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Practices, Principles and Promises of Conflict Early Warning Systems

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Executive Summary

Background

This report examines practices, principles and promises of Early Warning based on a review of the academic literature; an analysis of a set of eleven Early Warning Systems currently deployed by governments, international organisations, non-governmental organisations and research institutes; interviews with internal stakeholders and five organisations that run Early Warning Systems or pilot programmes; and expert analysis. The explicit purpose of this report is to distil the most important insights to be considered in the design of a Conflict Early Warning System.

Definitions, Definitions, Definitions

Reflection on the practices, principles and promises of Early Warning requires, first and foremost, definitions of the key concepts Early Warning, Early Warning System and Conflict Early Warning System. Concise working definitions are the following:

- Early Warning (EW) is a timely message to alert appropriate actors of an imminent crisis event in order to enable these actors to take preventative, mitigatory or preparatory action;
- An Early Warning System (EWS) is a system that integrates EW practices according to a standardised set of protocols within a conflict and policymaking cycle;
- A Conflict Early Warning System (CEWS) warns specifically for the development of various forms of political violence.

Key Design Parameters for a CEWS

The design of an effective CEWS adheres to the following parameters:

1. A CEWS is a system that integrates EW practices according to a standardised set of protocols within a policymaking cycle;
2. A CEWS issues official warnings for one or multiple conflict events on the basis of regularly collected data using both qualitative and quantitative analytical methods;
3. A CEWS offers both prediction and explanation in order to strengthen decision-makers' anticipatory abilities and inform Early Action (EA);
4. EA is aimed at preventing the conflict event, at mitigating its impact and/or at preparing for its consequences;
5. A CEWS embeds EW in a set of institutionalised procedures in order to ensure that EW products are received and discussed by relevant decision-makers.

Product and Process

An effective CEWS is as much about the EW products as it is about the EW process in which these products are created and deliberated by producers and consumers of these products. An effective CEWS offers different products which take digital, physical and verbal shape and which are embedded within a broader process. A CEWS includes a digital geospatial map which can serve as a focal point in the discussion between relevant stakeholders, both in the centre and post, including, possibly, external partners. The CEWS also generates EW Alerts in both digital and physical one-page memo formats that warn in clear terms for the conflict event and its anticipated consequences. The CEWS uses easy-to-understand visuals, supplemented by verbally delivered warnings to senior policymakers further up the decision-making chain both at regularly scheduled meetings and outside of them (see Table 1 below).

	Process	Key Actors	Intended Outcome
	**Basic Requirement:** Implementation of an EWS	Quantitative and qualitative analysts employing the EWS product, policymakers (civil servants and diplomats), local stakeholders as well as potentially other stakeholders both in the centre and post	An EWS that integrates EW practices according to a standardised set of protocols within a policy-making cycle.
	**Step 1:** Early Warning	Analysts, policymakers, local stakeholders	Once a pre-established threshold is broken, a ***distinct*** and ***immediate*** EW message is crafted. An analyst transforms the EW into a ***clear*** and ***concise*** brief, following a pre-established format.
	**Step 2:** Communication of EW	Analysts, policymakers, and outside experts	The EW is communicated to decision-makers by a ***credible source***. Outside sources may be brought in to increase credibility.
	**Step 3:** Decision and Debate	Decision-makers, outside experts, local stakeholders	Decision-makers discuss and ***decide*** whether to take action on the EW, possibly based on a set of criteria and with a menu of potential interventions.
	**Step 4:** Early Action	Frontline responders including external partners and local stakeholders	A plan of EA is ***designed*** and ***implemented***.

Table 1: The Early Warning Process in Action.

Data, Methods and Tools

An effective CEWS employs well-established multi-method approaches and leverages newly available data, tools, analytical techniques and methods as part of a constant process of improvement.

An effective CEWS makes full use of the possibilities to monitor, predict and explain developments at the country level whilst strengthening the ability to do so at other levels, including sub- and transnational levels. It leverages indicators from the social and physical realms and

explores the use of indicators from the virtual realm. For EW on a longer-term horizon, CEWS make use of slow-moving structural indicators from reliable international sources. For EW on shorter time horizons, it makes use of more frequently changing indicators whilst carefully curating and triangulating data sources and data.

An effective CEWS draws on a portfolio of qualitative and quantitative methods for different purposes of monitoring, prediction and explanation. It deliberately implements a multimethod approach in order to increase predictive performance and explanatory value, leveraging strengths and mitigating weaknesses associated with particular methodologies. This report offers a survey of methods as well as a reflection on their use and utility for EW in Table 7.

An effective CEWS also makes use of a wide array of data collection, collation tools and techniques, new quantitative tools and qualitative methods for data analysis and a variety of technical programmes to visualise and communicate results.

A CEWS will benefit from private sector best practices to ensure continuous innovation and organisational take up

Experimentation, Innovation and Organisational Integration

Because this field is in rapid development with new data, tools and technologies becoming available online, organisations setting up a CEWS will benefit from private sector best practices to ensure continuous innovation and organisational take up parallel to ongoing business. Four key insights include:

1. Encourage early warning analysts and advisors to suggest incremental improvements to EW practices;
2. Plan for the development of successive generations of EWS within the host organisation as part of a standard operating procedure;
3. Empower a small team to experiment with and work on forward-looking innovation;
4. Close the learning loop by conducting periodical reviews and ensure organisational take-up of the lessons learned.

Opportunities

An effective CEWS flags imminent conflict risk, supports strategic and policy planning and enhances conflict analysis and existing capabilities. Overall, an effective CEWS facilitates EA: an ounce of prevention is worth a pound of cure. It facilitates the alignment of policy efforts within governments by creating shared situational awareness and streamlining EA efforts into a whole-of-government approach. It also facilitates the alignment of policy efforts across governments through its facilitation of joint international interest formation and subsequently joint policy formulation. A CEWS can also help to strengthen relationships with non-governmental organisations and local populations. A CEWS can thereby bring reputational benefits and help promote the perception of the organisation carrying out the EW as a force for good, both domestically and internationally. Finally, a CEWS can deliver important efficiency gains by introducing a more digitalised way of working that can have spill-over effects to other policy domains.

Risks

A CEWS also presents a variety of risks and ethical concerns:

1. Warnings (or non-warnings) can be based on inaccurate information;
2. Big data approaches might violate data privacy of local populations;
3. EW can ignore local views and circumstances, yet the inclusion of local views can also politicise EW processes and lead to political risks;
4. Reflexive action might be taken on the basis of EWS findings by malicious actors;
5. Despite effective EW, EA can aggravate a humanitarian catastrophe;
6. Data-heavy approaches may alienate decision-makers and undermine support for EW.

An effective CEWS addresses and/or mitigates the principal risks and ethical concerns associated with EW as follows:

1. It triangulates data and models to address problems associated with inaccurate information and outcomes;
2. It formulates clear ethical and legal guidelines to address the risk of privacy infringements;
3. It makes use of trusted advisors with a deep understanding of local actors and conflict dynamics to ensure inclusion of local views while reducing the risk of the manipulation of EW inputs;
4. It operates as a "closed" CEWS, as opposed to an "open" one to mitigate the risk that malicious actors take reflexive action;
5. It programmes a clear stage in the process at which EW results are discussed to help minimise the risk of EW prompting unsustainable EA.

Finally, one fundamental issue to be cognizant of is the management of expectations: an effective CEWS increases situational awareness, strengthens anticipatory abilities and deepens understanding but does not provide a crystal ball.

An effective CEWS increases situational awareness, strengthens anticipatory abilities and deepens understanding but does not provide a crystal ball.

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1 Introduction[1]

This report explores various options for the development of a Conflict Early Warning System (CEWS) that can immediately flag countries or regions that face imminent emerging conflict, support strategic and programmatic planning and enhance conflict analysis as well as existing capabilities more generally.

This report analyses the practices, principles and promises of EW based on a review of academic literature; an analysis of a set of (Conflict) Early Warning Systems ((C)EWS) currently deployed by governments, international organisations (IGOs), non-governmental organisations (NGOs),research institutes and expert analysis. It reflects on opportunities and limitations and outlines risks associated with CEWS.

This report proceeds as follows: it first defines what a CEWS is in order to both demarcate its scope and to disentangle the key constituent elements of a CEWS, which include the purpose, the means and methods, the products, the processes, the risks and the opportunities. The report then turns to these components separately, as the following sections map out:

- Design parameters (What are the key components of EWS?);
- Products and Process (What are EW products and how are they embedded in policy and decision-making cycles?);
- Data, Methods and Tools (What does the inside of an EWS look like?);
- Risks (What are the possible risks and ethical concerns of CEWS?);
- Opportunities (What opportunities does EW offer to do good?).

Finally, the Conclusion summarises and synthesises the most important findings from this paper.

1 We would like to thank Simon van Hoeve, Giorgio Berti, Joris van Schie, Jelle van der Weerd and John Michaelis for their fantastic research assistance in the preparation of this report. We also would like to thank Paul Sinning from HCSS for his valuable review.

Readers Guide

Each chapter describes the findings, distils the most important insights and summarises the key takeaways at the end of the chapter in a textbox. Readers primarily interested in the key takeaways are recommended to skim the text and concentrate on the textboxes.

2 Definitions

Background

The practices, principles and promises of EW have received significant attention in recent years. While there are many definitions of EW, most converge on the notion that EW involves communicating a warning of future harm in order to act upon it. As such, governments have been interested in EW processes and tools for decades.[2] Efforts to develop EW of violent conflict accelerated in the 1970s and the first half of the 1980s.[3] Parallel to that effort, humanitarian agencies such as the United Nations High Commissioner for Refugees (UNHCR) spearheaded the development of EW capabilities in order to better anticipate refugee flows. In the 1990s, the genocides in Rwanda and Bosnia provided new impetus for the further development of EW capabilities. In the wake of these tragedies new strategies were drafted, expert working groups were established[4] and funds were allocated. Research efforts focused on the collection and collation of reliable granular data, the usage and development of different methodologies, the effect of psychological biases in future anticipation and on effective ways to communicate EW results to policymakers and the general public.[5]

In the 1990s, the genocides in Rwanda and Bosnia provided new impetus for the further development of EW capabilities.

The mid to late-1990s also gave rise to the first generation of CEWS, which was quickly followed by a second and a third generation. The first generation drew on both qualitative and quantitative data but had a limited presence in the field. Examples are the early efforts by the International Crisis Group (ICG) and an early iteration of the European Commission (EC) conflict indicators model. The second generation of CEWS, established in the early 2000s, involved a greater local presence.[6] The ICG's model and Swisspeace's *Früh-Analyse von*

2 Herbert Wulf and Tobias Debiel, "Conflict Early Warning and Response Mechanisms: Tools for Enhancing the Effectiveness of Regional Organisations? A Comparative Study of the AU, ECOWAS, IGAD, ASEAN/ARF and PIF," 2009, 3.

3 OECD, ed., *Preventing Violence, War and State Collapse: The Future of Conflict Early Warning and Response*, Conflict and Fragility (Paris: OECD, 2009), 26. & David Singer and Michael D. Wallace, *To Augur Well: Early Warning Indicators in World Politics* (Cambridge University Press, 1979), https://www.cambridge.org/core/journals/american-political-science-review/article/abs/to-augur-well-early-warning-indicators-in-world-politics-edited-by-j-david-singer-and-michael-d-wallace-beverly-hills-calif-sage-1979-pp-308-1750-cloth-895-paper/FD108EE88FB8CBA473C91F44803F09BB.

4 Forum on Early Warning and Response (FEWER), "Mission Statement" (York, February 19, 1997).; FEWER, "Conflict and Peace Analysis and Response Manual - 2nd Edition" (London: Forum on Early Warning and Early Response, 1999), https://reliefweb.int/sites/reliefweb.int/files/resources/964C52BE84D0C7E8C1256D-E800375D28-FEWER_earlywarning_july1999.pdf.

5 For a review of activities since 1990, see OECD, 27–29. Even though the Uppsala Conflict Data Program (UCDP) was founded in the 1980s, it greatly expanded its activities and started to publish its findings more broadly throughout the 1990s.The Armed Conflict Location & Event Data Project (ACLED) was launched in 2005. Vlassenroot & Doom present an overview of the rapid development of Early Warning practices and systems at the time focusing on data collection, networking, the formulating of indicators and conflict detection and anticipation. Koen Vlassenroot and Ruddy Doom, "Early Warning and Conflict Prevention: Minerva's Wisdom?," *The Journal of Humanitarian Assistance*, 1997, 1–55. The Forum for Early Warning and Early Response (FEWER) started to publish manuals on how to make analysis of conflict actionable, mapping out appropriate avenues for Early Response. FEWER, "Conflict and Peace Analysis and Response Manual - 2nd Edition."

6 David Nyheim and Saferworld (Organization), *Early Warning and Response to Violent Conflict: Time for a Rethink?*, 2015, 3–4.

Spannungen und Tatsachenermittlung (FAST) incorporated monitoring networks in unstable areas and connected to decision-makers to inspire Early Action (EA).[7] African regional organisations such as the Intergovernmental Authority on Development (IGAD) and the Economic Community of West African States (ECOWAS) pioneered the third generation of EWS, entirely based in conflict areas with stronger links to responses from 2003 onwards.[8]

Following the 2001 9/11 terrorist attacks, EW experienced a setback. European governments and the United States (U.S.) shifted attention and resources from the anticipation and prevention of conflict to counter-terrorism and stabilisation campaigns. Financial constraints following the 2008 Financial Crisis further impeded the development of EW capabilities, which became apparent when many governments, NGOs and media organisations were blindsided by the Arab Uprisings in the early-2010s. Since then, the horrific atrocities in Syria, Iraq and Libya, amongst other places, have prompted renewed interest in EW on the side of governments, IGOs and NGOs. In his first speech to the UN Security Council in 2017, United Nations (UN) Secretary-General António Guterres stated that "prevention is not merely a priority, but *the* priority. If we live up to our responsibilities, we will save lives, reduce suffering and give hope to millions."[9] In this context, various organisations have developed or are in the process of developing CEWS in order to strengthen their ability to anticipate conflict and act on foresight and insight.[10] They do so against the background of the rapid development of tools and technologies that can be used to this purpose, including the ubiquitous proliferation of data sensors, the advent of analytical machine learning (ML) techniques and easy access to off-the-shelf analytical and visualisation software applications.[11]

Following the 2001 9/11 terrorist attacks, EW experienced a setback. Financial constraints following the 2008 Financial Crisis further impeded the development of EW capabilities.

Definitions: What is a Conflict Early Warning System?

Reflection on the practices, principles and promises of EW requires, first and foremost, a definition of the key concepts Early Warning, Early Warning System and Conflict Early Warning System.

Early Warning

For EW, a commonly used definition is the one offered by the Organisation for Economic Co-operation and Development (OECD), which defines EW as "a process that (a) alerts decision-makers to the potential outbreak, escalation and resurgence of violent conflict; and (b) promotes an understanding among decision-makers of the nature and impacts of violent

7 OECD, *Preventing Violence, War and State Collapse*, 2009, 34–35.

8 Julia Manchin, "Overview of Crisis Rooms," in *Crisis Rooms: Towards a Global Network?* (EU Institute for Security Studies, 2014), 158–62, https://www.iss.europa.eu/sites/default/files/EUISSFiles/Book_Crisis_Rooms.pdf.

9 António Guterres, "Remarks to the Security Council Open Debate on 'Maintenance of International Peace and Security: Conflict Prevention and Sustaining Peace,'" United Nations Secretary-General, January 10, 2017, https://www.un.org/sg/en/content/sg/speeches/2017-01-10/secretary-generals-remarks-maintenance-international-peace-and.

10 In fact, the EU launched the EU Conflict Early Warning System in 2014, the Uppsala Conflict Data Programme launched the Violence Early-Warning System (ViEWS) in 2017 and the government of the Netherlands launched an Interdepartmental Working Group for Early Warning Early Action (EWEA) including several Early Warning System pilot schemes in 2019.

