing role of interstate tensions and external interventions in conflicts. Traditional models have focused on internal conflict dynamics, incorporating structural drivers such as climate change, demographics, and socio-economic conditions. However, recent geopolitical shifts, including conflicts in Ukraine and the Middle East, highlight the need for early warning systems that can integrate international conflict dynamics. The presentations in this session focus on bridging this gap by enhancing our ability to track and predict internationalised conflicts, ensuring policymakers can better anticipate and respond to escalations in today's complex geopolitical environment.

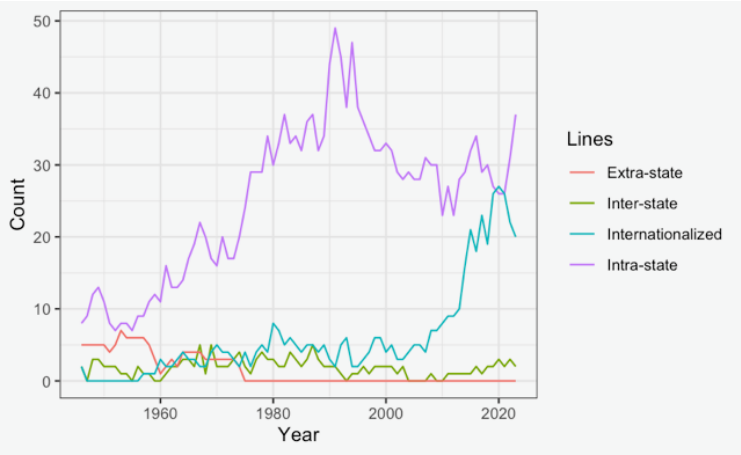
5.1. International Relations and the Internationalisation of Internal Conflicts

This presentation emphasises the growing interdependence of internal and international conflicts, arguing that conflict early warning must consider both dimensions simultaneously. The speaker highlights a significant trend: most modern conflicts involve some degree of international intervention. Using data from the Uppsala Conflict Data Program (UCDP), the presentation shows that in the past 10–15 years, the number of internationalised intrastate conflicts—where external states actively participate—has risen sharply. These conflicts tend to be more intense and longer-lasting than purely internal conflicts.

The speaker outlines key factors driving internationalization, including humanitarian concerns, spillover effects, strategic interests, and geopolitical rivalries. The involvement of external actors is often shaped by political, economic, or ethnic ties, as well as the broader international system's structure. Certain conflicts illustrate how rival states frequently support opposing sides, further prolonging and intensifying violence.

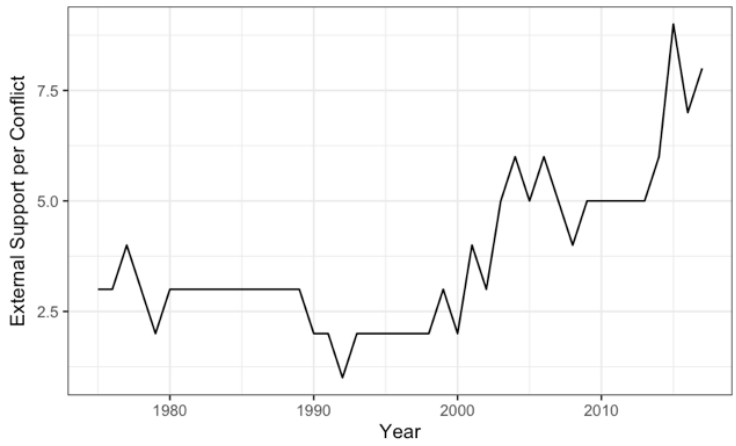
From a methodological perspective, the speaker discussed challenges in modelling and predicting internationalised conflicts. Traditional approaches rely on direct observations of armed confrontations, while newer methods incorporate latent indicators, such as trade relationships, diplomatic interactions, and arms transfers. The integration of event-level data, including news reports and international speeches, offers additional insights into shifting geopolitical tensions. Conflict early warning must move beyond a narrow focus on domestic factors to incorporate international conflict dynamics. Improving data collection and modelling techniques is essential for developing effective conflict early warning systems that can predict and mitigate modern conflicts.

