
**BUILDING A DIGITAL EARLY WARNING AND PEACE
INTELLIGENCE FRAMEWORK FOR AFRICA: INTEGRATING
ARTIFICIAL INTELLIGENCE, GEOSPATIAL AND COMMUNITY
DATA**

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ABSTRACT

Conflict prevention depends partly on the ability to recognise warning signs before disagreements develop into widespread violence. Across Africa, early warning mechanisms already operate at continental, regional, national and community levels. The African Union, for example, maintains a Continental Early Warning System within the African Peace and Security Architecture, while regional and national institutions operate their own monitoring mechanisms. Yet the existence of early warning arrangements does not always result in timely early action. One reason is that relevant information remains dispersed across communities, government institutions, humanitarian organisations, media platforms, social media and geographic information systems.

This paper proposes a Digital Early Warning and Peace Intelligence Framework for Africa that brings these sources together and places them within a structured process of data governance, intelligent analysis, peace intelligence, early warning and early action. The framework integrates community data, government data, media reports, social media, humanitarian information, geospatial data and expert knowledge. Artificial intelligence, machine learning, natural language processing, predictive analytics and geospatial analysis are proposed as supporting tools for identifying patterns and changes in conflict environments. The paper argues that the central problem is not simply the absence of data but the inability to convert fragmented data into reliable and context-sensitive intelligence that can support preventive decisions. The framework therefore introduces peace intelligence as

an intermediate layer between data analysis and early warning. It also places human judgement, community participation, privacy, data protection, bias control and accountability within the architecture. The paper concludes that digital early warning in Africa should be designed not as a surveillance system or a replacement for human peacebuilders, but as a decision-support system that connects information, local knowledge and preventive action.

KEYWORDS: Digital peacebuilding, early warning, early action, peace intelligence, artificial intelligence, geospatial intelligence, community data, conflict prevention, Africa.

1. INTRODUCTION

The prevention of violent conflict requires more than responding after violence has occurred. In many situations, tensions develop gradually through political disagreements, competition over resources, misinformation, social exclusion, population movements, economic pressures and deterioration in relationships between groups. These developments may provide warning signs before violence becomes widespread.

For this reason, early warning has become an important component of conflict prevention. The African Union's Conflict Prevention and Early Warning Division is specifically concerned with anticipating and preventing violent conflicts and providing decision-makers with timely information on potential threats to peace and security.

The challenge is that the information needed to understand emerging conflict is no longer found in one place. A community leader may observe an increase in tension before it appears in an official report. Local radio may report a dispute before national media takes notice. Social media may reveal the spread of a rumour within hours. Humanitarian organisations may observe displacement or increasing vulnerability. Satellite and other geospatial information may reveal changes in settlement, movement or environmental conditions.

These sources contain different types of knowledge. They also differ in reliability, purpose, geographical coverage and speed of reporting. Bringing them together is therefore not simply a technological exercise. It is a question of how information is governed, verified, interpreted and used.

Recent developments in artificial intelligence have increased the possibilities for analysing large and diverse datasets. AI can assist in identifying patterns in text, classifying information, detecting anomalies and analysing relationships between variables. Natural language processing can be used to examine large quantities of textual material, while

geospatial techniques can help identify the geographical distribution of conflict-related events.

However, the use of AI in peacebuilding also introduces risks. An algorithm can reproduce bias contained in its training data. A system that relies heavily on social media may mistake online activity for broader community sentiment. A false report can produce a false warning. The collection of sensitive community information can also create security and privacy concerns.

UNESCO's Recommendation on the Ethics of Artificial Intelligence emphasises human rights, privacy and data protection, fairness, transparency, accountability and human oversight. It specifically recognises that AI systems can reproduce or amplify existing biases and therefore require appropriate safeguards.

This paper proceeds from a simple proposition: **Africa does not necessarily need more disconnected warning systems; it needs stronger connections between data, analysis, warning and action.**

The paper therefore proposes a Digital Early Warning and Peace Intelligence Framework designed to integrate different sources of information while retaining human and community judgement at the centre of the process.

2. The Problem of Fragmented Early Warning

Early warning systems have developed considerably across Africa. The African Union's Continental Early Warning System forms part of the broader African Peace and Security Architecture. Its purpose is to support the anticipation and prevention of violent conflict and provide relevant information to decision-makers.