11 Applications include Tableau, Power BI, Sisense, OracleBI and Domo.

conflict."[12] This definition contains two important elements of (1) alerting decision-makers to a pending conflict and (2) enhancing their understanding of the conflict dynamics and impact, but it does not explicitly refer to any subsequent action that EW is intended to generate.[13] This third element is included by Christopher Meyer, Chiara de Franco and Florian Otto in *Warning About War* (2019), in which they define warning as "a single or a series of closely coordinated communicative acts by a given persuader, intended to raise the awareness among one or more persuadees for an impending threat to a valued good in order to enhance their ability to take preventive or mitigating action".[14] Building on these concepts, this report proposes the following definition for EW:

> EW is a timely message to alert appropriate actors (e.g., policymakers; stakeholders; affected populations) of an imminent crisis event, which is defined as an event with significant negative effects for human well-being, in order to enable these actors to take action to prevent the crisis event, to mitigate its impact or to prepare for its consequences.

Early Warning Systems

Prevailing definitions of EWS contain some version of the statement that an EWS necessarily includes a set of EW practices that involve the systematic collection and analysis of information, using different methods to generate EW products that are embedded in a formalised procedure in order to inform timely action. Alexander Austin, for instance, defines the term EWS as "any initiative that focuses on systematic data collection, analysis and/or formulation of recommendations, including risk assessment and information sharing, regardless of the topic, whether they are quantitative, qualitative or a blend of both" with an eye to formulating "recommendations"".[15] In a similar vein but more directly tied to conflict, the OECD defines an EWS as involving the "regular and organised collection and analysis of information on

EW is a timely message to alert appropriate actors of an imminent crisis event.

12 OECD, *Preventing Violence, War and State Collapse*, 2009, 22. The OECD's definition is an adjusted, slimmed-down version of the Forum on Early Warning and Response (FEWER)'s definition of EW from 1997. FEWER's 1997 definition is far more comprehensive, as it outlines what the EW process should be based on (i.e. "the systemic collection and analysis of information coming from conflict areas of crises"), and FEWER firmly ties EW to the goal of EA by insisting that EW should offer levers to respond to crises and that these should be presented to critical decision-makers that can pull such levers (i.e. "for the purpose of [...] b) the development of strategic responses to these crisis and c) the presentation of options to critical actors for the purposes of decision-making"). Forum on Early Warning and Response (FEWER), "Mission Statement," 1. In 1998, Alex P Schmid also adopted FEWER's 1997 definition in his "Thesaurus and Glossary of Early Warning and Conflict Prevention Terms", which was an important attempt to synthesise the conceptual diversity on EW and conflict prevention by providing "distinct definitions" for the field's key terms. Alex P Schmid, "Thesaurus and Glossary of Early Warning and Conflict Prevention Terms" (London, United Kingdom: FEWER, May 1998), 13, https://reliefweb.int/sites/reliefweb.int/files/resources/82548F38DF3D1E73C-1256C4D00368CA9-fewer-glossary-may98.pdf. Curiously, in 1999 FEWER also adopted a somewhat broader definition of EW in a manual it published, scrapping references to the need for data collection to be "systemic", but highlighting the need to provide policy options to "influential actors" at several levels (i.e. "the national, regional and international"). Finally, FEWER in 1999 made explicit that these policy options should be directed at promiting "sustainable peace". FEWER, "Conflict and Peace Analysis and Response Manual - 2nd Edition," 3.

13 David Nyheim in 2015 proposed an adjustment to the EW definition of the OECD, which 1) explicitly made reference to how EW is supposed to generate EA and 2) widened the audience the warning should be broadcasted to. He added three key elements: he specified that EW should inform and enable EA on the "international, regional and local-level", stressed the need for EW to also highlight "opportunities for peace" that decision-makers can make use of, and stated that EW alerts should be both broadcasted to decision-makers *and* affected populations. Nyheim and Saferworld (Organization), *Early Warning and Response to Violent Conflict*, 23.

14 Christoph O. Meyer, Chiara De Franco, and Florian Otto, *Warning about War: Conflict, Persuasion and Foreign Policy* (Cambridge University Press, 2019), 6.

15 Alexander Austin, "Early Warning and The Field: A Cargo Cult Science?," in *Transforming Ethnopolitical Conflict: The Berghof Handbook*, ed. Alex Austin, Martina Fischer, and Norbert Ropers (Wiesbaden: VS Verlag für Sozialwissenschaften, 2004), 130, https://doi.org/10.1007/978-3-663-05642-3_7.

violent conflict situations" to "deliver a set of early warning products (based on qualitative and/or quantitative conflict analysis methods) that are linked to response instruments/mechanisms."[16] Note that both definitions explicitly stipulate the notion of a standardised protocol to collect and analyse data, the use of a variety of methods and the link to response.

More expansive definitions for EWS are offered in the field of EW for natural and humanitarian disasters. Humanitarian disaster relief organisations have long developed and used EWS in support of their work. Ilan Kelman and Michael H. Glantz, for instance, define an EWS as "a social process aiming to address the need to avoid harm due to hazards. The social process occurs at a variety of spatial scales, from individuals in isolated villages without electricity through to the global UN processes working with governments." The "system" is in their view more than a set of technological applications that provide risk assessments of potential hazards; EWS should be "ingrained" in the "day-to-day and decade-to-decade" functioning of society.[17] Their definition is ambitious in terms of the scope of actors—both decision-makers and communities affected—but omits a description of what this social process entails, and which actors specifically should be included.

This gap is filled by the more encompassing description offered by the UN Office for Disaster Risk Reduction (UNDRR). The UNDRR defines an EWS as "an integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities systems and processes that enables individuals, communities, governments, businesses and others to take timely action to reduce disaster risks in advance of hazardous events."[18] According to the UNDRR, an EWS includes "(1) disaster risk knowledge based on the systematic collection of data and disaster risk assessments; (2) detection, monitoring, analysis and forecasting of the hazards and possible consequences; (3) dissemination and communication, by an official source, of authoritative, timely, accurate and actionable warnings and associated information on likelihood and impact; and (4) preparedness at all levels to respond to the warnings received."[19] The UNDRR's definition addresses many relevant elements: it stipulates the relevance of systematic data collection to be used for the purposes of monitoring, understanding and prediction; it emphasises authoritativeness, timeliness and accuracy as key characteristics of the products; it embeds EW in the context of a formal, institutionalised process; and finally, it stresses actionability as a key prerequisite in the sense that EW needs to provide levers for policy intervention. Note that neither the academic definitions cited here nor the OECD and the UNDRR specify the time horizon. Building on these concepts, this report proposes the following definition for EWS:

> An EWS is a system that integrates EW practices according to a standardised set of protocols within a policymaking cycle. An EWS issues official warnings for one or multiple crisis events on the basis of regularly collected data using qualitative and/or quantitative analytical methods. EA can be aimed at preventing the crisis event, at mitigating its impact, and/or at preparing for its consequences. An EWS embeds EW in a set of institutionalised procedures in order to ensure that EW products are received and discussed by relevant decision-makers.

16 OECD, *Preventing Violence, War and State Collapse*, 2009, 22.

17 Ilan Kelman and Michael H. Glantz, "Early Warning Systems Defined," in *Reducing Disaster: Early Warning Systems For Climate Change*, ed. Ashbindu Singh and Zinta Zommers (Dordrecht: Springer Netherlands, 2014), 89–108, https://doi.org/10.1007/978-94-017-8598-3_5.

18 UNDRR, "Early Warning System," accessed December 3, 2020, https://www.undrr.org/terminology/early-warning-system.

19 Ibid.

Conflict Early Warning System

Finally, a CEWS warns specifically for the onset, occurrence, escalation or resurgence of various forms of political violence. The latter term refers to acts of violence committed by both state and non-state actors for political purposes. Existing CEWS cover a span of different violent types, including but not limited to riots/protests, battles, violence against civilians and one-sided violence. Some EWS, such as the one deployed by the UNDRR, warn for crisis events that can indirectly lead to political violence; they include large-scale natural hazards but also famine and infectious diseases. Although the contemporary conflict spectrum is much more diffuse than before—and encompasses hybrid, transnational and internationalised forms of intrastate conflict—many CEWS surveyed in this report start with higher-level categorisations of political violence used by conflict data providers such as the Uppsala Conflict Data Program (UCDP). The UCDP distinguishes between state-based conflict, non-state conflict and one-sided violence, with further distinctions done in qualitative reporting.[20]

A CEWS warns specifically for the onset, occurrence, escalation or resurgence of various forms of political violence.

20 For an overview of different types of violence, see Tim Sweijs et al., The Many Faces of Political Violence, HCSS 2017, https://hcss.nl/sites/default/files/files/reports/The%20Many%20Faces%20of%20Political%20Violence.pdf.

Key Takeaways Definitions

Early Warning (EW) is a timely message to alert appropriate actors of an imminent crisis event in order to enable these actors to take preventative, mitigatory or preparatory action.

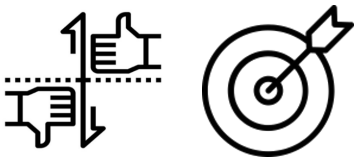
An **Early Warning System (EWS)** is a system that integrates EW practices according to a standardised set of protocols within a conflict and policymaking cycle.

A **Conflict Early Warning System (CEWS)** warns specifically for the development of various forms of political violence.

The design of a **CEWS** therefore adheres to the following design parameters:

1. A CEWS integrates EW practices according to a standardised set of protocols within a policymaking cycle;
2. A CEWS issues official warnings for one or multiple conflict events on the basis of regularly collected data using qualitative and/or quantitative analytical methods;
3. A CEWS offers monitoring, prediction and explanation in order to strengthen decision-makers' anticipatory abilities and inform Early Action (EA);
4. EA can be aimed at preventing the conflict event, at mitigating its impact and/or at preparing for its consequences;
5. A CEWS embeds EW in a set of institutionalised procedures in order to ensure that EW products are received and discussed by relevant decision-makers.

3 Design Parameters



Governments, IGOs, NGOs and research institutes have developed and deployed numerous EWS. This report has examined eleven existing EWS on the basis of desktop research, interviews with five representatives of organisations that employ a CEWS and background talks over the years in order to learn from existing principles and practices and distil key insights (see Table 2, Annex A, Annex B and Annex C). All the information cited in this report is grounded in and backed up by publicly available literature.

	Name	Organisation		Region
		Name	Type	
1.	EU Conflict Early Warning System (EUCEWS)	European Union External Action's (EEAS) Service	International Organisation	Europe
2.	Interdepartmental Working Group Early Warning Early Action (EWEA)	The Netherlands (NL)	Government	Europe
3.	Crisis Watch	International Crisis Group (ICG)	Non-governmental Organisation	Global
4.	Violence Early Warning System (ViEWS)	Uppsala Conflict Data Centre (UCDP)	Research Institute	Europe
5.	Five-country Anticipatory Action Framework pilot programmes	United Nations Office for the Coordination of Humanitarian Affairs (UN OCHA) and partners	International Organisation	Global
6.	Foresight Model	Danish Refugee Council (DRC)/IBM	Non-governmental Organisation & Corporation	Europe/U.S.
7.	Prediction, Visualization and Early Warning (PREVIEW)	The Federal Republic of Germany (FRG)	Government	Europe
8.	HCSS Political Instability Monitor	The Hague Centre for Strategic Studies (HCSS)	Research Institute	Europe
9.	Continental Early Warning System (CEWS)	The African Union (AU)	International Organisation	Africa
10.	Conflict Early Warning and Response Mechanism (CEWARN)	Intergovernmental Authority on Development (IGAD)	International Organisation	Africa
11.	ECOWAS Warning and Response Network (ECOWARN)	Economic Community of West African States (ECOWAS)	International Organisation	Africa

Table 2: Surveyed (Conflict) Early Warning Systems.

Key Design Parameters of Surveyed EWS

Most EWS specify: (1) the specific crisis event(s), or event(s) that have significant negative effects for human well-being that it warns for, (2) the geographical scope, (3) the time horizon, (4) the level of granularity, (5) the anticipated effects, (6) the key drivers and (7) the specific purpose (see Table below). The most important characteristics of these EWS are described below and are complemented with the most important insights that can be distilled for the development of an EWS.

Component	Focus	Examples
1. Crisis event type	What does the EWS warn about?	Political violence, natural hazards (e.g., floods and droughts), mass displacement, food insecurity.
2. Geographical scope	What is its geographical scope?	Global, continental, regional group of particular countries with shared characteristics (e.g., instability; drought), country-specific.
3. Time horizon	How far does the EWS project into the future?	"Nowcasting", days, weeks, months, years e.g., 6-days; 12-days; 1 month; 6 months; 1 year; 4-years.
4. Granularity	What is its level of analysis?	Country-level, first/second administrative level, community-cluster, specific area at risk (e.g., Monsoon area in Bangladesh).
5. Effects	What are the expected effects if the crisis event materialises?	(Larger) violent conflict; displacement of population; food insecurity; immense human suffering and huge economic and social costs; threats against the national interest.
6. Drivers	What are the drivers of the crisis event?	Structural factors: e.g., environmental pressures; horizontal inequality. Immediate triggers: e.g., incendiary calls by (political) leaders.
7. Purpose	What is the goal of the EWS?	Alert (raise the red flag); identify levers for EA; lobby appropriate actors to take EA; provide threat overview to centralise, streamline and inspire policy debate and to allocate resources; enhance policy analysis.

Table 3: Key Components of a (C)EWS.

EWS warn for a variety of violent and non-violent crisis events

Most EWS predict or give a risk assessment about violent conflict in one form or another, with a specific focus on one or multiple forms of intrastate violence. The UCDP's Violence Early-Warning System (ViEWS) warns about armed conflicts (i.e., state-based conflict), violence against civilians and between non-state actors and forced population displacements. The Dutch government's Risk Monitor predicts whether a conflict will escalate in the near future.[21] FRG's PREVIEW warns of "increased crisis potential".[22] The European Union Conflict Early Warning System (EUCEWS) of the European Union External Action Service (EEAS) provides a risk assessment of "the probability and intensity of violent conflict".[23] Other EWS consider natural hazards (e.g., floods and droughts) or look at crisis events that are not necessarily related to violence but that can cause large-scale human suffering. UN OCHA's EWS, for instance, considers two types of large-scale natural hazards (i.e., droughts and floods), whereas the Danish Refugee Council's Foresight Model predicts large-scale forced displacement. Important insights for the design of an EWS are that *one size does not fit all* and that an EWS needs to be specific about what it does and does not warn for.

21 Melle Brinkman, "EU cooperation on Early Warning Early Action," De Veiligheidsdiplomaat (Ministerie van Buitenlandse Zaken, March 5, 2021), https://magazines.rijksoverheid.nl/bz/veiligheidsdiplomaat/2021/03/05.

22 Federal Foreign Office, "Preventing Crises, Resolving Conflicts, Building Peace: Report on the Implementation of the Federal Government Guidelines" (Berlin: Federal Foreign Office, March 2021), 102, https://www.auswaertiges-amt.de/blob/2465762/a96174cdcf6ad041479110e25743bb20/210614-krisenleitlinien-download-data.pdf.

23 EEAS, "EU Conflict Early Warning System: Objectives, Process and Guidance for Implementation," March 10, 2021, 3, https://eeas.europa.eu/sites/default/files/jswd_eu_early_ews_from_vista.pdf.

EWS have different geographical scopes: global, regional and national

Most of the EWS reviewed have either a global or a regional scope that focuses on particularly volatile regions or continents. Pilot programmes typically focus on one specific country or a group of countries. The scope of the Dutch Government's Security Monitor, which provides an overview of current conflict trends and that of the EUCEWS, are (near) global.[24] The scope of the AU Continental Early Warning System, on the other hand, is limited to the African continent. UN OCHA only launched pilot schemes in several countries in East Africa and Bangladesh and the Foresight Model of the Danish Refugee Council (DRC) (so far) has only looked at Myanmar and Bangladesh and is currently in the process of expanding to the Sahel. The most important, if seemingly trite, insight for the design of an EWS is the potential trade-off between scope and depth of EW products in the context of a finite set of resources. This trade-off needs to be considered against the objectives of the EWS.