Figure 5. Increase of internationalised conflict



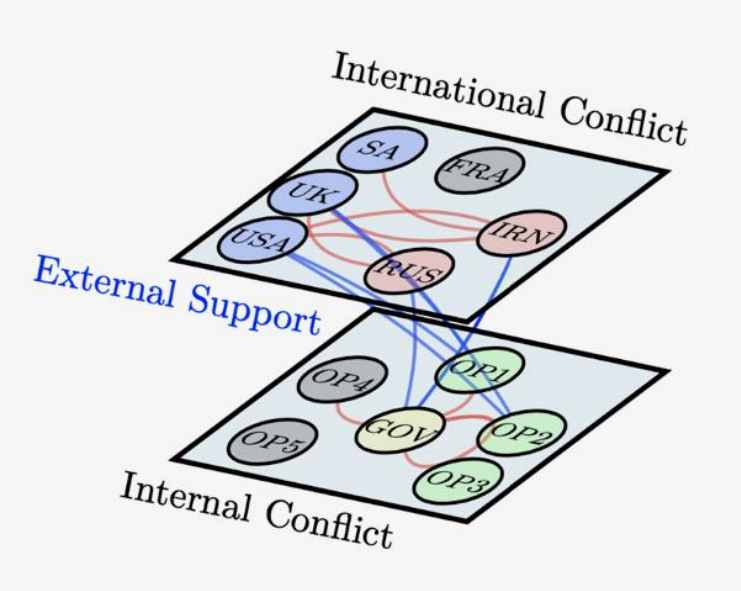
Source: Davies, Shawn, Garoun Engström, Therese Pettersson & Magnus Öberg (2024). Organised violence 1989-2023, and the prevalence of organised crime groups. Journal of Peace Research 61(4).

Figure 6. External Support in Armed Conflicts



Source: Meier, Vanessa, Niklas Karlén, Therése Pettersson & Mihai Croicu (2023). External Support in Armed Conflicts. Introducing the UCDP External Support Dataset (ESD), 1975-2017. Journal of Peace Research 60(3).

Figure 7. Linking internal and international conflict. Red and Blue lines represent external support.



Source: Meier, Vanessa, Niklas Karlén, Therése Pettersson & Mihai Croicu (2023). External Support in Armed Conflicts. Introducing the UCDP External Support Dataset (ESD), 1975-2017. Journal of Peace Research 60(3).