There is therefore an important institutional foundation for early warning on the continent.

The difficulty lies partly in fragmentation.

Information about the same conflict situation may be held by different actors. A government agency may have security information. A humanitarian organisation may have displacement figures. A local peace committee may know about an emerging community dispute. Journalists may be reporting allegations or rumours. Social media users may be circulating competing narratives. Satellite imagery may show physical changes in an affected area.

Each source may provide only part of the picture.

When these sources are not connected, analysts and decision-makers may receive an incomplete understanding of the situation. The problem is especially serious when the information changes quickly.

There is also a distinction between **information availability** and **actionable intelligence**. A large amount of information does not necessarily produce a better decision. What matters is whether the available information has been assessed, compared, placed in context and interpreted sufficiently to support action.

This paper identifies four related weaknesses that a digital framework should address.

First, **data fragmentation** makes it difficult to combine information from different sources.

Second, **data quality problems** can produce misleading signals.

Third, **analytical gaps** can prevent institutions from recognising relationships between different indicators.

Fourth, **the warning-action gap** means that even credible warnings may not result in preventive intervention.

The proposed framework addresses these four problems as a connected process rather than treating them as separate technical issues.

3. From Early Warning to Peace Intelligence

The distinction between data, information, intelligence and action is central to the proposed framework.

Data are individual observations or records. Information is data that has been organised and given some meaning. Intelligence goes further by examining relationships, significance, trends and possible implications.

For peacebuilding purposes, this can be represented as:

Data → Information → Intelligence → Warning → Action

The paper proposes the term **peace intelligence** for the intelligence stage.

Peace intelligence refers in this paper to the systematic collection, verification, integration and interpretation of information for the purpose of understanding risks to peace, identifying conflict trends and supporting preventive decisions.

The concept is important because early warning should not simply answer the question of whether something is happening. It should help answer:

- What is happening?
- Where is it happening?
- What has changed?
- What factors are connected to the change?
- Who is affected?

- How reliable is the information?
- What could happen if the trend continues?
- What preventive options are available?

For example, an increase in hostile messages on social media may be a weak warning signal by itself. It becomes more significant if it occurs at the same time as reports of political mobilisation, communal confrontation, population displacement and threats against a particular group.

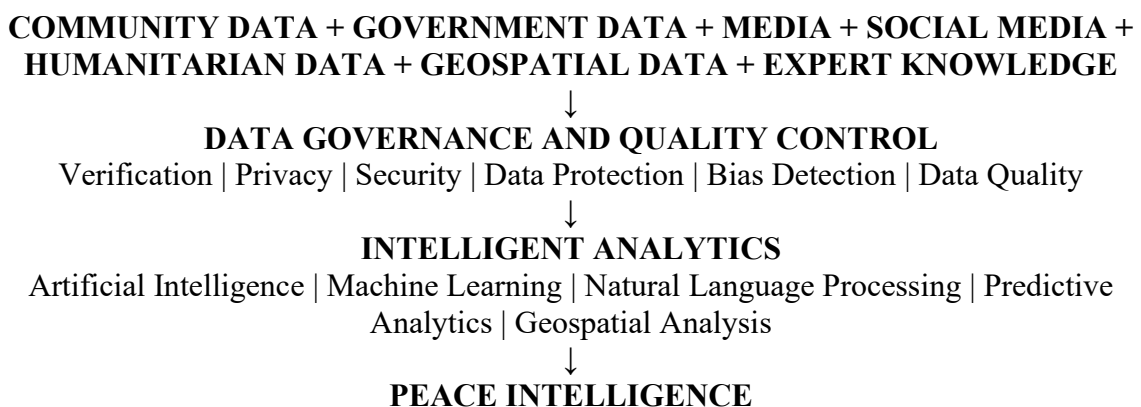
The role of peace intelligence is therefore to bring these pieces together and provide context. This is the principal conceptual contribution of the proposed framework.

4. The Proposed Digital Early Warning and Peace Intelligence Framework

The proposed framework contains seven connected stages:



The framework should not be interpreted as a purely linear technological pipeline. Information should move in both directions. Feedback from communities, peace practitioners and decision-makers should continually improve the quality of the system.