Most EWS focus on the country-level simply because extensive economic and political data sources are currently available at this level.

EWS' level of analysis ranges from country-level to community clusters

Most EWS focus on the country-level simply because extensive economic and political data sources are currently available at this level. Some EWS, such as UCDP ViEWS and the HCSS Political Instability Monitor, have started to focus on the first administrative level. UCDP ViEWS even takes the second administrative level and community clusters for their analyses into account, as an increasing amount of meso and micro-level data is becoming available. The most important insights here are that more granular assessments typically lead to more accurate and more precise EW products that are conducive to targeted interventions and that the data and techniques are increasingly available.

EWS' time horizons range from days to years

Some EWS look only days into the future, whereas other EWS consider the onset of crisis and conflict weeks, months or even years ahead (see Table). At one side of the spectrum, UN OCHA and its partners' pilot scheme forecasts immediate large-scale natural hazards from approximately twelve days into the future (for flooding in Bangladesh) to several months (for droughts). Crisis Watch, an initiative of ICG, has an even shorter horizon, as it tries to give a live account of events of all countries it is active in, through what it calls "nowcasting". This means monitoring highly volatile situations and projecting risks weeks and sometimes months into the future. On the other side of the spectrum, the DRC's Foresight Model time horizon is one to three years and EUCEWS uses a time horizon of up to four years for its risk assessments.[25] While predictions and risk assessments with longer time horizons tend to be less accurate, they can serve as general warnings of vulnerability, facilitate cross country comparison and allow upstream preventative action. The key insight for the design of an EWS is that different policy purposes require different time horizons: direct response benefits from short-term analysis; long-term programming is served by longer-term, multi-annual projections.

24 Thierry van der Horst and Emma Cats, "Data voor een veiligere wereld," De Veiligheidsdiplomaat (Ministerie van Buitenlandse Zaken, February 3, 2020), https://magazines.rijksoverheid.nl/bz/veiligheidsdiplomaat/2020/02/03; Brinkman, "EU cooperation on Early Warning Early Action"; Stamatia Halkia et al., *Global Conflict Risk Index: New Variables in 2018.*, EUR 29501 EN (Luxembourg: Publications Office of the European Union, 2018), 10, https://data.europa.eu/doi/10.2760/258293.

25 EEAS, "EU Conflict Early Warning System: Objectives, Process and Guidance for Implementation," 3.

	Short Term (real-time, days, weeks)	Mid Term (1-36 months)	Long Term (1-4 years)
EWS	NL EWEA ("near future")[26] ICG Crisis Watch (close to "real-time forecasting") UN OCHA floods (12 days) HCSS (1 month) AU and IGAD	ViEWS (1-36 months) UN OCHA for droughts HCSS (6 months) AU and IGAD	EU CEWS (up to 4 years), DRC & IBM (1-3 years) HCSS (1 year) AU and IGAD
PROS	Immediate information for EA.	Allows for medium-term strategic and policy adjustments.	Allows for long-term strategic and policy planning.
CONS	Does not allow for long-term strategic and policy planning.	Does not provide immediate information for EA. Does not allow for long-term strategic and policy planning.	More uncertainty due to the a bigger temporal space.

Table 4: EWS and their different time horizons.

N-th order effects are generally implied but not always explicitly described in EWS products

In addition to direct human casualties and fatalities, large-scale political violence as well as large-scale natural disasters typically generate a range of negative consequences. Some EWS warn of such specific negative 1st and 2nd, N-th order effects including but not limited to poverty, food insecurity, mass displacement of population, emergencies and (the escalation of) other violent conflicts. UN OCHA's pilot programme, which warns of imminent drought and floods, specifically stresses food insecurity as a primary negative effect. Crisis Watch discusses specific potential effects of violent conflict such as forced displacement and food security. The most important insight here for the development of an EWS is to not only warn for the onset of the event but also identify its first, second and N-th order effects.

Most EWS include an assessment of drivers; most focus on structural, slow-moving ones

Most EWS do not only warn for specific crisis events but also give some attention to the driving factors. Because the integration of trigger events (i.e., immediate, short-term factors leading to the eruption of conflict) into methods and models utilised by EWS still poses a challenge, most EWS tend to focus on structural factors, which are updated only periodically and in many cases only annually. For example, the EUCEWS model incorporates numerical data for political, security, social, economic, geographic and demographic risk factors that are correlated with the future onset of violence. While it does not deploy quantitative analysis of potential trigger factors, it does make use of qualitative experts and local assessments to refine its risk assessment.[27] Crisis Watch and UN OCHA's (pilot) programmes do seek to identify triggers, deploying, respectively an entirely qualitative and an entirely quantitative approach to assess the impact of both structural, slow-moving and more rapidly changing drivers. Crisis Watch conducts on the ground qualitative analysis of a wide range of structural (e.g., poverty) and immediate factors (e.g., incendiary speeches by leaders), closely following live situations as they unfold both to monitor the situation and to explain the potential conflict

26 Brinkman, "EU cooperation on Early Warning Early Action."

27 EEAS, "EU Conflict Early Warning System: Objectives, Process and Guidance for Implementation," 3, 11.

dynamics at play. UN OCHA's pilots focus on droughts and floods that depend on both structural climatological trends and immediate meteorological phenomena. Structural indicators highlight the dangerous periods (e.g., the monsoon season in Bangladesh and the summer in East Africa) and other long-term developments that aggravate extreme weather (e.g., climate change). Meteorological phenomena highlight the short- (or immediate) term risks (e.g., heavy rainfall or extreme heat) required to predict whether a flood or drought will actually occur. The most important insight for the design of an EWS is that policymakers seeking EW for the purposes of immediate response will need to include more frequently updated information in their assessments.

Aims range from prediction to explanation for EA, long-term policymaking and scientific purposes

All existing EWS have one or a combination of the following aims:

1. To raise a red flag (by warning of the onset; escalation; or resurgence of a crisis event);
2. To identify drivers of the event in order to enhance understanding and enable effective and short-term response (by offering levers for EA);
3. To enhance policy analysis throughout the entire policymaking cycle and enable long-term strategic and programmatic planning, mostly by providing a horizon scanning tool that traces trends over time and allows for the prioritisation of longer-term preventative, mitigatory or preparatory efforts in one country over another);
4. To broaden and refine our scientific understanding (by using predictive and causal modelling to generate and test models and theory).[28]

The most important insight for the design of an EWS is that policymakers seeking EW need to include more frequently updated information in their assessments.

Almost all EWS harness a combination of the first and second aims in that they both intend to raise red flags and to provide causal explanations in order to identify levers for policy interventions in the form of EA.[29] EUCEWS, for instance, in 2014 strived to implement "upstream conflict prevention" measures.[30] Helping "decision-makers prevent and resolve deadly violence" forms part of the ICG's Crisis Watch's *raison d'être*.[31] Finally, the ICG does not just warn about the onset of violence; it also monitors the deterioration (or escalation or resurgence) or the improvement of conflict situations.

EA can refer both to prevention, which means avoiding the crisis event from occurring and to mitigation or preparation for the crisis event's adverse effects. EA can have a short, medium and long-term horizon and can run the entire gamut of instruments of government influence across social, economic, health, governance and human rights domains. The most important insight here is that prediction and explanation is not an either/or issue: EWS typically provide warning combined with some degree of explanation of the conflict dynamics at play in order to bridge the gap between EW and EA.

28 UCDP's Violence Early-Warning System (ViEWS) sets out to fulfil this latter purpose, as its stated aim is to "develop, test, and iteratively improve a pilot Violence Early-Warning System (ViEWS) that is rigorous, data-based and publicly available to researchers and the international community." UCDP, "About ViEWS - Department of Peace and Conflict Research - Uppsala University, Sweden" (Uppsala University, Sweden), accessed December 4, 2020, https://www.pcr.uu.se/research/views/about-views/.

29 The exceptions of the EWS surveyed for this report are those of the UCDP and HCSS. Their primary goal is the iterative and constant improvement of EW models and their respective CEWS on the basis of which Governments, NGOs and IOs can improve their own practices.

30 EEAS, "EU Conflict Early Warning System," Factsheet (EU External Action Service, September 2014), 2, http://www.eeas.europa.eu/archives/docs/cfsp/conflict_prevention/docs/201409_factsheet_conflict_earth_warning_en.pdf.

31 Crisis Group, "About CrisisWatch," Crisis Group, July 28, 2016, https://www.crisisgroup.org/about-crisiswatch.

Key Takeaways Design Parameters

An effective CEWS explicitly takes the following parameters into account:

- **The conflict event(s) it warn(s) for** (e.g., intrastate conflict, one-sided violence);
- **The geographical scope** (e.g., global, regional, national, subnational);
- **The time horizon** (e.g., nowcasting, days, weeks, months, years);
- **The level of granularity** (e.g., international, transnational, country-level, district-level);
- **The anticipated second order effects**; which are sometimes made explicit and always implied;
- **The key drivers**, mostly focusing on structural slow-moving ones;
- **The specific purpose of the EW** (e.g., monitoring, prediction, explanation, scientific research).

4 Products and Process

EW products, while not commonplace in the diplomatic toolkit, are not entirely new phenomena. A host of governments and international bodies have been developing or aspiring to develop these products over the last years. The two notable elements and expressions of effective EWS prototypes and processes are the ability to present an overview of predictions and risk assessment and the ability to deliver effective, immediate warnings. This section reviews best practices and identifies the most important insights for the design of an EWS.

Existing EWS Products include geospatial maps, written memos and verbal messages

A set of EWS products serve as the cornerstone of an integrated EWS. Existing EWS typically deploy geospatial dashboards to visualise the results of their respective EW analysis. Some EWS also offer alerts in the form of standardised products that flag an imminent crisis event and communicate this to appropriate actors. Few of the surveyed organisations have adopted standardised processes to ensure that these results—both the horizon-scanning analysis and the warning of an imminent threat—are effectively communicated to the appropriate actors. Academic literature, on Early Warning Early Action (EWEA) does offer valuable insights pertaining to good practices in designing both EW products and EW processes, especially on the topic of immediate warnings (e.g., when to warn, how to warn, who should warn). Publicly available documents of governments and international organisations complement these findings by mapping out how different organisations are exploring more institutionalised products and practices to produce a geospatial overview of risk assessment for strategic and policy planning.[32]

A set of EWS products serve as the cornerstone of an integrated EWS.

NGOs and research institutes are front runners in the development of state-of-the-art EW products. UCDP ViEWS, for instance, offers a geospatial map that visualises the probability of future violence at the national and sub-national levels (see Figure 1 on the next page).

The ICG's Crisis Watch combines a geospatial dashboard with alerts. It offers an interactive, geospatial map that uses a traffic light system (red, amber and green) to indicate whether a country experiences a deterioration in conflict, an unchanged situation or an improvement. "Risk Alerts" and "Resolution Opportunities" are both pinned to this map in the form of concise memos, highlighted in monthly reports and sent out as immediate risk messages to communicate opportunities for EW to any party that can contribute to the prevention of conflict.

32 For FRG's preview visualisation tools see Federal Foreign Office, "Preventing Crises, Resolving Conflicts, Building Peace: Report on the Implementation of the Federal Government Guidelines" (Berlin: Federal Foreign Office, March 2021), 121, 124, https://www.auswaertiges-amt.de/blob/2465762/a96174cdcf6ad041479110e25743bb20/210614-krisenleitlinien-download-data.pdf; for EUCEWS geospatial map see Stamatia Halkia et al., *Global Conflict Risk Index: New Variables in 2018.*, EUR 29501 EN (Luxembourg: Publications Office of the European Union, 2018), 10, https://data.europa.eu/doi/10.2760/258293.

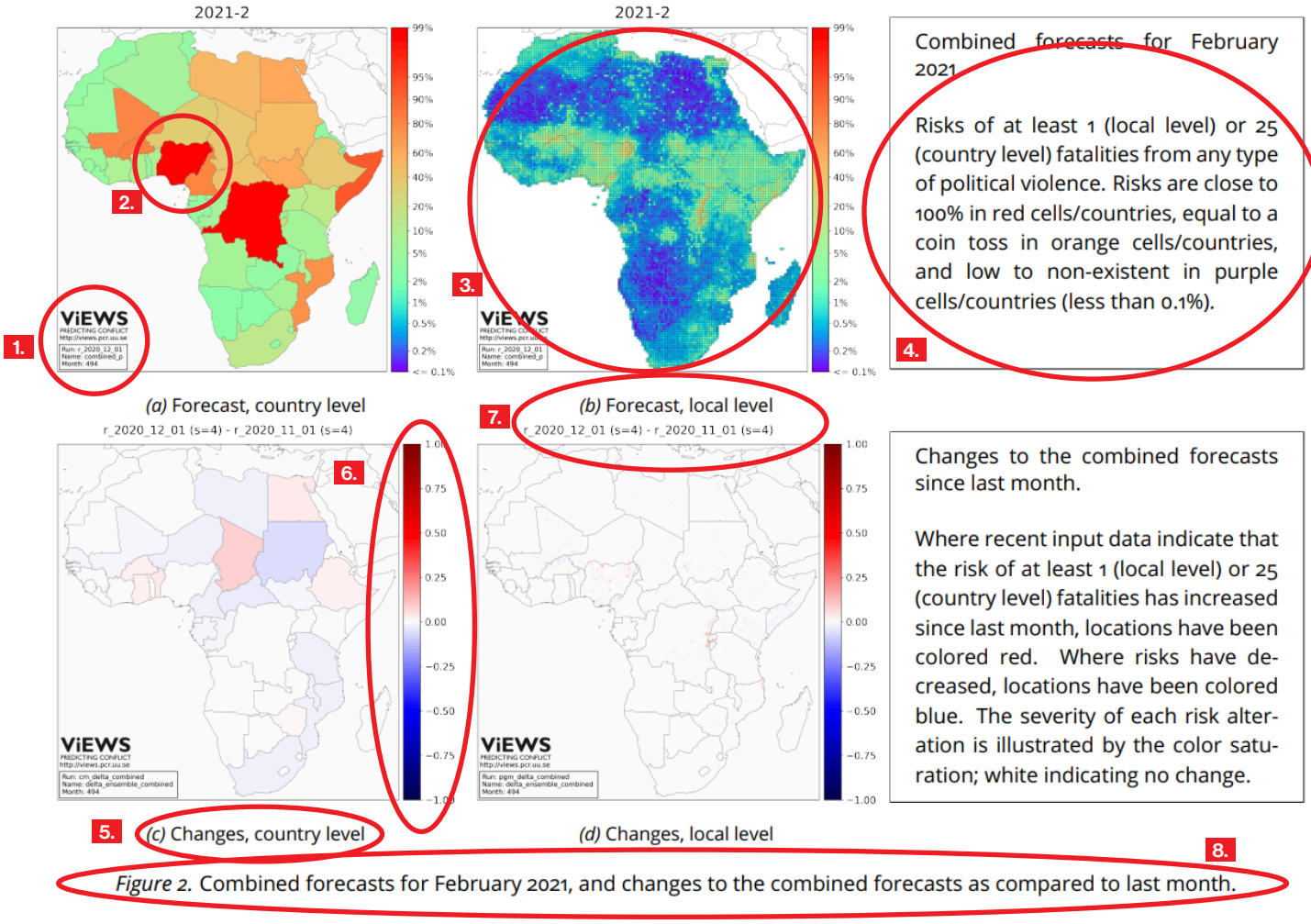


Figure 2. Combined forecasts for February 2021, and changes to the combined forecasts as compared to last month.