5.2. Beyond Borders: Monitoring Interstate Conflict in a Changing World

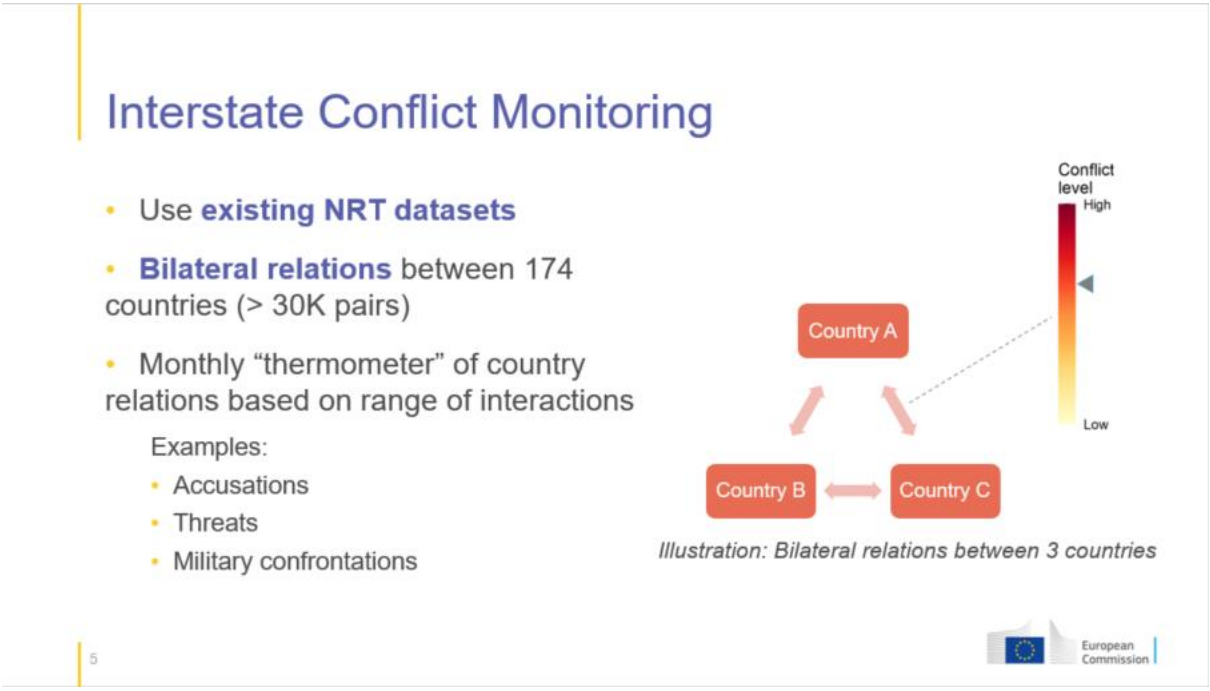
The integration of interstate conflict dynamics into early warning models is crucial, as direct conflicts between states are resurging and internal conflicts are becoming increasingly internationalised. Traditional conflict prediction models, which focus on domestic risk factors, are becoming inadequate due to the growing influence of global geopolitical rivalries.

A significant gap in current models is the lack of data on external state behaviour and relationships between countries. While event-based data sources provide near real-time information on battles and attacks, they offer limited insight into the broader geopolitical context. To address this, a systematic approach is being developed to measure interstate tensions, even at early stages before violence occurs, by tracking diplomatic disputes, threats, and military manoeuvres.

The goal is to monitor tensions between states on a monthly basis, analysing bilateral relationships between countries to identify patterns of increasing hostility. An index, or "thermometer," of interstate tensions is being constructed, categorising interactions from diplomatic accusations to outright military confrontations. This index is built using multiple datasets, including monthly conflict event records, weekly updates on violent and non-violent events, and an automated event extraction system from news sources. Recent experiments leveraged large language models (LLMs) to re-classify event data, successfully assigning incidents to categories more suitable for the study of interstate conflict. Early results were promising, suggesting that AI can effectively identify specific types of events from raw text data.