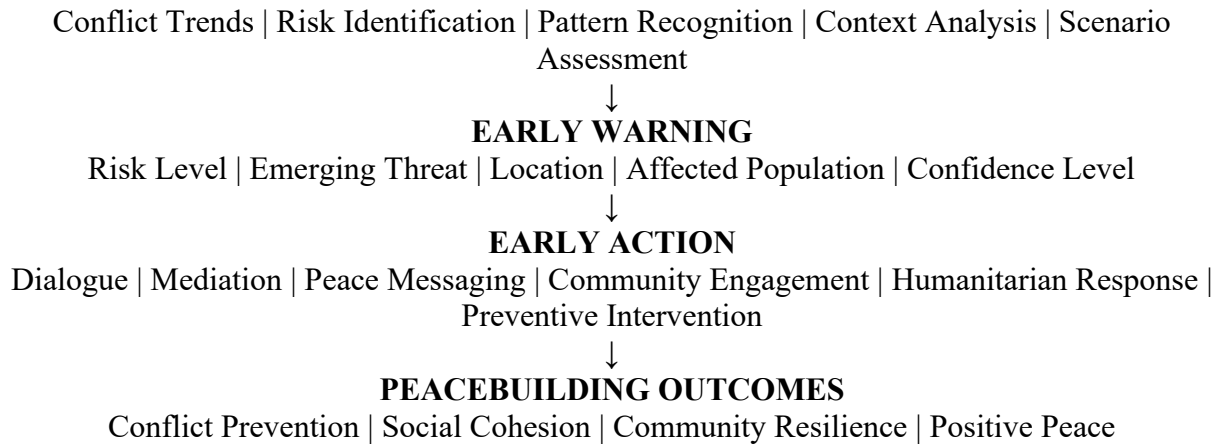
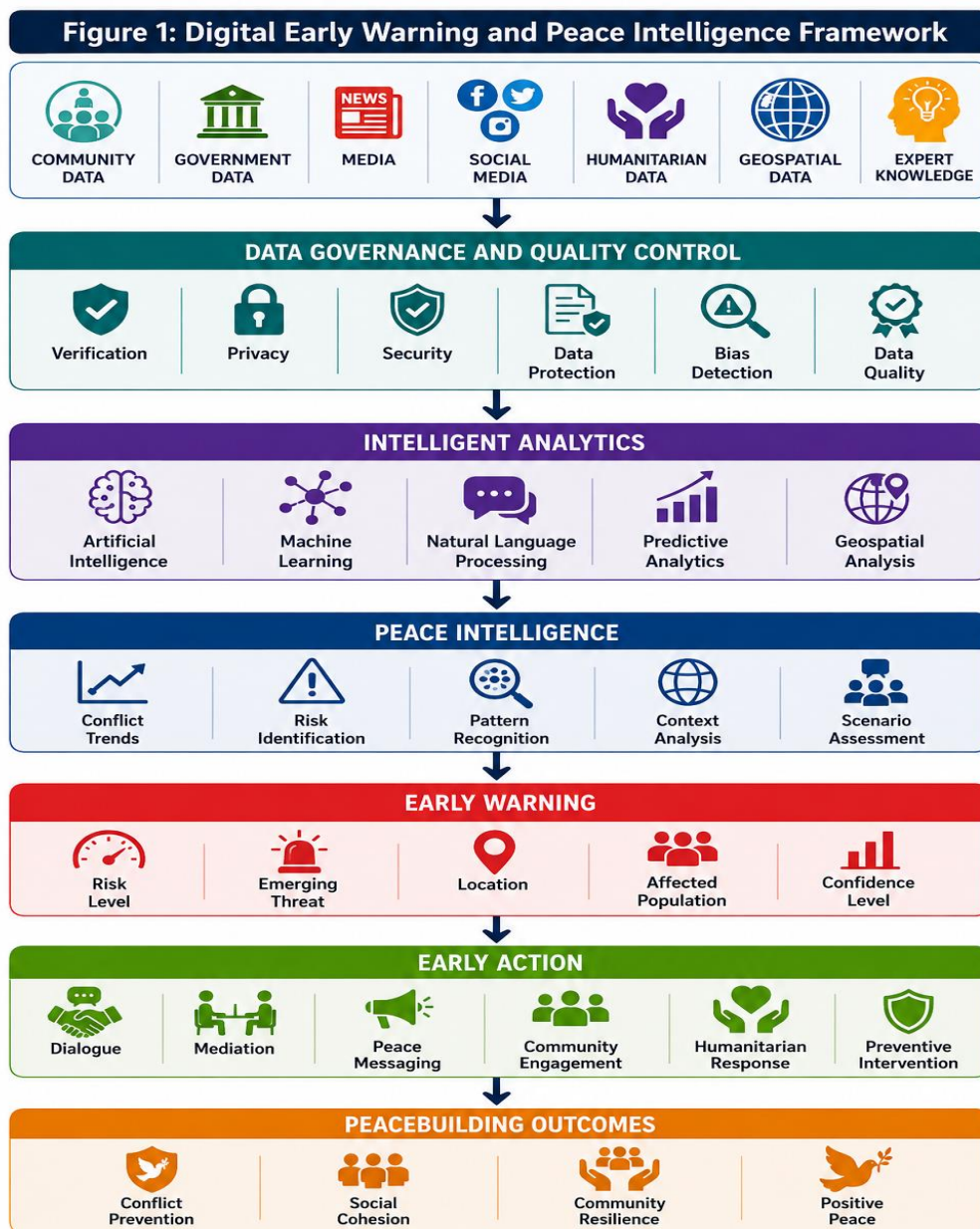