1. Clearly defined timeframe
2. Individual unit of analysis is clear (country-level)
3. Geographic scope of EWS is clear (Africa)
4. Clear methodology and purpose
5. Allows the user to visualize projected or historical change over time
6. Has a clear representation of key statistics or trends
7. May differentiate between different regions
8. Clearly identifies the contingencies this EWS is built for

Figure 1: The UCDP ViEWS EWS Geospatial Dashboard.[33]

Several European states and institutions are developing or possess EWS products. EWS are still in the early stages of development, with most organisations opting to first develop a centralised, user-friendly unit, i.e., geospatial dashboards to showcase the fruits of their EW analysis to internal audiences and officials at partner institutions in an accessible way. These geospatial dashboards are instrumental in facilitating policy discussions about conflict prevention within and amongst different government departments. They can also help bridge the gap between foreign ministries and embassies or an NGO's main office and the regional offices that support its fieldwork via the joint fabrication of memos by specialists in the centre and diplomats posted abroad, which are added to the dashboard. The FRG's PREVIEW, for instance, makes use of "forecasts, visualisations, maps and interactive applications (e.g. dashboards)" whilst it supplies insights, products and services "in the field of early warning and information management" to several ministries.[34] The Global Conflict Risk

33 UCDP, "About ViEWS - Department of Peace and Conflict Research - Uppsala University, Sweden."

34 Federal Foreign Office, "Preventing Crises, Resolving Conflicts, Building Peace:," 117.

Index (GCRI) that functions as the basis of the EUCEWS also includes a geospatial map.[35] It also allows officials situated around the world to stay simultaneously up-to-date on the latest conflict developments. The geospatial map can hence initiate, streamline and continuously inform conflict analysis.

EUCEWS, which is already operational, also seeks to integrate contributions from its institutions and its representations abroad as well as from member-states. Senior management of the EEAS and the EC rank countries of particular interest and select five countries annually for a deep assessment. During this assessment of the structural risk of conflict, EU actors on field missions in these countries identify gaps in relation to risk factors within areas such as "legitimacy and rule of law, security and regional stability, inter-group relations and society, human rights and civil society/media, climate change/disasters and economic performance". They finalise a "Conflict Prevention Report" that forms the basis of "follow-up work by various services, EU delegations and member-states".[36]

A dashboard that offers regularly updated EW findings generated by EW methods can serve as the cornerstone for group discussion.

From this overview, several best practices can be distilled for the design of a CEWS. A dashboard that offers regularly updated EW findings generated by EW methods can serve as the cornerstone for group discussion. On a periodical basis, all stakeholders add their own qualitative assessments to the dashboard. According to a fixed rhythm, representatives of relevant departments—from local offices or embassies and main office and ministries—convene in a plenary workshop and contextualise, analyse, and prioritise countries at risk.

The institutionalisation of the plenary discussions helps ensure that policymakers reserve sufficient agenda bandwidth for EW. To challenge group thinking and assumptions, external stakeholders such as NGOs, research institutes, specialised journalists working in the field, the local population and representatives of allied governments can be invited to partake in the institutionalised forum. (see Figure 2 below)

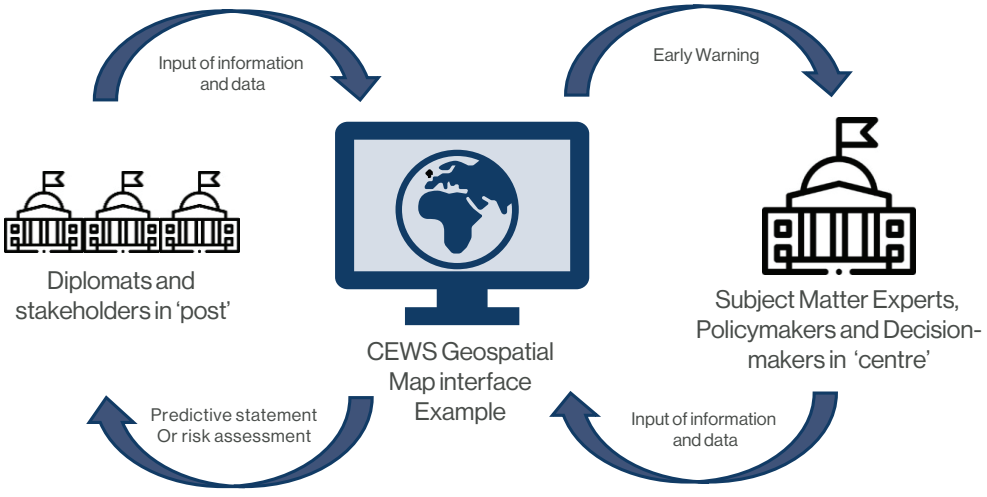


Figure 2: Centre-Post and the Early Warning Process.

35 Federal Foreign Office, 121, 124. shows FRG's Preview visualization tools. Halkia et al., *Global Conflict Risk Index (GCRI)*, 10. shows EUCEWS geospatial map.

36 EEAS, "EU Conflict Early Warning System: Objectives, Process and Guidance for Implementation," 2.

Effective immediate warnings are explicit and urgently delivered to the right policymaker, and lead to a careful deliberation of EA in response

Effective warnings are key to successfully flagging the most disconcerting predictions of the imminent eruption or escalation of conflict. An effective warning of "impending harm" explicitly uses the word "warning" or "warn" at the beginning of a document.[37] Based on best practices identified in the literature, warnings should take the shape of a verbal warning or a one-page memo—or ideally a combination of the two. The memo is clearly written (bullet-pointed), uses explicit language, is accompanied by easy-to-understand visuals, cites an authoritative outside source in support of the warning, specifies risk categories that are easy to understand also for non-quantitative analysts, and delineates potential effects of the crisis event (see Appendix E for an example).

The identities of the sender and receiver of the EW—both inside and outside of the organisation—and the relationship between them is as important as the design of the message

Another key component of delivering effective warning are the identities of both the warner, for example, inside an organisation a lower-level policymaker, and of the warned, for instance, a senior decision-maker. One recent analysis highlighted that effective warning relies on "relationships, reputations and conditions" created far earlier than the warning window as trust can only be established over longer time frames.[38] The inside warner should therefore be a trusted, authoritative individual inside the organisation with a combination of "courage, knowledge, social skills and credibility" and the ability to explain local conflict dynamics to policymakers.[39] Even if warners do not share the values and ideals of the recipients, warners should be aware of the recipient's biases and opinions and effectively tailor the message accordingly.[40] Following these stipulations, two groups of officials exist whose warnings matter most: (1) senior officials with a local presence in the country under discussion such as ambassadors or heads of field missions, and (2) a small group of "in-group" senior officials with close ties to senior decision-makers with whom they have "personal familiarity" and "ideological proximity" allowing them "easy", "regular and quality" access.[41]

Those who warn of imminent harm may consider the role of "outside parties", such as authoritative media organisations, NGOs and other governments, for their warnings. Outside-in warning, i.e., warnings issued by authoritative outside organisations, can complement inside-up warning as it increases the attention the warning receives. Especially the outside-in warning of senior foreign correspondents working for a small number of authoritative, "quality media" with reach in the "national and transnational foreign policy communities" can support the "notice, prioritisation and, to some extent, the acceptance of the probability claims of conflict warnings".[42] Such voices are deemed especially persuasive for two reasons: (1) Their accounts offer new paths to persuade relevant policy and decision-makers, and (2) Their outside opinion can offer support and confidence to policymakers who came to the same conclusion but may not be confident enough to speak up. In fact, one in-depth survey found

37 Meyer, Franco, and Otto, *Warning about War*, 2019.

38 Meyer, Franco, and Otto. P.273

39 Gerrit Kurtz and Christoph O. Meyer, "Is Conflict Prevention a Science, Craft, or Art? Moving beyond Technocracy and Wishful Thinking," Global Affairs 5, no. 1 (2019): 35.

40 Gerrit Kurtz and Christoph O. Meyer, "Is Conflict Prevention a Science, Craft, or Art? Moving beyond Technocracy and Wishful Thinking," *Global Affairs* 5, no. 1 (2019): 30.

41 Meyer, Franco, and Otto, *Warning about War*, 2019, 269.

42 Meyer, Franco, and Otto, 269.

that newspaper articles were generally equally important in shaping the convictions of policymakers as the classified information produced in bureaucracies.[43] Warnings will therefore likely be taken more seriously by high-level policymakers if trusted organisations share the concerns these warnings are based on — even in cases where governments do not share their analysis with outside organisations.

More broadly, an even smaller group of country experts in NGOs such as ICG, Human Rights Watch and Amnesty International also helps to create knowledge in policy communities both in centre and post. One large-scale quantitative research effort found that "substantial tactical and strategic information sharing" occurred between NGO staff and journalists on the one hand and policy-communities on the other. In some cases, this allowed officials "who feel ignored, too junior or too exposed" to channel their warnings via these actors.[44] This is especially true for those NGOs that excel in authoritativeness, by for instance, being able to produce "exclusive knowledge" on the basis of their country experts.[45] However, it does not always result in the warning being taken seriously, as outside organisations can also be believed to have their own interests. The most important insight, therefore, is that outside confirmation of the warning by trusted organisations can strengthen the warning but at the same time yield other difficulties.

EWS is as much about methods, techniques and tools as it is about embedding EW within a wider social process.

Finally, embassies of allied governments can also successfully enhance the inside warning by, for instance, issuing a joint telegram. In general, publishing in broader venues than academic articles or having previous government service experience makes scholars enjoy greater familiarity among policymakers than their academic achievements.[46] Persons with either government experience or an established media profile are more likely to convince policymakers of imminent harm.

The most important insight here corroborates the notion that EWS is as much about methods, techniques and tools as it is about embedding EW within a wider social process. It is not (only) about the product; it is about the process.

From the foregoing analysis, the most important insights for the design of a CEWS can be summarised as follows: The EWEA cycle of a fully developed CEWS follows a four-step standardised trajectory, moving from 1. issuing of EW, to 2. communication of EW, to 3. deliberation and decision on response and finally, 4. EA. The EW is produced after a pre-established risk threshold is broken, as a quantitative risk model or an official in post produces an EW. An analyst drafts a clear and concise EW memo which is delivered by a credible source to the relevant decision-maker within the organisation. Decision-makers discuss and decide on whether and what sort of EA should be taken in response. Following that decision, EA is implemented by frontline responders of the parent and/or partner organisations (see also Table 5 on the next page).

43 Paul C Avey and Michael C Desch, "What Do Policymakers Want from Us?," *International Studies Quarterly* 58 (2014): 244.

44 Meyer, Franco, and Otto, *Warning about War*, 2019, 270.

45 Christoph O. Meyer, Chiara De Franco, and Florian Otto, *Warning about War: Conflict, Persuasion and Foreign Policy* (Cambridge University Press, 2019), 274.

46 Avey and Desch, "What Do Policymakers Want from Us?," 244.

	Process	Key Actors	Intended Outcome
	**Basic Requirement:** Implementation of an EWS	Quantitative and qualitative analysts employing the EWS product, policymakers (civil servants and diplomats), local stakeholders as well as potentially other stakeholders both in the centre and post	An EWS that integrates EW practices according to a standardised set of protocols within a policy-making cycle.
	**Step 1:** Early Warning	Analysts, policymakers, local stakeholders	Once a pre-established threshold is broken, a ***distinct*** and ***immediate*** EW message is crafted. An analyst transforms the EW into a ***clear*** and ***concise*** brief, following a pre-established format.
	**Step 2:** Communication of EW	Analysts, policymakers, and outside experts	The EW is communicated to decision-makers by a ***credible source***. Outside sources may be brought in to increase credibility.
	**Step 3:** Decision and Debate	Decision-makers, outside experts, local stakeholders	Decision-makers discuss and ***decide*** whether to take action on the EW, possibly based on a set of criteria and with a menu of potential interventions.
	**Step 4:** Early Action	Frontline responders including external partners and local stakeholders	A plan of EA is ***designed*** and ***implemented***.

Table 5: The Early Warning Process in Action.

Key Takeaways Products and Process

Effective EW is embedded in a wider system and is as much about products as it is about the process. An effective CEWS yields different products which take both digital, physical and verbal shape and include:

1. **A digital geospatial map** as the centralised starting point for the sharing of insights between relevant stakeholders both in centre and post including, possibly, from external partners.
2. **EW Alerts** that come in digital and physical formats in the form of a one-page memo that warns in clear terms for the event and its consequences and uses easy-to-understand visuals.
3. **Urgent warnings that are delivered verbally** to senior policymakers further up the decision-making chain.

The process of a CEWS delivering a credible and actionable EW is as follows:

Step 1: Early Warning. When certain thresholds within the CEWS are reached, an EW message is sent out to an analyst.

Step 2: Communication of EW. An analyst prepares a bullet-pointed memo, which is delivered by a well-trusted policymaker to key decision-makers.

Step 3: Decision and Debate. The key decision-makers debate whether and how to respond, and if so, what course of action is to be executed.

Step 4: Early Action. The plan of action is put into place.

There are key considerations in setting up a CEWS that organisations should be cognizant of the management of expectations being crucial: an effective EWS increases situational awareness, strengthens anticipatory abilities and deepens understanding, but does not provide a crystal ball.

5 Data, Methods and Tools


Existing EWS use a wide variety of indicators drawn from a range of data sources and deploy different methods, tools and analytical techniques with different time horizons. To get a better understanding of the methodological build-up of an EWS, this section first reviews data and methods employed by existing EWS for the purposes of prediction and explanation, and reflects on caveats and constraints and then identifies promising newly-emerging data, methods and tools. It outlines these traditional and emerging qualitative and quantitative methods for EW following the three key steps of EWS models: data collection and processing, data analysis and data visualisation.

EWS use indicators predominantly from the natural and social realms

The most prolific usages of EWS have classically been in the environmental realm.

Broadly speaking, EWS can leverage three types of indicators in their assessment: physical, social and virtual. Current EWS primarily rely on indicators and data from the physical and social realms, trailing larger societal shifts into the virtual realm. Physical indicators include environmental and meteorological phenomena such as extreme weather conditions (e.g., heavy rainfall, heat) that can lead to drought, floods or other calamities. The most prolific usages of EWS have classically been in the environmental realm with a variety of models and simulations deployed to forecast the risk of natural disasters. Many CEWS also make use of physical indicators because such phenomena can be critical drivers or play a role in driving conflict. Social indicators include political, socio-economic and security indicators such as metrics on the quality of governance, polar factionalism, ethnic tensions, horizontal and vertical income inequalities, human rights records as well as levels of violence.[47] Indicators from the virtual realm garner decidedly less attention, although there are some initial attempts to start monitoring sentiments expressed online including incendiary calls by political leaders. Even though today, indicators from the physical and the social realm are still leading in EWS, in the future, more and more indicators from the virtual world will likely be taken into account. This may also help to get a better grip on potential conflict triggers. The insight for the design of a future robust EWS is to examine how virtual indicators can be usefully leveraged for EW.

47 It is easier to capture material indicators such as the level of economic wealth, income inequality or the number of state executions than it is to operationalise ideational factors, such as grievance predicters of conflict like experiences of injustice, exclusion or depression.

	Type of Indicator	Examples	Usage in Ews
	Physical	Floods; droughts; extreme heat	Common
	Social	Horizontal inequality; polar factionalism, and ethnic tensions	Common
	Virtual	Statements expressed online sentiment	Uncommon

Table 6: Usage of indicators from the physical, social and virtual realms.

EWS mostly use structural, slow-moving, quantitative data as input, although data on violence is more frequently updated

The vast majority of indicators used in quantitatively-driven EWS are structural indicators or those indicators that capture slow-moving and structural trends that contribute to situations of political violence based on slow-changing data that is typically updated annually. These are generally obtained from the ever-increasing number of open-source indices providing data on a host of different economic, political and human rights indicators. These indices provide data at the country level, provide sophisticated information and are usually accompanied by detailed methodologies. Examples include, but are certainly not limited to the World Bank's Worldwide Governance Indicators, the UN's Development Programme's Human Development Index, the Freedom House Democracy Index and the Polity IV Index produced by the Center for Systematic Peace. Many of these structural indicators are especially relevant for the purposes of EW with longer time horizons (1-5 years), but less so for EW with the purpose of generating a direct response.[48]

The data used in both structural, annual indicators and more immediate warning signs are collected at various levels: regional, national and sub-national, including first or second-level administrative regions and even more granular community clusters. Especially data based on views from those on the ground, such as assessments from ambassadorial posts or local populations, can provide more timely and granular insights into specific local circumstances such as ethnic tensions, the experience of grievances as a result of wealth inequality in particular areas, and incendiary calls by local leaders.