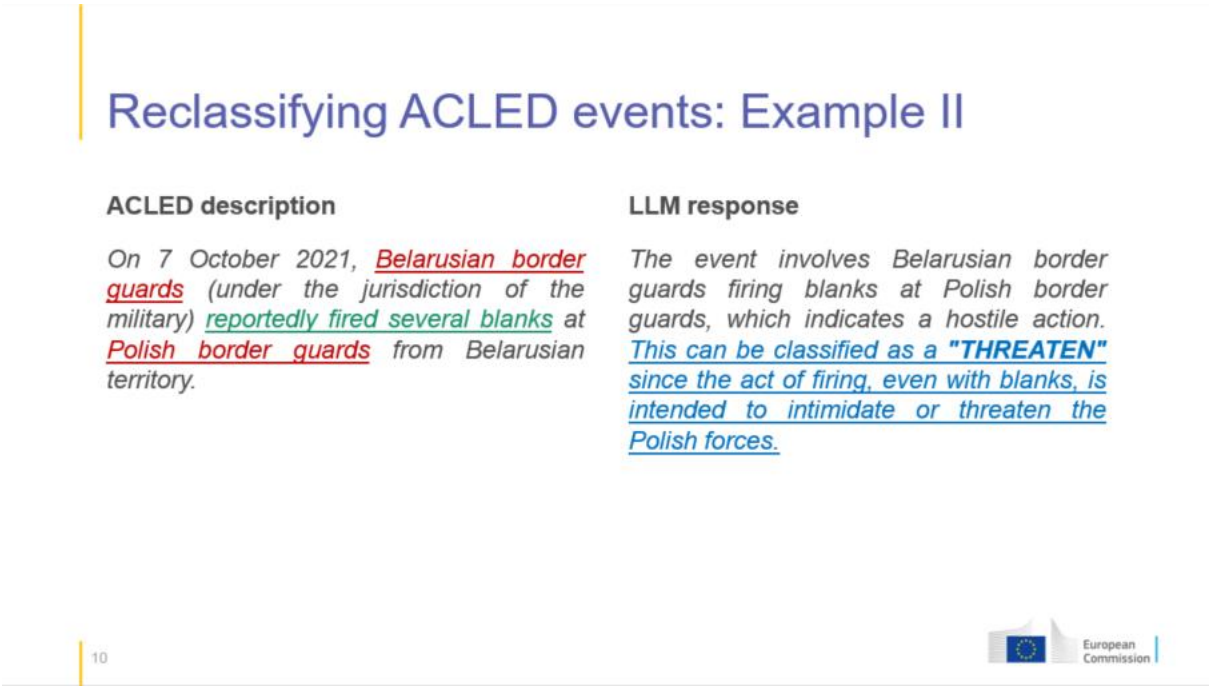
Future steps include expanding the data sources, refining the AI-based classification system, and integrating the new tension index into existing conflict prediction models. By systematically tracking global tensions, this approach could enhance the ability to anticipate conflict escalation and improve early warning systems.

Figure 8. Monthly thermometer of country relations



Source: workshop presentation: Beyond Borders: Monitoring Interstate Conflict in a Changing World

Figure 9. LLM-based reclassification of ACLED data, example



Source: workshop presentation: Beyond Borders: Monitoring Interstate Conflict in a Changing World

5.3. Meet GINA: Data-driven Geopolitics

GINA (Geopolitical Interactive Network Analysis) is a project that analyses economic, diplomatic, military, and media data to monitor geopolitical trends. This initiative focuses on measuring interstate interactions in real time rather than solely predicting conflict.

The primary objective is to predict conflict onset, which is a challenging task due to the lack of early indicators. Traditional forecasting models struggle with timing escalation, making it essential to enhance observational capabilities. By improving real-time analysis, the "interstate prediction gap" and the "data gap" can be bridged.

The approach consists of four key tools that provide a multidimensional perspective on global interactions. These tools focus on diplomatic engagement,[1] informational interactions,[2] military interactions,[3] and economic engagements.[4] These tools share the same backend, database, and infrastructure, allowing for seamless integration and analysis across domains. This network-based approach enables users to track interactions between states over time, visualise geopolitical relationships, and combine multiple dimensions for a more comprehensive understanding of global dynamics.

The methodology integrates advanced Natural Language Processing (NLP) techniques, such as Named Entity Recognition to identify states, sentiment analysis for assessing news and speech data, and topic modelling for clustering related content. Additionally, network science methods help identify diplomatic and economic blocs, community structures, and shifts in international alliances. One application of this analysis has been mapping global trade blocs and evaluating the stability of diplomatic alignments.

The tools have interactive features, allowing users to analyse diplomatic relations based on speech or voting behaviour. Future versions will expand these capabilities to trade and speech data for a more comprehensive analysis.

An AI-powered agentic model is also being developed, which allows users to interact with the geopolitical network through natural language queries. This system converts user queries into database searches using a graph database, retrieves relevant data, and generates responses based on structured geopolitical insights. This technique, known as Retrieval-Augmented Generation (RAG), ensures accuracy by relying on dedicated data sources rather than generalised language models.

The next development phase will focus on integrating predictive elements, potentially through scenario-based forecasting rather than deterministic predictions. By leveraging real-time observational data, the goal is to enhance geopolitical analysis and provide deeper insights into state interactions, speech patterns, and economic shifts.