Figure 1: Digital Early Warning and Peace Intelligence Framework.



5. Data Sources

The first component of the framework is the collection and integration of relevant data.

5.1 Community Data

Community data is particularly important because conflict often develops at the local level.

Community members may notice changes that are not immediately visible in national datasets. These may include rumours, threats, changes in relationships, movement of groups, disputes over land or water, inflammatory public statements and other local developments.

Community reporting can take different forms, including:

- community peace monitors;
- local peace committees;
- SMS reporting;
- mobile applications;
- local radio;
- community organisations;
- traditional and religious leaders;
- civil society organisations; and
- structured interviews and surveys.

Community data should not be treated simply as raw information to be extracted by a technological system. Local actors should participate in interpreting the information and determining appropriate responses.

This is particularly important in Africa, where local knowledge and informal institutions remain important in many conflict prevention processes.

5.2 Government Data

Government institutions possess information that can contribute to conflict analysis, including information on elections, population movements, crime, public services, security incidents, displacement and other indicators.

The integration of government information with community and non-governmental information could improve the completeness of early warning.

However, access to government information must be governed by clear rules. Sensitive information should not be made available simply because it could theoretically improve prediction.

5.3 Media Data

Media reports provide another source of information about emerging conflict.

Local media are especially relevant because they may report community-level events that receive limited international attention. Radio remains important in many African settings, particularly where internet access is uneven.

Automated text analysis can assist analysts in identifying repeated references to particular locations, groups, events or narratives.

Media information should nevertheless be verified. Reporting can contain errors, political bias or incomplete accounts.

5.4 Social Media Data

Social media creates an additional source of real-time information.

Public digital conversations can provide indications of:

- emerging grievances;
- rumours;
- inflammatory narratives;
- hate speech;
- mobilisation;
- misinformation;
- threats; and
- changing public discourse.

However, social media should never be treated as a direct representation of society.

People without reliable internet access may be absent from the dataset. Highly active users may appear more influential than they actually are. Coordinated campaigns can create artificial impressions of public opinion.

Social media data should therefore be considered one source among several rather than a stand-alone predictor of conflict.

5.5 Humanitarian Data

Humanitarian organisations often possess information concerning displacement, food insecurity, access to essential services, protection concerns and vulnerable populations.

Such information can help identify conditions that may increase conflict risks or worsen the consequences of existing tensions.

The framework should therefore provide appropriate mechanisms for integrating humanitarian information while maintaining confidentiality and the protection of vulnerable populations.

5.6 Geospatial Data

Conflict occurs in physical locations.

Geospatial data can help identify where incidents occur and how conflict patterns change across space and time.

Geospatial information may include:

- satellite imagery;
- geographic information systems;
- population distribution;
- infrastructure;
- environmental conditions;
- land-use changes;
- displacement patterns; and
- locations of reported incidents.

Its greatest value comes when it is combined with other information.

For example, a map showing repeated conflict incidents becomes more useful when examined alongside population movement, environmental stress and community reports.

5.7 Expert Knowledge

No digital system should be designed on the assumption that algorithms can replace experienced conflict analysts.