On the output side, CEWS also rely on more specific conflict databases, which are updated more regularly than the broad indices listed earlier. These databases together provide data on various conflict types including state-based armed conflict, non-state conflict, protests, riots and terrorist attacks. They also provide information on duration, intensity, severity, geolocation

48 A failure to focus on structural, slow-moving indicators can be costly. Swisspeace's FAST, until 2008 recognized by most EW specialists as a top player in the EW field, focused on operational over structural prevention. Due to a failure to find paying clients, Swisspeace FAST was closed in April 2008. OECD, *Preventing Violence, War and State Collapse*, 2009, 60.

and dates. The most important insight is that EW with shorter time horizons will require input and output data that is more frequently updated, while for EW with longer time horizons, structural indicators are better suited.

Timeliness and accuracy of data continue to be two central challenges

Data accuracy usually improves over time as more details emerge about conflict situations. This introduces an important trade-off between accuracy and timeliness. Automated event data—information created through a process in which software programmes automatically collect, process and code events—promises to offer a way around this. Conflict scholars have convincingly demonstrated that the use of automated event data does improve the overall predictive performance of the models.[49] Yet, challenges associated with automated event data at this moment pertain to duplication of events, misinformation being taken for face, and problems with geographical identification beyond the country-level, as pinpointing the location where an event occurred within a country's borders remains difficult.[50]

Curation and triangulation of data sources is an important consideration in the design of an EWS.

Existing CEWS generally seek to find ways around it to shorten the time horizon and speed up the renewal rate of EW products based on more timely information. The most important insight is that curation and triangulation of data sources is an important consideration in the design of an EWS.

Both structural, slow-moving and more immediate event data sources are expanding rapidly

Throughout the last decade, an increasing volume of new conflict data has become available, covering a wide range of factors and phenomena. The increased availability of conflict data is expected to further strengthen predictive efforts in the conflict field. Notably, both the quality and the level of granularity of data have increased—but data sources still stand at different levels of maturity.

In addition to the development and refinement of the ACLED and UCDP databases and the general indices that existing EWS already use, data sources offering event data are expanding in number and scale. This is primarily a consequence of the compilation of databases assembling news articles and the proliferation of social media use around the world. The Integrated Crisis Early Warning System (ICEWS) provides automated event data of events globally.[51] Using the Conflict and Mediation Event Observations (CAMEO) ontology, it codes hundreds of thousands of news items to identify 'who-did-what-to-whom-when-and-where'.[52] The Global Database of Events, Language and Tone (GDELT) similarly processes several hundred thousand news items from several thousand news sources in almost a hundred languages. In addition, remote sensing data of environmental variables are increasingly becoming available and can be used to monitor and analyse both structural but also, more and more immediate drivers of conflict. The World Resources Institute, for instance,

49 Håvard Hegre et al., "Introduction: Forecasting in Peace Research," *Journal of Peace Research* 54, no. 2 (March 1, 2017): 115, https://doi.org/10.1177/0022343317691330.

50 Michael D. Ward, "Can We Predict? Toward What End?," *Journal of Global Security Studies* 1, no. 1 (2016): 80–91.

51 Elizabeth Boschee et al., "ICEWS Coded Event Data" (Harvard Dataverse, November 19, 2020), https://doi.org/10.7910/DVN/28075.

52 CAMEO, "Data: CAMEO," accessed December 11, 2020, http://eventdata.parusanalytics.com/data.dir/cameo.html.

provides detailed data on the presence and usability of natural resources. Specifically, its Aqueduct Global Maps outlines the risk of water-related hazards (e.g., droughts and floods) by using hydrological satellite imagery. The most important insight is that EWS can leverage a much larger assortment of data to feed their assessments than existing CEWS currently make use of.

New tools present promising avenues for automated data collection and collation

New tools for survey collection and text parsing can further strengthen data collection efforts. Increasingly inexpensive and accessible tools can facilitate survey collection in remote and unstable areas. Survey data can help map and create an understanding of societal dynamics. Increasingly, such data is collected via mobile phones. The UN Food Programme's mobile Vulnerability Analysis Mapping (mVAM) provides open-source and deeply detailed data of almost 30 countries that are experiencing the most pressing levels of food insecurity.[53] Crisis reporting and crisis management efforts increasingly make use of crowdsourcing and social media data such as on-site citizen reporting. One example is the use of messaging apps to transfer intentionally generated data produced by citizens. Radio Dabanga, operating in Sudan, assesses situation-based messages assembled by chatbots and then engages the messengers if additional information are required. Tools to process data such as surveys have also become more sophisticated. The processing of surveys collected in the field used to be a labour-intensive aspect of conflict analysis. An increasing number of software applications to automate the processing of surveys have become available. The open-source software application KoBo Toolbox is used by the UNHCR, UNDP and WFP to engage in survey collection and process collected data. Their use decomplicates survey collection as well as processes the collected data and facilitates data visualisation.[54]

Duplication and misinformation are two issues that complicate text parsing.

In addition, text parsing offers new ways to collect and process semantic data, which can support an EWS with the real-time or short-term monitoring of developments. Text parsing is most often used on news articles and social media posts. Examples in the semantic data gathering category include programmes that merely parse, cluster and visualise information as well as sources that also code the information in order to produce automated event data. A growing number of user-friendly commercial Text Scraping programmes, which can be used after minimal training, has become available. These include complex tools that use web crawler software to disclose new valuable sources and processes that gather and organise data to create visualisations such as Shodan, IBM Analyst Notebook and Maltego (for an overview see Appendix D). Furthermore, open-source tools like Harvester and Metagoofil, which can gather metadata, have been developed.

There are also public providers of pre-processed data. The European Media Monitor (EMM), for instance, uses event-data, as it gathers and aggregates about 300,000 news stories per day in up to 70 languages and is updated every ten minutes. The EMM groups related items, categorises items per class, extracts information and provides descriptive statistics.

As discussed, duplication and misinformation are two issues that complicate text parsing. Open source Natural Language Processing (NLP) applications are likely to report the same

53 World Food Program, "Reduced Coping Strategies Index," accessed November 4, 2019, https://vam.wfp.org/mvam_monitoring/DataBank_Csi.aspx.

54 KoBo, "KoBoToolbox - Data Collection Tools for Challenging Environments," accessed November 4, 2019, https://www.kobotoolbox.org/.

event more than once, as multiple articles on the topic are produced.[55] In addition, concocted or inaccurate stories, with the online proliferation of falsehoods, are also taken into consideration.[56] In the short term (0-2 years), better curation of sources in combination with human sample testing of NLP analysis can help solve this issue. In the medium term (2-5 years), improved NLP is likely to be able to first recognise and solve duplications and later to spot and ignore falsehoods. The most important insight here for the design of an EWS is the expanding availability of data in the various physical, social and virtual domains, which can be leveraged through the use of technology for the purposes of EW.

Existing EWS use an assortment of qualitative and quantitative methods

The methods used in EWS can be divided into strictly qualitative and strictly quantitative, with the latter encompassing both traditional statistical methods and more modern ML techniques, as well as mixed-method approaches to EW. Table 7 on pages 30, 31 and 32 discusses their pros and cons.

Strict qualitative approaches are rare in the surveyed EWS. Only ICG's Crisis Watch uses a strictly qualitative approach, relying on advocacy centres and field offices to assess the situation on the ground in a particular country, region or community cluster.[57] The key advantage of such a qualitative approach is that it provides highly granular information. Qualitative conflict analysts write their appreciation based on insights gathered from on the ground field research by analysts, and/or officials in post sometimes using local views and on the basis of desk research and expert analysis. Such an assessment can provide more granular insight into specific local circumstances and conflict dynamics. Local views of affected populations generally do not have direct input.

55 Thomas Chadefaux, "Conflict Forecasting and Its Limits," *Data Science* 1, no. 1–2 (2017): 7–17.

56 Phil Schrodt, "Instability Forecasting Models: Seven Ethical Cosiderations," *Asecondmouse* (blog), February 20, 2019, 4, https://asecondmouse.wordpress.com/2019/02/20/instability-forecasting-models-seven-ethical-considerations/. p.4/14.

57 Crisis Group, "Methodology: Field Research. Sharp Analysis. High-Level Advocacy.," Crisis Group, July 22, 2016, https://www.crisisgroup.org/how-we-work/methodology.

Methods & Techniques	*Tools*	*Aim*	*Pros*	*Cons*
Desk Research: the collection and analysis of existing research.		Data collection; analysis	Context and background information on potential conflict dynamics.	Lacks local knowledge.
Field Monitoring: on the ground presence of observers reporting on immediate developments.		Data collection; collation and analysis	Granular insight, timely and reliable information; inclusion of local views.	Security and political risks; snapshot, no systematic overview; little predictive value.
Expert Analysis: analysis by a person who has extensive knowledge in a particular subject or geographical area.		Data analysis	Deep understanding of conflict dynamics.	Potentially biased; little predictive value.
Expert Workshops: a process to solicit and synthesise the views of experts and stakeholders (e.g., Delphi-method).		Data analysis	Deep understanding of conflict dynamics; some predictive value; create shared situational awareness and support for EW.	Typically not systematic therefore not replicable; labour intensive.
Scenarios: exploration of possible futures to identify trigger points; examine potential causal pathways; identify levers for response.		Data analysis	Challenges group think, increases understanding, builds shared situational awareness and enables preparation.	Little predictive value.
Actor Analysis: a systematic overview of the key parties, interests and relationships.		Data analysis	Insight in key conflict actors.	Other drivers of conflict ignored; little predictive value.
Game theory: modelling strategic interaction between key actors with identification of relevant actors, preferences and capabilities.		Data analysis	Formalised understanding of pathways to conflict; discovery of unanticipated outcomes; some predictive value.	Complicated to explain to laymen; often abstract and few empirics; labour-intensive.
Prediction markets: use of market principles to solicit and prioritise views on probability of events.		Data analysis	Engages stakeholders; helps share information; some predictive value.	Does not provide insight into drivers.
Superforecasting tournaments: large-scale predictive tournaments in which participants compete to forecast events.		Data analysis	Tangible point prediction; promotes engagement; helps spread information throughout the organisation; predictive value.	Does not provide insight into drivers; labour-intensive.
Monitoring of indicators: regular assessment of developments of a set of predefined indicators that are associated with conflict.		Data collection; collation and analysis	Systematic insight in trends over time; infuses empirics in policy debates; can be used for comparative purposes; scalable.	Little predictive or explanatory power.
Statistical forecasting models: statistical analysis of historical data to predict onset of future conflict based on relations between conflict drivers and conflict events.	MySQL, R, Python	Data analysis	Scientifically robust, data-driven prediction with relatively good predictive value.	Precise spatial and temporal dimensions sometimes missing; provides limited insight into drivers and conflict dynamics.

Methods & Techniques	*Tools*	*Aim*	*Pros*	*Cons*
Causal models: abstract quantitative representation of real-world dynamics describing the causal and other relationships, among a set of variables.		Data analysis	Formal understanding of causal pathways and interaction between conflict drivers.	At experimental stage of development.
Machine Learning (ML): the ability of a computational application to study/ learn from/ adjust to data without manual adjustment.	MySQL, R, Python, GitHub, Stack Overflow, h2o.ai.	Data analysis	High predictive value for various conflict types.	Blackbox; no insight into drivers; involves (Big) Data related risks and ethical concerns.
Natural Language Processing: AI application that enables computers to understand human language (e.g., text scraping/parsing).		Data collection; collation and analysis	Can offer granular and real-time information to enhance situational awareness and improve short-term predictive performance.	Prone to duplication and manipulation as well as other (Big) Data related risks and ethical concerns.
Crowdsourcing Data Collection: a participatory approach to compile data-sets with the contribution of a large number of people.	Mobile Vulnerability Analysis and Mapping (mVAM); KoboToolbox	Data collection and collation	Increase situational awareness; outreach; labour extensive.	Issues with completeness and representa-tiveness as well as other (Big) Data related risks.
Survey Collection and Processing: the (automated) collecting and collating of answers to (often standardised) questions from a sample group.	Mobile Vulnerability Analysis and Mapping (mVAM), KoBoToolbox	Data collection and collation	Can offer granular insight (including spatial and temporal dimensions of conflict onset); outreach; could be labour extensive.	Can be manipulated by malicious actors.
Sentiment Analysis: the computational gathering and analysis of popular sentiments from text and voice audio data.	PrediCX, DatamineR, Qatalog. Metagoofil; Maltego; HootSuite; Meltwater	Data collection; collation and analysis	Can offer granular and real-time information to enhance situational awareness and improve short term predictive performance.	Can be manipulated by malicious actors; Involves specific (Big) Data related risks and ethical concerns.
Image Analysis: computational application to sort through images, detect patterns and verify the authenticity of images.	TruePic, Invid.; AnyVision; EyeWitnness	Data collection; collation and analysis	Can offer granular and real-time information to enhance situational awareness and improve short term predictive performance; can help verify the authenticity of images.	Its utility for EW requires further exploration.
Visualisation methods: e.g., Charts; Tables; Graphs; Maps; Infographics; Dashboards.	Doma, Power BI, Sisense, OracleBI, Tableau, Shodan, IBM Analyst Notebook, Maltego	Data visualisation	Helps communicate the results to deci-sion-makers and broader audiences.	Over-simplification of results.
Multi-method approach: combination of different qualitative and quantita-tive methods.		Data analysis	Offers insight into conflict dynamics; improves predictive performance.	Requires investment into all the compart-mental methods (both qualitative methods and quantitative models).

Table 7: Overview of Methods and Tools.

Even though expert analysis can be very useful, it should be complemented with other methods. Whilst long-term engagement in the study of a particular field or area can lead to deep, granular knowledge about areas and topics including the driving factors behind crisis events, the predictive performance of experts is limited.[58] Sponsored by the U.S.-intelligence community,[59] Phil Tetlock conducted a large-scale research effort for over 20 years on the prediction of more than 300 experts in the fields of politics and economics, ultimately concluding that expert judgement was not more accurate than random guesses.[60] One possible explanation is that experts are incentivised to take an outspoken view, as more mundane predictive statements may fail to capture the imagination of the public and the media. In addition, a failure to predict correctly seldomly leads to any penalties.[61] Another constraint associated with qualitative forms of analysis is that they are time-intensive and, therefore, costly. The amount of hours required to organise expert workshops, another method used by existing EWS, is even more labour-intensive. The most important insight here is that qualitative approaches are necessary to provide context and to explain, but that they are time-intensive, and that the predictive track record of most individuals is poor.

Even though expert analysis can be very useful, it should be complemented with other methods.

Quantitative methods for data analysis used in EWS can be distinguished between more traditional analytical techniques such as the monitoring of indicators, statistical modelling (including bi- or multivariate regressions and econometric forecasting models) and emerging techniques, in the form of ML, to arrive at risk predictions. EUCEWS is based on a traditional statistical modelling effort that produces rankings of countries at risk, namely, the GCRI, using structural indicators "based on (the) human security dimension, which show(s) a strong correlation with violent conflict."[62] Some CEWS also deploy newer ML methods. HCSS, for instance, employs a Random Forest model (that limits variance), an XGBoost model and a Gradient Boosted Machine model (that limits bias). In addition, HCSS uses ensemble models to aggregate the results of the best performing predictive models and to correct for bias in order to optimise predictive performance. Aggregating and combining various forms of different quantitative models into 'ensemble models' has been recognised to reduce prediction error rates.[63] FRG's PREVIEW makes use of "data and AI-based prediction models".[64]

To generate EA, EWS should both *warn* of danger by raising a red flag and *provide an understanding* of the danger by providing insight into the drivers behind the crisis event. Good predictive performance of EWS that rely on ML does not yet translate into an improved understanding of the causal factors at play. It is not always possible to identify which drivers and interaction effects are responsible for the increased risk.[65] Even if statistical and ML methods tend to be comparatively better at conflict prediction, at least in their current incarnations, they are less suited for the purposes of explanation. The most important insight here for the design

58 General overview, see Tetlock 2005; for specific details Tetlock and Gardner 2015; more specific on conflict, see Gibler, Douglas M. "Combining Behavioral and Structural Predictors of Violent Civil Conflict: Getting Scholars and Policymakers to Talk to Each Other." International Studies Quarterly, September 30, 2016, sqw030. doi:10.1093/isq/sqw030.