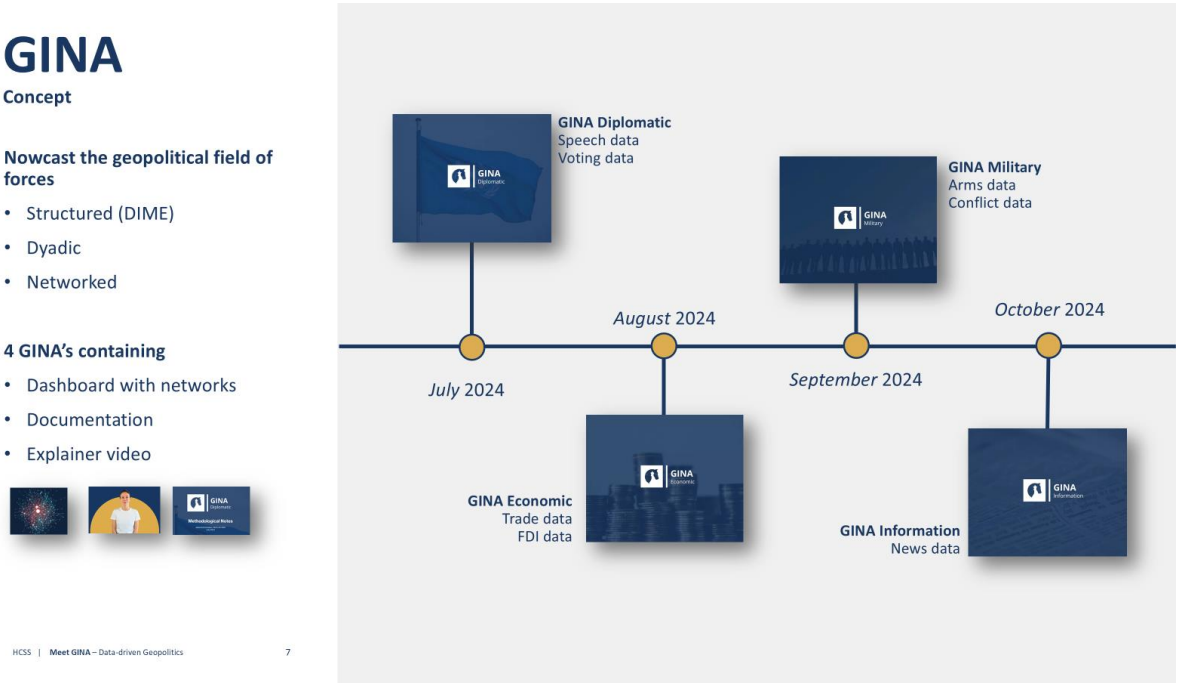
[1] GINA Diplomatic

[2] GINA Information

[3] GINA Military

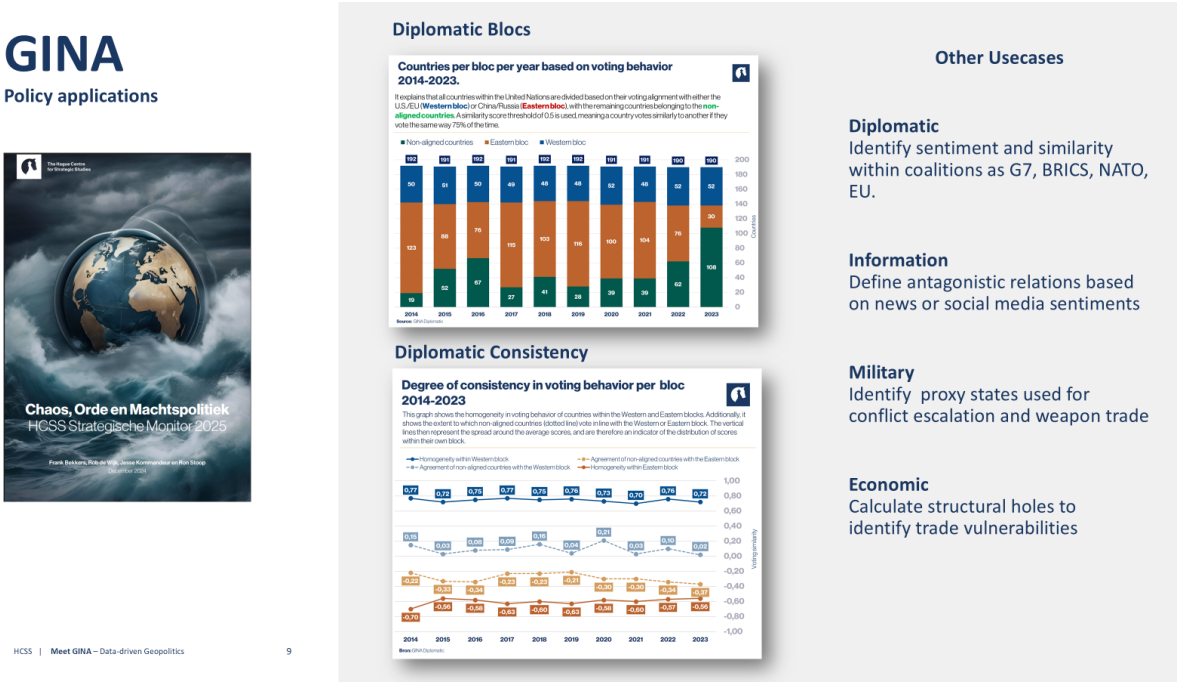
[4] GINA Economic

Figure 10. Geopolitical Interactive Network Analysis (GINA): four key tools



Source: workshop presentation: Meet GINA: Data-driven Geopolitics

Figure 11. Analysing geopolitical trends over time: UN voting behaviour



Source: workshop presentation: Meet GINA: Data-driven Geopolitics

5.4. Q&A Session

The discussion covered the value of data visualization for decision-making, the limitations of forecasting tools, and the importance of integrating geopolitical, economic, and internal factors into conflict prediction models. A key takeaway was the importance of systematic monitoring and structured databases in improving early warning systems.

While some elements of conflicts could be identifiable in advance, refining predictive models requires better integration of historical trends and causal relationships. The feasibility and usefulness of large-scale conflict prediction was also questioned, with suggestions to focus instead on preparing policy responses through scenario simulations.

Another key point was the need for tailored forecasting models that allow policymakers to select relevant variables, such as economic or diplomatic data. The potential of integrating parliamentary transcripts with international diplomatic discourse was highlighted as a promising approach for identifying trends.

Challenges in accessing reliable data were also discussed, particularly regarding disruptions to data streams and historical records. The issue of hybrid threats was raised, with a focus on embedding relevant concepts into knowledge graphs for improved querying. While some tools are open source, advanced features linked to large language models come with computational costs that need further consideration.

Finally, concerns were expressed about understanding the true triggers of interstate conflict. Beyond military movements, factors such as political legitimacy, economic competition, and dispute settlement mechanisms were identified as crucial. Strengthening international and bilateral peace-building institutions was suggested as a necessary step toward better conflict prevention.

6. Interactive Group Discussion

The afternoon session featured interactive group discussions that addressed several key topics based on specific questions posed to participants (see Annex: Working group discussion questions). These included identifying the most promising technological innovations for conflict early warning and prevention, strategies for their effective integration into policy workflows, limitations and safeguards related to quantitative data and AI in early warning systems, methods to measure success and effectiveness of early warning tools, relevant indicators for monitoring interstate conflict, and concrete steps to bridge the gap between scientific research and policymaking.