Experts provide contextual understanding that may not be present in datasets. They can identify historical relationships, political sensitivities, cultural factors and limitations in the available evidence.

Expert knowledge should therefore be treated as an important component of the data environment.

6. Data Governance and Quality Control

The second layer of the framework is data governance.

This layer is essential because the quality of the final warning depends on the quality of the information entering the system.

Five areas require particular attention.

6.1 Verification

Information should be checked before being treated as a reliable warning signal.

Verification can involve comparison with other sources, confirmation by local actors, examination of historical records and assessment of the credibility of the source.

6.2 Privacy

Information concerning individuals and communities should be collected only where necessary for a legitimate peacebuilding purpose.

Personal information should not be exposed simply because it is technically possible to collect it.

6.3 Security

Conflict-related information can become dangerous when accessed by actors who intend to cause harm.

Data systems must therefore include appropriate technical and institutional security measures.

6.4 Bias Detection

Bias may enter the system at several points.

A community with strong digital connectivity may generate more data than a remote community. A media organisation may report some groups more frequently than others. Historical datasets may reflect existing political or institutional biases.

If these problems are ignored, AI systems may reproduce them.

UNESCO's AI ethics framework specifically identifies fairness, non-discrimination, transparency, accountability, privacy and human oversight as important principles for responsible AI.

6.5 Data Quality

Data should be assessed for completeness, accuracy, timeliness, consistency and relevance.

A sophisticated analytical system cannot compensate for consistently poor input.

7. Intelligent Analytics

The third component involves the analysis of information.

The framework proposes five complementary analytical capabilities.

7.1 Artificial Intelligence

AI can assist in processing large quantities of information and identifying relationships that may be difficult to detect manually.

Its role should be supportive rather than determinative.

The system may identify a pattern that requires human investigation. It should not independently declare that a community is likely to become violent without appropriate contextual assessment.

7.2 Machine Learning

Machine learning can assist in identifying patterns from historical and current information.

For example, models can examine relationships between previous incidents and variables such as location, timing, population movement or environmental conditions.

However, historical relationships do not necessarily remain stable. Conflict actors adapt, political conditions change and unexpected events occur.

Predictive models should therefore provide **risk estimates**, not claims of certainty.

7.3 Natural Language Processing

Natural language processing can assist with large amounts of text from publicly available media and digital sources.

It may help identify:

- recurring conflict-related terms;
- emerging narratives;
- changes in sentiment;
- threats;
- rumours;
- references to specific locations; and
- changes in the volume of conflict-related discussion.

African languages present an important research challenge. Many AI language systems have stronger capabilities in widely represented global languages than in African languages.

A serious African digital peacebuilding system must therefore address language diversity rather than assuming that English-language analysis is sufficient.

7.4 Predictive Analytics

Predictive analytics can be used to examine whether combinations of indicators are associated with increasing risk.

The purpose is not to produce a definitive prediction of violence. It is to help analysts identify areas that require further attention.

7.5 Geospatial Analysis

Geospatial analysis provides the spatial dimension of peace intelligence.

It can help identify:

- clusters of incidents;
- movement patterns;
- proximity between conflict events and population centres;
- changes in land use;
- areas experiencing repeated violence; and
- relationships between environmental and social conditions.

8. Peace Intelligence

Peace intelligence is the central analytical layer of the proposed framework.

At this stage, raw analytical outputs are interpreted in relation to the conflict environment.

A system may detect:

increased negative social media discussion + reports of local confrontation + population movement + political mobilisation.

These observations are still not a warning until they are assessed.

Peace intelligence asks whether the combination represents a meaningful change in conflict risk.

The output should therefore contain at least five elements:

1. **Risk** – what type of conflict risk is emerging?
2. **Location** – where is the risk concentrated?
3. **Trend** – is the situation improving, stable or deteriorating?
4. **Confidence** – how reliable is the available evidence?
5. **Context** – what factors help explain the development?

This approach is preferable to presenting a single numerical “conflict score” without explanation.

Decision-makers need to understand not only that a risk has increased but also why the system reached that conclusion.

9. Early Warning

Once peace intelligence has been generated and reviewed, it can support early warning.

A warning should communicate information in a form that decision-makers can understand and use.