59 Philip E. Tetlock, Barbara A. Mellers, and J. Peter Scoblic, "Bringing Probability Judgments into Policy Debates via Forecasting Tournaments," *Science* 355, no. 6324 (February 3, 2017): 481–83, https://doi.org/10.1126/science.aal3147.

60 P. Tetlock, *Expert Political Judgement: How Good Is It? How Can We Know?* (Princeton University Press, 2006).

61 Chadefaux, "Conflict Forecasting and Its Limits." p.9.

62 EEAS, "EU Conflict Early Warning System: Objectives, Process and Guidance for Implementation," 4.

63 Jacob Montgomery, Florian Hollenbach and Michael Ward, "Improving Predictions Using Ensemble Bayesian Model Averaging," *Political Analysis* 20 (2012): 272-273.

64 Federal Foreign Office, "Preventing Crises, Resolving Conflicts, Building Peace:," 120–21.

65 Lars-Erik Cederman and Nils B. Weidmann, "Predicting Armed Conflict: Time to Adjustour Expectations?," *Science* 355, no. 6324 (2017): 476. and Håvard Hegre et al., "Introduction: Forecasting in Peace Research," *Journal of Peace Research* 54, no. 2 (March 1, 2017): 117, https://doi.org/10.1177/0022343317691330.

of an EWS is that effective EA necessitates that decision-makers both receive accurate and timely warnings and understand the factors that drive the crisis event. Explanation is also needed to convince the policymaker of the urgency of the warning. In short, an EWS should both *predict* and *explain*. For that purpose, it is essential to use a multimethod approach.

The vast majority of surveyed EWS combine multiple methods in the production of their EW results.

The vast majority of surveyed EWS combine multiple methods in the production of their EW results. These tend to be a mix of the quantitative and qualitative methods introduced earlier or a mix of quantitative methods. Institutions have combined both qualitative and quantitative approaches to establish what can be considered good practices. The FRG and the EEAS, for instance, combine the broad use of quantitative methods for horizon-scanning with an in-depth qualitative study of specific units of analysis.[66] Global or regional horizon scans and risk assessments based on quantitative methods are followed up with a more in-depth qualitative analysis of an individual country or group of countries. (see Figure 3 below).

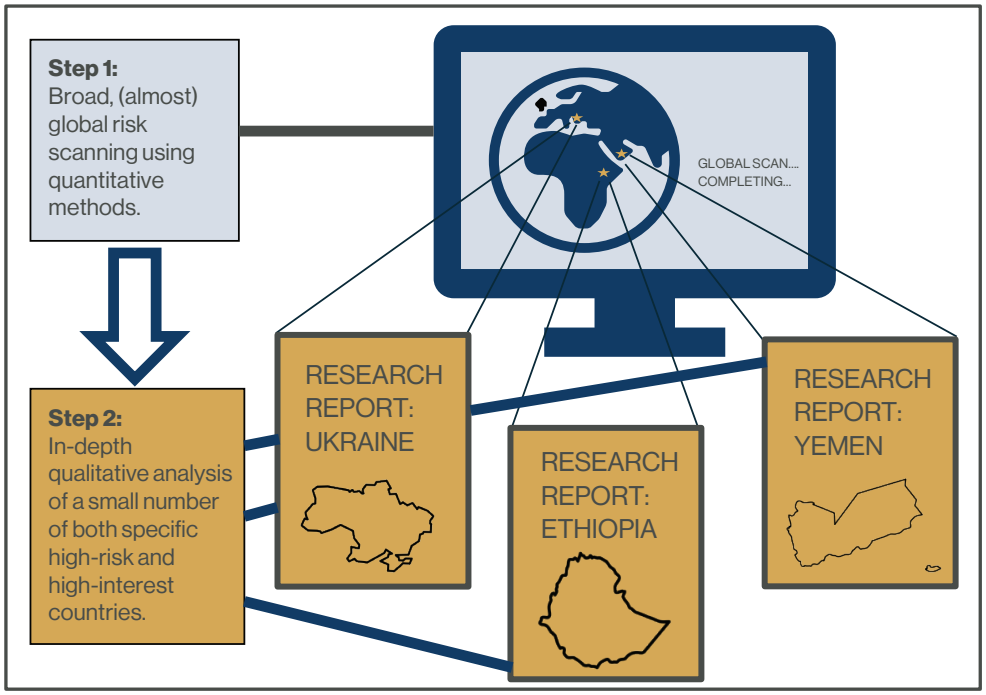


Figure 3: The FRG and the EEAS establish a good practice in combining quantitative and qualitative EW methods.

EUCEWS in its preparatory stage compiles "Regional Risk Tables" by combining its quantitative GCRI horizon scanning tool to establish an overview of the most at-risk countries on the basis of structural factors with intelligence-based analysis from the Single Intelligence Analysis Capacity (SIAC) as well as analysis from the EEAS and other EU institutions.[67] On the basis of this overview, senior managers in the EC and EEAS pick a handful of countries that show significant risk, opportunities for preventative action and in which the EU has an interest and leverage for a more in-depth, on the ground analysis of conflict drivers.[68] The FRG follows a similar procedure to arrive at single cases to conduct in-depth qualitative analysis. In so doing, the FRG first sends out the results of its quantitative risk assessment,

66 EEAS, "EU Conflict Early Warning System: Objectives, Process and Guidance for Implementation"; Federal Foreign Office, "Preventing Crises, Resolving Conflicts, Building Peace:," 120–21.

67 EEAS, "EU Conflict Early Warning System," 4.

68 EEAS, "EU Conflict Early Warning System: Objectives, Process and Guidance for Implementation," 4.

which is first evaluated by experienced conflict researchers and data scientists, both in Berlin and in missions abroad, assessing the extent to which the risk assessment the AI provides is plausible and Germany's interests in this conflict. In the next step, subject matter experts and country analysts from various ministries, including the Federal Ministry of Defence, the Federal Ministry of Economic Cooperation and Development, and the Federal Intelligence Service discuss and comment on the results of both the model and the qualitative assessment. This process leads to a selection of prioritised potential crises and countries on which an in-depth early warning analysis should be performed and courses of action for crisis prevention are formulated.[69]

Quantitative methods are thus used to generate a broad overview of the landscape in combination with qualitative analysis of specific cases of high importance. The most important insight is that multimethod approaches that deploy a portfolio of methods in the generation of EW tend to yield the best results, are already actively used and ready to be implemented.

Predictive efforts are constantly improving on the macro-level, prediction at the micro-level remains a challenge

The predictive record within the conflict field is improving as a result of more refined and applicable indicators, timely and accurate new data sources, rapidly improving ML applications and innovations in the multimethod application of CEWS that includes qualitative methods. Approaches that make use of new data sources and advances in ML are especially leading to significant progress in the ability of EWS to accurately predict events.[70] One central discussion in the conflict prediction literature focuses on whether conflict dynamics are like those of clocks, which are "regular, orderly, and highly predictable in their behaviour", clouds, which are "highly irregular, disorderly, and more or less unpredictable"[71] or like black swans, which are events that are so highly improbable that they are impossible to predict.[72] Black swan events have a "low probability even conditional on other variables."[73] If conflicts belong to the latter category, then conflict prediction is impossible. Yet, that does not appear to be the case—at least not for all conflicts. Michael D. Ward, for instance, finds that, like the weather, the occurrence of various forms of intrastate conflict and crisis can be predicted with some level of probability.[74] Even though state-of-the-art tools are not able to predict conflict with complete certainty, in probabilistic terms intrastate conflicts have more clock-like and some cloud-like attributes. While their precise onset and location cannot always be perfectly predicted, the accuracy of predictive models is strong when looking at the overall set of intrastate conflicts.[75]

Events on the micro-level, particularly so-called trigger events, are more difficult to predict. Structural conditions and indicators are relevant but do not determine whether or when exactly conflict erupts in unstable states. Neither assessments of structural conditions nor

69 Federal Foreign Office, "Preventing Crises, Resolving Conflicts, Building Peace:," 120–24.

70 Ward, "Can We Predict? Toward What End?" p.88; Andreas Beger, C.L. Dorff, and Michael Ward, "Irregular Leadership Changes in 2014: Forecasts Using Ensemble, Split-Population Duration Models," *International Journal of Forecasting* 32, no. 1 (2016): 149. For instance, the HCSS Political Instability Monitor was out of sample tested on the period from 1990-2015 and between 2015 and 2019 achieved a good score (>0,85) on the precision/recall curve.

71 Karl R. Popper, *Objective Knowledge: An Evolutionary Approach*, Revised edition (Oxford Eng. : New York: Oxford University Press, 1972).

72 Nassim Nicholas Taleb, *The Black Swan: The Impact of the Highly Improbable*, Re-issue edition (London: Penguin, 2008).

73 Chadefaux, "Conflict Forecasting and Its Limits," 12.

74 Ward, "Can We Predict? Toward What End?," 86.

75 Turing. HCSS. Schrodt. Ward. Chadefaux.

monitoring of lower-level factors yield perfect insight into the "triggers" of violence.[76] Even a sophisticated EWS does not offer a crystal ball. To take the onset of the Arab Uprisings as an example, it would have been impossible to deduce from structural factors such as levels of corruption, horizontal and vertical socio-economic inequalities, and grievances in Northern Africa and the Middle East that a police officer slapping a Tunisian fruit salesman in the face, who subsequently set himself on fire, would trigger uprisings that would come to engulf the wider region. That would require a sophisticated understanding of local dynamics, an ability to predict events at the micro-level, as well as a refined understanding of the myriad causal pathways how such trigger events scale up to transitions from peace to violence (and vice versa). Efforts in this direction—for instance, by monitoring potential triggering events or by modelling transitions, including by the Turing Institute and HCSS —are ongoing, but in a complex world that features humans with free will, this will continue to pose a considerable challenge. The most important insight is that the best EWS still does not offer a crystal ball and that expectation management to stakeholders—both internal and external—is an important concern.

Both predictive and explanatory efforts benefit from new quantitative and qualitative tools and methods

New tools, methods and techniques to assess the likelihood of the future onset of violence and to identify causal pathways are becoming available.

Sentiment Analysis

Sentiment analysis tools engage in the computational detection of popular sentiments from text and voice audio data. This tool is widely used within the field of advertisement and public relations. As algorithms are increasingly successful in predicting the incidence of conflict within a larger geographical area over longer time horizons, capturing "the spark" that causes the eruption of conflict or even analysing the drivers of conflicts on a short to medium-term basis, requires much more fine-grained analysis. Sentiment analysis, an automated method to extract the sentiments of groups of people on the basis of publicly available text data, can be used to measure popular sentiments by, for instance, spotting explicit threats and heating rhetoric. Sentiment analysis may provide an avenue in the future to enable EWS to spot "trigger events", as these occur on the micro-level over a very short time horizon.

Software tools such as PrediCX or DataminR—which can facilitate the automated monitoring of situations as well as the identification of newly emerging threats—in combination with better curation of traditional and social media sources may further help this endeavour along. DataminR is used to analyse an enormous number of social media posts on platforms such as Facebook and Twitter and can therefore provide real-time information alerts. Sentiment analysis can also be applied to voice audio data. The UN Global Pulse developed "Qatalog", a programme that mines sentiments of radio shows (voice) and social media (text). The use of voice analysis is especially promising in areas where local communities are not connected to social media. Sentiment analysis can also be applied to voice audio data. UN personnel use Qatalog in order to translate, locate and monitor local living conditions. Qatalog can be used to study signs of the imminent eruption of political violence and instability and pinpoint the location where this will take place.

76 Douglas M. Gibler, "Combining Behavioral and Structural Predictors of Violent Civil Conflict: Getting Scholars and Policymakers to Talk to Each Other," *International Studies Quarterly* 61, no. 1 (March 1, 2017): 28–37, https://doi.org/10.1093/isq/sqw030. P. 10

Image Analysis

Image analysis tools can be used to sort through images, detect patterns, and verify the authenticity of images. Even though these applications have a more direct application in the realm of hybrid conflict, such as the countering of disinformation, distorted imagery can also lead qualitative analysts to believe that conflict might erupt when this is not the case. The development of algorithms that can recognise objects on images provides an additional application for image analysis tools aiming to uncover manipulated images. Programmes such as TruePic and Invid can spot metadata manipulation in images.[77]

Machine Learning

ML applications offer great potential to EW efforts. Organisations can develop their own datasets and ML libraries to predict various conflict types with various levels of granularity using readily available tools like MySQL and coding languages like R and Python. Similarly, a swath of data libraries, scripts and algorithms, provided through GitHub, Stack Overflow and h2o.ai, amongst other platforms, are also readily available for use.[78] Specialised companies like Narrative Science and Koto can help analyse large amounts of data and detect new patterns.

Causal models

Aside from monitoring and prediction, quantitative efforts also extend to getting a better grip on the causal mechanisms that lead to—and away from—conflict. Efforts include the Alan Turing Institute's GUARD programme (funded by the UK Ministry of Defence), with the goal to "improve understanding of causal mechanisms by quantifying interaction effects",[79] as well as HCSS's Water Peace and Security Project's work in progress to develop causal models in the field of climate security and conflict, unpacking the various causal pathways to conflict based on interaction effects between socio-economic, political, environmental variables.[80] Finally, and perhaps further down the road, one of the focal points of new Defence Advanced Research Projects Agency (DARPA) and the Intelligence Advanced Research Projects Activity (IARPA) programmes in the U.S. is the development of AI that can explain to humans how it has arrived at predictions. Even though the development of these causal models is still in its early stages, they do propose solutions to the "black box" problem associated with results generated by AI.

Wisdom of Crowds and Delphi Methods

On the qualitative side of the spectrum, local views can be better harnessed through the use of new data collection technologies discussed earlier, as for instance proposed by Forecast-Based Action (FBA).[81] Qualitative methods that make use of "the wisdom of crowds" within and outside government can be used to improve the predictive power of EWS. The weighting and

77 "Truepic," accessed November 4, 2019, https://truepic.com/technology/; "Description - InVID Project," InVID, accessed November 4, 2019, https://www.invid-project.eu/description/.

78 R Project, "The R Project for Statistical Cumputing," accessed November 4, 2019, https://www.r-project.org/; MySQL, "MySQL," accessed November 4, 2019, https://www.mysql.com/; Python, "Python," accessed November 4, 2019, https://www.python.org/.

79 Alan Turing Institute, "Global Urban Analytics for Resilient Defence," The Alan Turing Institute, accessed December 11, 2020, https://www.turing.ac.uk/research/research-projects/global-urban-analytics-resilient-defence.

80 https://hcss.nl/news/water-peace-and-security

81 Marie Wagner and Catalina Jamie, "An Agenda for Expanding Forecast-Based Action to Situations of Conflict" (Global Public Policy Institute (GPPI), September 22, 2020), https://www.gppi.net/media/Wagner_Jaime_2020_FbA-in-Conflict-Situations.pdf.

aggregation of opinions significantly improves predictions, a phenomenon commonly known as the wisdom of crowds.[82] This can also be done in smaller group settings in which standardised, systematic practices such as the Delphi method can be used to leverage the collaborative judgments of experts, which is thus far not common practice in the surveyed EWS.[83]

Superforecasting tournaments

Another systematic qualitative method that leverages expert judgment is encapsulated by the notion of "superforecasters", which has shown promising results.[84] It derives from a U.S.-intelligence community-sponsored research project, whereby Phil Tetlock organised tournaments in which participants predicted real-world social, political and economic events.[85] Tetlock found that a small group of "superforecasters" exists, which tends to be made up of people that combine probabilistic reasoning with updating their assessments based on regular feedback. This was not a random, lucky event, as these "superforecasters" outperformed other participants year after year.[86] Tetlock's findings suggest that keeping an account of the risk assessments and predictions of in-post diplomats and country and subject matter experts over time helps to improve the ability to anticipate conflict. Formulating predictions forces EW actors to be specific in their analysis and explicit about their expectations for the future. Furthermore, bad (sometimes implicit) theories can be thrown out once they are falsified.[87] Like Tetlock's tournaments, keeping an inhouse tally can support the iterative selection of a group of "superforecasters" within organisations. Subsequently, their judgments on conflict prediction could be elevated within the EW process. Even though none of the existing EWS has made use of such tournaments, the iterative selection of diplomats and officials who do well at prediction may improve EW practices in the future.