Regarding **the most promising innovations for conflict early warning and prevention**, automated text mining emerged as particularly valuable. Among other things, such data could be used for addressing information asymmetry, especially when combined with data such as Member States' speech behaviours, voting patterns, and televised statements. Expert judgment remains crucial for validating automated findings. For prediction and decision support, participants emphasised adaptable tools tailored to specific needs, whether humanitarian or conflict related. Scenario modelling was highlighted as an effective method to convert complex data into actionable insights. While platforms like ACLED/GINA+ can aid prediction and monitoring, participants cautioned against oversimplification, emphasizing the importance of managing expectations and involving human intermediaries or "data translators" to enhance usability.

Effective policy integration of these tools into existing workflows such as daily briefs and crisis coordination meetings requires building trust among users. This can be achieved through benchmarking model outputs against multiple sources, establishing clear standards, enhancing policymakers' data literacy, improving model transparency, and fostering open dialogue. Potential barriers include the risk of oversimplification and expectation management. These challenges highlight the important role of intermediaries who can help to translate complex outputs into actionable decisions. Suggested solutions included the quantification of alternative scenarios and positioning these tools as supplementary resources rather than exclusive decision-making bases.

Addressing **limitations of data-driven early warning and AI,** participants highlighted several key challenges, including persistent gaps in available data, the lack of real-time information aligned with policy needs, a disconnect between academic research and operational priorities, and misaligned incentives that discourage academic contributions to the development of practical early warning tools. Additional concerns included over-reliance on qualitative data and challenges in human-machine interactions, alongside accountability risks. Mitigation strategies proposed were enhancing data contextualization for better interpretability, structured engagements between scientists and policymakers, increased funding for operational research, and improved data-sharing mechanisms like CRAF'd.

Measuring the success and effectiveness of early warning tools poses challenges, particularly when evaluating their added value in preventing conflict. Success assessments require broader evaluations rather than "cherry-picking" isolated cases, clear explanations of tool functionality, and transparency of research findings. Participants emphasised understanding and communicating the actual influence of these tools on policy decisions as essential for accurate assessment.

For **indicators relevant to monitoring interstate conflict,** the discussions emphasised tracking international dimensions beyond physical confrontations. Identified indicators included escalatory rhetoric between states, increased militarization, and political leaders' demonstrated appetite for conflict. Timeliness and accurate scope of these indicators were noted as vital, as delayed recognition

often limits preventive action potential. Analysing actor networks and understanding underlying conflict drivers were also highlighted as critical areas.

Finally, **bridging data-driven insights and preventive action** requires concrete steps from both scientists and policymakers. Participants discussed how joint and independent actions could maximise the usefulness and impact of data-driven insights, ensuring their effective integration with other information sources, especially within an increasingly challenging international environment. Collaboration should involve structured engagements, joint development of standards, and efforts to align scientific outputs with actionable policy decisions.

7. Closing statements

The workshop concluded with a reflection on the rapid progress in conflict prediction and prevention, highlighting the challenges that remain in ensuring data availability, securing funding, and addressing political will. The importance of collaboration between policymakers and researchers was emphasised.

A key takeaway was the need to categorise challenges based on who can effectively address them, structuring them in a more actionable way to facilitate stakeholder coordination. The increasing commercialization of data sources and the tension between regulatory efforts and private company advancements were also discussed, underscoring the need to strike a balance between innovation and public influence over critical data resources.

The importance of trust in data, models, and analytical products was stressed, with a call for transparency in data sourcing, coding, and analysis to ensure credibility and informed decision-making. The need for integrating mixed methods, looking beyond conventional prediction models, and exploring novel approaches such as futures and systems thinking was also highlighted.

The declining availability of funding for humanitarian and development-related data was raised as a pressing concern, with a discussion on the potential role of European institutions in addressing these funding gaps. Despite challenges, there was also a sense of optimism, with a call to prioritise flexible and innovative research approaches and to ensure continued collaboration, innovative methodologies, and strategic funding decisions.

The workshop served as a valuable space for bringing together different perspectives, and the concluding remarks emphasised the crucial role of scientific work in informing policy, despite challenges in implementation. The importance of learning from past experiences, documenting successful interventions, and refining existing early warning and early action mechanisms was noted. The need for responsible use of technology and ensuring its alignment with the needs of policymakers was also stressed.