The iterative selection of diplomats and officials who do well at prediction may improve EW practices in the future.

Overall, the most important insight is that a variety of existing and emerging quantitative and qualitative techniques can be leveraged to strengthen EW efforts.

New data visualisation tools can make EW outcomes accessible for policymakers and decision-makers from different backgrounds

Finally, data visualisation software programmes can facilitate analysis and presentation of EW results for policymakers and to decision-makers, especially those without a quantitative background. These applications can especially help overcome the so-called qual-quant divide in organisations. Many of these tools are not open-source but can be obtained at modest cost. Applications include Doma, Power BI, Sisense, OracleBI and Tableau.[88] One of the most commonly used programmes is Tableau, which is able to process billions of data rows, uses external databases and can be integrated with Python. Table 8 provides an overview of commonly used data visualisation software programmes.

82 James Surowiecki, *The Wisdom of Crowds*, Reprint edition (New York, NY: Anchor, 2005).

83 Megan M. Grime and George Wright, "Delphi Method," in *Wiley StatsRef: Statistics Reference Online*, ed. N. Balakrishnan et al. (Chichester, UK: John Wiley & Sons, Ltd, 2016), 1–6, https://doi.org/10.1002/9781118445112.stat07879.

84 Philip E. Tetlock and Dan Gardner, *Superforecasting: The Art and Science of Prediction* (USA: Crown Publishing Group, 2015).

85 Tetlock, Mellers, and Scoblic, "Bringing Probability Judgments into Policy Debates via Forecasting Tournaments."

86 Tetlock and Gardner, 2015.

87 Ward, "Can We Predict? Toward What End?" P.84

88 Domo, "Domo," accessed November 4, 2019, https://www.domo.com/; Sisense, "Sisense," accessed November 4, 2019, https://www.sisense.com/; Oracle, "Oracle Business Intelligence," accessed November 4, 2019, https://www.oracle.com/middleware/technologies/bi.html.

	Data Collection and Processing	Data Analysis	Data Visualisation
	*The **input** into the EWS*	*The **throughput** of the EWS*	*The **output** of the EWS*
Methods and Techniques	Desk Research, Field Monitoring; Monitoring of indicators; Natural Language Processing; Crowdsourcing Data Collection; Survey Collection and Processing; Sentiment Analysis; Image Analysis	Expert Analysis; Expert Workshops; Scenarios; Actor Analysis; Game theory; Prediction markets; Superforecasting tournaments; Monitoring of indicators Statistical forecasting models; ML; Natural Language Processing sentiment analysis; Image Analysis; Multimethod approach	Visualisation methods: e.g., Charts; Tables; Graphs; Maps; Infographics; Dashboards
Specific Programmes	Mobile Vulnerability Analysis and Mapping (mVAM); PrediCX, DatamineR; Qatalog; Metagoofil; Maltego; HootSuite; Meltwater; KoboToolbox; AnyVision; EyeWitness	MySQL; R; Python; GitHub; Stack Overflow; h2o.ai.; PrediCX; DatamineR; Qatalog; Metagoofil; Maltego; HootSuite; Meltwater; TruePic; Invid	Doma; Power BI; Sisense; OracleBI; Tableau; Shodan; IBM Analyst Notebook; Maltego

Table 8: Methods, Techniques and Specific Programmes for EWS Data Collection, Processing, Analysis and Visualisation.

The private sector offers good practices for governments to improve EWS

Both in academia and the private sector, there has been considerable progress in prediction through the adoption of new data, methods and tools. Governments are trailing these developments. For instance, one large-scale survey found that decision-makers deemed quantitative analysis and formal modelling "not very useful" or "not useful at all",[89] with opinion polling and economic models being the only exceptions. Government efforts to experiment with new EW data, tools and methods are few and far between. A range of cultural, institutional, educational as well as budgetary reasons may be to blame for this lack of experimentation which inhibits the progress in EW seen in other fields. Three good practices that spur innovation in the private sector can be informative for IGOs and governments to design their EW efforts.

Government efforts to experiment with new EW data, tools and methods are few and far between.

First, in the private sector, incremental innovation is achieved by encouraging local improvement suggestions for products by factory workers. They are encouraged to propose minor alterations to the production methods of the products and the product itself to see whether such incremental changes can accomplish useful innovations, which management then can sign off on. This approach was pioneered as a part of the Toyota Production System, which engages frontline workers in approving their work. Governments can similarly allow—and build in time—for those who operate EW systems or are engaged in conflict analysis practices more broadly to propose adjustments to improve their processes. Second, some corporations have established standard planning cycles for the next generations of products. Parallel to working on products that are set to appear soon, they are also investing in the development of the successive generation by probing promising, newly available methods, tools and techniques. Governments or other organisations developing EWS can already initiate partnerships with academia, the private sector and other research institutes to assemble components for next-generation products that they will use in the future. Third, some private sector actors allocate budget to continuous, experimental and highly visionary R&D efforts as part of standard practice, with Lockheed Martin's "Skunk Works" as the original propagator.[90] "Skunk Works" projects are not seen as "nice-to-haves" but are particularly

89 One general complaint is that in the eyes of these policy-makers these models fail(ed) to specify the timing, nature, scale and wider consequences of the escalation of violence. Avey and Desch, "What Do Policymakers Want from Us?," 231.

90 "The Skunk Works® Legacy," Lockheed Martin, accessed January 15, 2021, https://www.lockheedmartin.com/en-us/who-we-are/business-areas/aeronautics/skunkworks/skunk-works-origin-story.html.

valued for providing the building blocks for innovation in the longer-term. Particularly successful pilots and experiments coming out of "Skunk Works" projects can be launched as innovative products on a larger scale (see Table 9 below). Fourth, governments can close the learning loop; they can conduct periodical reviews of the EWS –including of the process– by internal and external stakeholders and implement measures to promote the organisational take-up of any lessons learned that are identified in these reviews.

Lesson from Private Sector	Incremental Innovation	Planning for the Next Generation	Disruptive Innovation: Skunk Works
Example	Toyota encourages factory workers from the frontline to come up with constant improvements in their work-flow and has standardised operating procedures to spread them throughout the company.[91]	At Apple, teams are already working on the next generation iPhone 11 while still putting the finishing touches on the iPhone X as part of standard planning cycles.[92]	Originating from Lockheed Martin, the term SkunkWorks refers to a team that works autonomously on forward-looking projects to come up with rapid proto-types for new products.
Takeaway for EWS	Actively build-in learning loops in the EWS.	Plan for the development of the next generation EWS parallel to work on the present one.	Empower a team of forward innovators to work on new EW products outside the regular workflow.

Table 9: Three Approaches from the Private Sector to Continuously Improve a CEWS.

In order to strengthen experimentation and innovation, governments can step up cooperation between and across governments, the private sector and research and academia. This will facilitate experimentation with promising but perhaps less mature tools and techniques before they are ready for game time. Similar to what Google does, governments, international organisations and NGOs can create special one-year positions for data science PhDs in their EW departments. They can also learn from partner governments analogous to Orange's "corpoworking" innovations and receive EW civil servants to and from other governments to work side-by-side and to share best practices.[93]

91 HBR, "How Toyota Pulls Improvement from the Front Line," *Harvard Business Review*, June 24, 2011, https://hbr.org/2011/06/how-toyota-pulls-improvement-f.

92 For a general overview of the practice of developing next generation products alongside the current generation, look at: Behnam Tabrizi and Rick Walleigh, "Defining Next-Generation Products: An Inside Look," *Harvard Business Review*, November 1, 1997, https://hbr.org/1997/11/defining-next-generation-products-an-inside-look.

93 Gabor Nagy and Greg Lindsay, "Why Companies Are Creating Their Own Coworking Spaces," *Harvard Business Review*, September 24, 2018, https://hbr.org/2018/09/why-companies-are-creating-their-own-coworking-spaces.

Key Takeaways
Data, Methods and Tools

A **CEWS** should seek to offer both timely and accurate *monitoring*, *prediction* and *explanation*, raising both a red flag of a pending conflict event alongside offering insight into key drivers. **CEWS** should employ well-established multi-method approaches and leverage newly available data, tools, analytical techniques and methods as part of constant process improvement. Effective **CEWS** models...

- **Strike a careful balance** between **accuracy** and **timeliness** when making predictions;
- **Make full use of the possibilities to monitor and predict developments at the macro-level** whilst strengthening the ability to predict at the meso and micro-level;
- **Include a focus on analysis of the drivers and their interaction effects** so that decision-makers can meaningfully decide on what, if any, EA to take.

Adopt good and best practices of existing EWS such as:

- The inclusion of four main **CEWS model** components: a **selection** of reliable **data sources**, **data collection** and **collation** tools and methods, **data analysis** tools and methods and **data visualisation** tools;
- **The use of social and physical indicators** and the exploration of **virtual indicators**;
  - **The use of slow-moving**, **structural indicators** from reliable international sources;
  - **Complementing these with more frequently changing indicators** using **curation** and **triangulation** of data sources and data;
- Reliance on a **multimethod approach** leveraging a **portfolio** of **qualitative** and **quantitative methods**.

Learn from best practices from the private sector including:

- Encouraging workers to suggest **incremental improvements** to EW practices;
- **Planning for the development of successive generations** of CEWS within the host organisation as part of a standard operating procedure;
- **Empowering a small team** to autonomously work on **forward-looking**, **disruptive innovations**;
- **Close the learning loop** by conducting periodical reviews and ensure organisational **take-up** of the **lessons learned**.

Make use of newly available applications such as:

- **A wealth of new**, **more refined data sources** on conflict situations at the micro, meso and macro levels.
- A wide array of **data collection and collation** tools and techniques;
- Quantitative tools and qualitative methods for **data analysis**;
- A variety of technical programs to **visualize results** and facilitate responses.

6 Risks

CEWS also come with a variety of risks and ethical concerns. This section reviews seven principal risks and ethical concerns and outlines how an effective EWS can address and/or mitigate them.

Warnings or non-warnings can be based on inaccurate information

CEWS can both produce false positives, meaning a warning of conflict where none occurred or false negatives, meaning no warning of conflict was given despite conflict taking place. This may occur for several reasons. The CEWS might have been fed inaccurate, incomplete or biased data. These anomalies are unfortunately frequent due to the highly contentious and chaotic nature of conflict. Also, data-heavy methods face new forms of manipulation attempts by malicious actors. For instance, in recent years, we have seen authoritarian regimes such as the government of Belarus removing internet access for their states during mass protests. Government interference can go even further, as Viktoria Spaiser, Thomas Chadefaux, Karsten Donnay, Fabian Russman and Dirk Hebbing showed that during the mass anti-government protests in Russia (2011-2012) Twitter contained a large number of messages with deliberately false information spread by the Russian authorities.[94] In addition, EW predictive models used to generate the EW can be inaccurate because they are wrongly applied.

There is no silver bullet to these problems, but ways to partially address these revolve around the curation of data sources to ensure that these are impartial, reliable, and unbiased,[95] through the use of multimethod approaches. Additionally, cross-validation and peer review of models and processes as part of the modus operandi can further help to address this. Quantitative models specifically can be cross-validated through out-of-sample testing, which is the "gold-standard" in testing such models.[96] External organisations assist by reviewing and testing models.[97] It is also helpful to recognise that models by themselves do not offer a

94 Viktoria Spaiser et al., "Communication Power Struggles on Social Media: A Case Study of the 2011–12 Russian Protests," *Journal of Information Technology & Politics* 14, no. 2 (April 3, 2017): 132–53, https://doi.org/10.1080/19331681.2017.1308288.

95 Whenever analysing hundreds of thousands of datapoints, it becomes very important for data analysts to be able to account for biases within the data. This has been a large problem for many big-tech companies, who have realised their advanced AI and analytics can still be subject to biases. Consider the example of gender bias in Google's targeted ads. Datta, Tschantz and Datta found that males "were shown ads encouraging the seeking of coaching services for high paying jobs more than females." In response, it is important to re-emphasise the importance of periodically reviewing the performance of the CEWS and to invest in a skilled and qualified analytics department that can manually correct for such biases. The key insight here is that even sophisticated algorithms reflect biases (such as gender biases) that can be manually adjusted for.
Amit Datta, Michael Carl Tschantz, and Anupam Datta, "Automated Experiments on Ad Privacy Settings: A Tale of Opacity, Choice, and Discrimination," *Proceedings on Privacy Enhancing Technologies* 2015, no. 1 (April 1, 2015): 92–112, https://doi.org/10.1515/popets-2015-0007.

96 Ward, "Can We Predict? Toward What End?," 87.

97 DRC/IBM, "MODEL CARD: DRC Foresight Model" (OCHA, July 2020), https://s3.eu-central-1.amazonaws.com/hdx-ckan-filestore-prod/resources/be6ab2c8-f3c4-4045-9acf-529f6091c253/drc-model-card.pdf?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Expires=180&X-Amz-Credential=AKIARZNKTAO7U-6UN77MP%2F20201206%2Feu-central-1%2Fs3%2Faws4_request&X-Amz-SignedHeaders=host&X-Amz-Date=20201206T214103Z&X-Amz-Signature=19ed7f1ba2437343001982052dac24684a1b-7caef5e12856dd0052fe8e6f1db7.

magical solution, but do offer unique advantages, including acting as a counterweight against groupthink and highlight areas of conflict proneness based on data.

Big data approaches might violate data privacy of local populations

Operators of CEWS using advanced data-heavy methods should also recognise important legal and ethical issues associated with the use of certain data sources. Throughout the past decade, governments, businesses and civil society have participated in a highly contentious debate on who owns the data of internet users. Large tech companies such as Facebook, Twitter and Google have been criticised for using, selling or improperly protecting their users' data.[98] An EWS that would make use of automated-event data from social media is at risk of entering the territory of this ethical debate, as it uses the posts and other information of social media users. Data streams flowing from the developing world into the developed world face additional ethical challenges. Branka Panic raised concerns about the violation of the "data sovereignty" of the first by the latter through the collection of data.[99] The critical theorists Nick Couldry and Ulises A. Mejias went further, as they use the term "data colonialism" arguing that:

> Data colonialism combines the predatory extractive practices of historical colonialism with the abstract quantification methods of computing. [...] Through what we call "data relations" (new types of human relations which enable the extraction of data for commodification), social life all over the globe becomes an "open" resource for extraction that is somehow "just there" for capital. These global flows of data are as expansive as historic colonialism's appropriation of land, resources and bodies, although the epicentre has somewhat shifted. Data colonialism involves not one pole of colonial power ("the West"), but at least two: the United States and China.[100]

Even though Couldry and Mejias specifically mention the purpose of "commodification" as a key element of data colonialism, the extraction and the use of data from the Global South by states mainly in the Global North should give pause for thought.

In addition to ethical risks, the misuse of personal data can lead to severe political repercussions. For this reason, data scientists should only utilise ethical and appropriate data sources that are in line with government and regional regulations efforts such as the EU's General Data Protection Regulation (GDPR). The most important insight here is that organisations should carefully weigh and internally discuss the ethical dilemmas and political risks involved with assembling large amounts of information and draw up a set of ethical guidelines.

98 Richie Koch, "The GDPR Meets Its First Challenge: Facebook," GDPR.eu, January 4, 2019, https://gdpr.eu/the-gdpr-meets-its-first-challenge-facebook/.

99 Branka Panic, "Ecosystem Mapping The State of Play and the Path to Creating a Community of Practice" (New York: NYU Center on International Cooperation, 2020), 26.

100 Nick Couldry and Ulises A. Mejias, "Data Colonialism: Rethinking Big Data's Relation to the Contemporary Subject," *Television & New Media* 20, no. 4 (May 1, 2019): 2, https://doi.org/10.1177/1527476418796632.

An EWS can fail to take local views and circumstances into account; however, interaction with local populations risks manipulation of EW processes and presents political risks

EW can lead to EA being taken that does not adequately take into consideration or understand the local views or circumstances of those directly impacted by the EA. This can lead to action which is simply *about* and not *for* local populations. Most academic and governmental development of EWS has been done either in Africa or in the Global North (North America and Europe). Organisations in the latter group rarely focus on instability in their own region but instead focus on countries deemed unstable that are far away, which they may not have sufficient knowledge of.

A way to mitigate this risk is to make sure that EWS as well as conflict response programmes follow decentralised programme principles, consider local needs and local voices, and work in partnership with local parties based on a network of trusted local advisors. This may help increase conflict sensitivity into the programme, including in the information collection stages, embed *Do No Harm* as a central principle in the EWEA process and include specific attention to the gender-specific adverse effects both of conflict and EA. IGAD's CEWARN uses field monitors on a local level living among local populations, as this regional organisation also represents the governments of the countries that are analysed for political instability. At the same time, EW also needs to carefully weigh and consider the views of local actors, which might be manipulated and coerced by malicious actors that actually drive the conflict in highly opaque and chaotic environments. Finally, local governments can claim that their country's sovereignty has been violated as a European power interacts with its population without the government's consent. The most important insight is that the careful inclusion of local perspectives is relevant to better understand local conflict dynamics and to improve the odds of EA being tailored to local circumstances.

The careful inclusion of local perspectives is relevant to better understand local conflict dynamics.

Reflexive action might be taken on the basis of EW by malicious actors

On the basis of reliable conflict prediction and EW, malicious actors can take action to further their interests. Consider the following quote from an expert in CEWS:

> "One of my models attempts to predict where there will be coups d'etat and other types of irregular regime changes on a monthly level. Maybe if Muhammadu Buhari, who assumed the presidency of Nigeria at the end of May 2015, sees our manuscript, he might be able to prevent any irregular leadership change from occurring in the next six months."[101]

In short, a leader might use the information provided to prevent a crisis event from occurring. A retort would be that highly suspicious authoritarian leaders do not need more encouragement to crush dissent. But, both for humanitarian and for reputational reasons, even the claim that a particular act at great cost of human lives was committed because of the results of an EWS, would be detrimental. Possible effects in the short term can include retaliation by an aggrieved group or in the long term, greater distrust towards assistance efforts in general.

These risks can only be partly mitigated, namely by operating a closed CEWS that publishes its results only internally and perhaps shares them with trusted allies and partner organisations. The FRG is in favour of linking the results of its PREVIEW programme more closely together with similar programmes of EU member states, initiatives at the EU level and those of

101 Ward, "Can We Predict? Toward What End?" p.88.

other partner countries.[102] An EWS aimed at predicting large-scale natural hazards such as floods and droughts is far less politically sensitive and can therefore serve a more open function. Simply put, for an impartial international organisation such as the UN OCHA, predicting conflict is far too politically sensitive. The prediction of natural hazards, however, is not. The most important insight here is that the future is not set in stone, but that all actors participating in the present help shape it. As a result, malicious actors might make use of the information presented about the future to further their own goals, which should be figured in the decision of whether to operate an open or closed EWS.

Despite effective EW, EA can aggravate a humanitarian catastrophe

EA can inadvertently violate the *Do No Harm* principle, a well-established minimum threshold for any intervention in conflict areas.[103] Specifically, military intervention can be politically unsustainable due to its potentially high cost in human lives and funds. Throughout the post-Cold War era, Western decision-makers have expressed various levels of optimism about their ability to prevent or mitigate conflict by taking military action, especially after failed interventions in the Middle East. For many, it was hard to imagine greater brutality in Libya than that committed by Muammar Khaddaffi himself. Following Western-backed intervention against him in 2011, the country has fallen into a violent civil war at an ever greater cost to human life. Failures like these have led to debates about the role of sovereignty and more generally, about the appropriateness of interference in the affairs of other countries. Even approaches based on a lighter, non-military intervention face great scrutiny. As such, this is not necessarily an EW problem, but an EA problem.

EA can inadvertently violate the *Do No Harm* principle.

Nonetheless, two lessons can be learned from this. First, for the design of an EWS, it is relevant to consider setting up an EWS in such a way that recognises that EA is decided upon not just based on humanitarian concerns but also broader political interests that might limit intervention.[104] Second, unlike FBA, CEWS should allow for sufficient time for decision-makers to consider whether and how to take EA when a conflict situation arises. Hence, EWS should be loosely linked to EA. The most important insight here is that even if EW is entirely effective, taking effective EA requires an additional range of careful considerations to achieve the desired ends and to prevent, mitigate or prepare for the consequences of conflict.

Data-heavy approaches might alienate decision-makers without proper training

Since data-heavy approaches are still relatively new, they often have several issues that can make them unattractive for policymakers. First, as mentioned earlier, many of the policy and decision-makers who work with CEWS may not be well-educated in data analytics and hence may attach less value to results from data-heavy approaches. It may also undermine support for EW. However, clear and trusted communication, working in multi-disciplinary teams and involving decision-makers in the CEWS developmental phase may be able to overcome such difficulties.

102 Federal Foreign Office, "Preventing Crises, Resolving Conflicts, Building Peace:," 124–25.

103 Conflict Sensitivity, "Do No Harm," accessed January 3, 2021, https://conflictsensitivity.org/conflict-sensitivity/do-no-harm-local-capacities-for-peace-project/.

104 Barnett R. Rubin, *Blood on the Doorstep: The Politics of Preventive Action* (New York: The Century Foundation, 2002), 131.

Key Takeaways
Risks

An effective CEWS addresses and/or mitigates the principal risks and ethical concerns associated with EW. These are the following:

1. Warnings or non-warnings can be based on inaccurate information.
2. Big data approaches might violate data privacy of local populations.
3. CEWS can ignore local views and circumstances, but local views can also politicise EW processes and present political risks.
4. Reflexive action might be taken on the basis of EWS findings by malicious actors.
5. Despite effective EW, EA can aggravate a humanitarian catastrophe.
6. Data-heavy approaches may alienate decision-makers and undermine support for EW.

Avenues to mitigate/address these:

- **Operating a "closed" CEWS**, as opposed to an "open" one mitigates the risk that malicious actors take reflexive action;
- Using **trusted advisors** with a **deep understanding** of **local actors** and conflict dynamics can help **ensure inclusion of local views** while reducing the risk of the manipulation of EW inputs;
- **Triangulation of data and models** can help address problems associated with inaccurate information and outcomes;
- **Formulation of clear ethical** and **legal guidelines** can help address the **risk of privacy infringements**;
- **Programming a clear stage** in the process at which **EW results** are **discussed** can help minimise the risk of EW prompting unsustainable EA.

7 Opportunities

The development of an EWS also provides ample opportunities.

EW facilitates effective EA

The greatest opportunity that EW provides is the same as its overall purpose: helping people. As the saying states, an ounce of prevention is worth a pound of cure. In fact, no or late responses leading to conflict and state fragility is far more costly than prevention of conflict.[105] To this end, effective EW enables more effective EA. The predictive performance of current generation ML models, more generally, are improving.[106] Once governments expand on their EW pilots and connect them more clearly to EA efforts, EW will help governments move upstream and prevent, mitigate and prepare for the outbreak and the consequences of violent conflict, in a similar way as FBA helps mitigate and prepare for the effects of large-scale natural hazards.

An ounce of prevention is worth a pound of cure.

EW facilitates alignment of policy efforts within government

EWS can help streamline efforts within governments into a whole-of-government approach because EWS helps create a shared situational awareness among different ministries and departments, as well as between international and local offices or ministries and embassies. The horizon-scanning function of countries at risk provides an overview that, in the form of a geospatial dashboard, can be used interactively by officials across ministries and in centre and post. One review showed that the development of early response mechanisms and instruments indeed leads to "more rapid, coherent, and informed responses within institutions to situations of violent conflict and state fragility."[107] Furthermore, the decision-making approach of both political leadership and bureaucracies was found to be more "consensus-based" when these crisis mechanisms were in place.[108]

EW facilitates alignment of policy efforts across governments

An EWS can also facilitate conflict analysis alignment with allies, international organisations or NGOs. The results of EUCEWS generated by the GCRI are shared with the heads of the EC and the EEAS, as well as with the governments of its member-states. The FRG is in favour of linking the results of its PREVIEW program more closely together with similar programs of EU member states, initiatives at the EU level and those of other partner countries.[109] Partaking in such initiatives allows organisations to build new relationships on both mid and senior civil-servant levels, offering new avenues for shaping and influencing policy. The most important insight here is that shared situational awareness as a consequence of joint EW efforts with others can lead to joint interest formation, the shaping and influencing of those interests and joint policy formulation.

105 OECD, *Preventing Violence, War and State Collapse: The Future of Conflict Early Warning and Response*, Conflict and Fragility (OECD, 2009), 83, https://doi.org/10.1787/9789264059818-en.

106 Thomas Chadefaux, "Conflict Forecasting and Its Limits," *Data Science*, 2017, 7.

107 OECD, *Preventing Violence, War and State Collapse*, 2009, 16.

108 OECD, *Preventing Violence, War and State Collapse*, 2009, 83.

109 Federal Foreign Office, "Preventing Crises, Resolving Conflicts, Building Peace:," 124–25.

EW can facilitate alignment with other stakeholders

Furthermore, connections to NGOs and other stakeholders in the EWS field can be strengthened through EW practices. EWS can include local voices in the data collection phase of EW, in the assessment of actual risk and in the reflection on EA effort based on closer contact with local populations and their leaders. This way EW can be used to strengthen and deepen their relationships with many actors overseas.

EWS can bring reputational benefits

EWS can also be important from a communication standpoint to convey not just EW results but also for an organisation's efforts in the field of humanitarian assistance. Domestically, this can help garner societal support and promote the perception of the organisation as a positive force in the world. The most important insight here is that the use of an EWS with some open applications can help garner support and promote the perception of an organisation as a force for good on multiple levels.

The introduction of more efficient, digitalised ways of working is likely to spill-over into more traditional practices

EWS can bring important efficiency gains by introducing a more digitalised way of working

The adoption of an EWS that employs a centralised dashboard and interactive collaboration can also yield efficiency gains, which in turn can inspire the adoption of such methods and tools in other fields. In the case of EW specifically, as less time is spent on assessing individual and scattered documents, the interactive geospatial dashboard frees up valuable time that can be dedicated to act upon EW products and design effective EA. The most important insight here is that the introduction of more efficient, digitalised ways of working in newly-introduced fields such as EW is likely to spill-over into more traditional practices.

Key Takeaways Opportunities

An effective CEWS **flags imminent conflict** risk, **supports strategic and policy planning** and **enhances conflict analysis and existing capabilities**. Introducing it provides the following opportunities:

- **A CEWS facilitates effective EA:** an ounce of prevention is worth a pound of cure.
- **A CEWS facilitates alignment of policy efforts within government.** An EWS can create shared situational awareness and streamline EA efforts into a whole-of-government approach.
- **A CEWS facilitates alignment of policy efforts across governments.** It can facilitate joint interest formation, the shaping and influencing of interests, and subsequently, joint policy formulation.
- **A CEWS facilitates alignment with other stakeholders**, including the strengthening of relationships with NGOs and local populations.
- **A CEWS can bring reputational benefits** and help promote an organization as a force for good domestically and internationally.
- **A CEWS can deliver important efficiency gains** by introducing a more digitalized way of working that can have spillover effects to other policy domains.

8 **Conclusion:** Key Findings and Next Steps

An effective CEWS can flag imminent and emerging conflict that inspires EA, supports strategic and programmatic planning based on humanitarian concerns and continuously enhances conflict analysis and existing capabilities by providing a common platform that is fully integrated into the network model and decision-making cycle of the relevant ministries' departments and posts or organisations' international offices and regional offices. The review presented in this report finds a thriving EWEA community both inside and outside governments that offers many practices and principles in existing EW that can be used in the development of an EW that is instrumental in achieving these goals. Key findings of this report are:

An effective CEWS can flag imminent and emerging conflict supports strategic planning and enhances conflict analysis.

- **Effective EW and EA are embedded in a wider system and encompass more than mere technological solutions.** This requires integrated EW and EA processes along the entire chain from collection and analysis to deliberation and decision and involves key stakeholders from across government departments, including centre and post, as well as local views.
- **At the same time, new data, methods and tools can effectively contribute to this endeavour.** New data is becoming increasingly available to assess conflict situations at the micro, meso and macro levels. Major advances are being made in both new and emerging quantitative methods and traditional qualitative methods that are relevant both for prediction and for understanding.
- **Organisations setting up a CEWS will benefit from private sector best practices to ensure continuous innovation and organisational take up** parallel to ongoing business by planning for the development of successive generations of CEWS within the host organisation as part of a standard operating procedure, by empowering a small team to autonomously work on forward-looking, disruptive innovations and by closing the learning loop through periodical reviews and organizational take up of lessons learned.
- **An effective CEWS offers monitoring, prediction, and explanation.** The raising of red flags for predicted conflict should be complemented with an analysis of the drivers and their interaction effects so that decision-makers can meaningfully decide on what, if any, EA to take.
- **A CEWS should not be perceived as a panacea for all purposes.** Aside from its strengths, our ability to both predict and explain future violent conflicts continues and will continue, to face challenges because data and models are approximations of the real world and the real world is indeterminate. In order to manage expectations, the development of an EWS necessitates realism about what can and cannot be achieved. Clarity about the types of violent conflict, the time horizon and the specific purpose is therein an important precondition.
- **A CEWS offers many opportunities.** First and foremost, EW can facilitate EA. It can also facilitate the alignment of policy efforts within government, across government and with additional stakeholders. It can help increase societal support for humanitarian assistance and bring reputational benefits globally. Finally, the data applications used in a CEWS can contribute to efficiency and help introduce a more digitalised way of working.

- **CEWS also comes with risks that need to be considered and addressed.** These include warnings (or non-warnings) based on inaccurate information; violations of data privacy; exclusion of local views and failure to understand local circumstances; politicisation of EW processes and concomitant political risks; reflexive action by malicious actors taken on the basis of CEWS results; EA aggravation of a humanitarian catastrophe based on effective EW; alienation of key decision-makers based on data-heavy approaches, undermining support for EW and systematic distortion of EWS because of fear for political liabilities. An effective CEWS addresses and/or mitigates the principal risks and ethical concerns associated with EW through:

1. Triangulation of data and models to address problems associated with inaccurate information and outcomes;
2. Formulation of clear ethical and legal guidelines to address the risk of privacy infringements;
3. Utilisation of trusted advisors with a deep understanding of local actors and conflict dynamics to ensure inclusion of local views while reducing the risk of the manipulation of EW inputs;
4. Operation of a“closed”CEWS, as opposed to an“open”one to mitigate the risk that malicious actors take reflexive action;
5. Pre-programming a clear stage in the process at which EW results are discussed to help minimise the risk of EW prompting unsustainable EA.

Preventing conflicts comes with far less cost to human well-being and treasure than stopping them.

By learning from these practices and principles, government and other organisations can help deliver on the promises of EW. A return of great power competition risks reducing or upending governmental efforts to accomplish conflict prevention and mitigate the effects of conflicts. This is unfortunate, as preventing conflicts comes with far less cost to human well-being and treasure than stopping them once they have started. A range of exciting newly available data sources and data collection, collation, analysis and visualisation methods as well as new possibilities to integrate EW practices throughout organisations, offers governments an opportunity to still commit to EWA amidst other pressing priorities.

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