The closing statements ended on a note of optimism, with a commitment to supporting and advancing analytical tools, and an invitation to explore the possibility of forming a community of practice to sustain the dialogue beyond formal workshop settings. The goal is to establish a regular exchange platform focused on new developments and lessons learned in the field, fostering mutual understanding and maximising the practical use of conflict prediction and prevention tools.

8. Conclusions

Looking ahead, the hope is that the ideas and connections established during this event will support ongoing and future research efforts and lead to tangible joint initiatives. Participants were encouraged to stay engaged, and to jointly explore new opportunities to collaborate in leveraging technology to enhance conflict early warning systems. Establishing collaborations with relevant actors is crucial for identifying common goals, exploring synergies, and avoiding duplication of efforts. Some of these dialogues on potential collaborations are already underway.

Regular exchanges and brainstorming around each other's projects were encouraged, with the goal of building a network of experts committed to advancing early warning initiatives. The event concluded with gratitude to all involved and anticipation of future collaborations.

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List of abbreviations and definitions

Abbreviations	Definitions
ACLED	Armed Conflict Location & Event Data
AI	Artificial Intelligence
CCVI	Climate-Conflict Vulnerability Index
COVID-19	Coronavirus disease
CRAF'd	Complex Risk Analytics Fund
DG HOME	Directorate-General for Migration and Home Affairs of the European Commission
DRMKC	Disaster Risk Management Knowledge Centre
E.1	Disaster Risk Management Unit of the JRC
EEAS	European External Action Service
EU	European Union
FEWS NET	Famine Early Warning Systems Network
FPI	Service for Foreign Policy Instruments of the European Commission
GDELT	Global Database of Events, Language, and Tone
GFFO	German Federal Foreign Office
GINA	Geopolitical Interactive Network Analysis
GPPi	Global Public Policy Institute
HCSS	The Hague Center for Strategic Studies
ICG	International Crisis Group
IMF	International Monetary Fund
JRC	Joint Research Centre of the European Commission
LLM	Large Language Model
NLP	Natural Language Processing
OHCHR	Office of the High Commissioner for Human Rights
PCM.2	Peace, Security and Defence Partnerships Division of the European External Action Service
POLECAT	POLitical Event Classification, Attributes, and Types
PRIO	Peace Research Institute Oslo
RAG	Retrieval-Augmented Generation
UCDP	Uppsala Conflict Data program
UN	United Nations
VIEWS	Violence and Impacts Early Warning System

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Annex: Working group discussion questions

Q1.1. The Most Promising Innovations for Policy

Based on today's presentations and discussions, which new tools and technologies (e.g., automated text mining, large language models, new modelling approaches) have the greatest potential to identify, prioritise, and assess the risk of violent conflict? Which are most suited for short-term implementation, and which could shape policymaking over the long term?

Q1.2. Effective Policy Integration

How can the tools and technologies presented today be effectively integrated into existing policy workflows (e.g., daily briefs, crisis coordination meetings), and what potential barriers might hinder their adoption or reduce their effectiveness?

Q2.1. Addressing Limitations of Data and AI

What are the main limitations of data-driven early warning, and which safeguards or strategies could help mitigate these challenges?

Q2.2. Measuring Success

What challenges do we face when measuring the added value and effectiveness of early warning tools in preventing conflict, and how can we address them? Which metrics or qualitative indicators can reliably demonstrate these tools' real-world impact?

Q3.1. Indicators for Inter-State Conflict

Which international dimensions of conflict are most relevant for policy makers to track and which potential data sources can we use for them? How can we adapt early warning systems to monitor international developments more effectively?

Q3.2. Bridging Data and Preventive Action

What concrete steps can scientists and policymakers take (jointly and independently) to maximise the usefulness and impact of data-driven insights and ensure their effective integration with other information sources, especially in an increasingly challenging international environment?

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