A practical warning could include:

Emerging risk: communal tension

Location: identified locality

Trend: increasing

Key indicators: local incidents, online threats, population movement

Confidence: moderate/high

Potential consequence: escalation into violence

Recommended attention: community dialogue and verification

Such a system would be more useful than a warning that simply states that “conflict risk is high.”

The warning should also make clear what is known, what is uncertain and what requires further investigation.

10. From Early Warning to Early Action

The most important test of an early warning system is whether it contributes to action.

There is little value in producing accurate warnings if institutions do not respond.

Early action should be appropriate to the nature and severity of the risk.

Possible responses include:

- Dialogue between conflicting groups;
- Mediation;
- Engagement with community leaders;
- Peace education;
- Countering harmful rumours;
- Youth engagement;
- Humanitarian assistance;
- Protection measures;
- Diplomatic engagement;
- Support for local peace structures; and
- Preventive political intervention.

The response should not automatically be a security response.

This is an important principle of the proposed framework. The purpose of peace intelligence is not to identify people as threats. It is to understand conditions that may produce violence and identify opportunities to prevent escalation.

11. Community Participation and Local Ownership

A digital peacebuilding system that excludes communities may become technically sophisticated but socially weak.

Local people should participate at different points in the framework.

They can contribute to:

- identifying relevant indicators;
- reporting local developments;
- verifying information;
- interpreting conflict trends;
- assessing the credibility of warnings; and
- determining appropriate responses.

This creates a feedback loop between technology and local knowledge.

It also helps address one of the weaknesses of externally designed early warning systems: the possibility that technical indicators may not reflect the realities experienced by people at community level.

Community participation must, however, be based on trust.

People need to know why information is being collected, who will have access to it and how it may be used.

12. Artificial Intelligence: Opportunities and Limits

The use of AI in early warning should be approached carefully.

There is a temptation to assume that more advanced algorithms will automatically produce better predictions. This assumption is not justified.

Conflict is not a mechanical process.

People make decisions. Political leaders change positions. Communities respond to events. Rumours can suddenly spread. A peace agreement can alter an expected trajectory. An unexpected incident can change the situation within hours.

AI can identify patterns, but it cannot fully understand human intentions.

For this reason, the framework adopts a **human-in-the-loop** approach.

The process should be:

AI identifies patterns → analyst examines evidence → local knowledge provides context → decision-maker assesses options → action is taken.

This arrangement preserves the advantages of technology without transferring responsibility for peace decisions to an algorithm.

This is also consistent with the principle of human oversight emphasised by UNESCO in its Recommendation on the Ethics of Artificial Intelligence.

13. Geospatial Intelligence and the African Context

Geospatial information can strengthen conflict analysis because many African conflicts have a strong relationship with territory and resources.

Land disputes, pastoral mobility, competition over water, environmental degradation, settlement expansion and population displacement all have geographical dimensions.

A digital peace intelligence platform could therefore combine incident data with spatial information.

For example:

Conflict incidents + population movement + water availability + land-use change + community reports

may provide a stronger understanding of a local conflict than any of these sources individually.

Geospatial intelligence can also support the identification of areas where preventive resources should be concentrated.

However, geospatial information should be interpreted carefully. The presence of two events in the same geographical area does not necessarily mean that one caused the other.

Spatial correlation should therefore lead to further investigation rather than automatic conclusions.

14. Misinformation and Digital Conflict

The digital environment has created new opportunities for peacebuilding but also new pathways for conflict escalation.

False information can spread quickly through social media and messaging platforms. In situations of political or communal tension, rumours can influence perceptions and behaviour.

A digital early warning system should therefore monitor not only physical incidents but also changes in information environments.

This does not mean monitoring every private communication or treating disagreement as a security threat.

The emphasis should be on identifying publicly observable patterns that may contribute to conflict escalation and verifying them through independent sources.

Peacebuilding responses should focus on accurate information, dialogue and media literacy rather than censorship as the default response.

15. Ethical and Human Rights Considerations

The proposed framework raises significant ethical questions.

15.1 Privacy

Community reporting should not become an excuse for collecting unnecessary personal information.

15.2 Surveillance

Digital peacebuilding should not become indistinguishable from security surveillance.

The purpose should remain conflict prevention and peacebuilding.

15.3 Algorithmic Bias

AI systems may produce unequal results if their data or design reflects existing inequalities.

15.4 Transparency

Decision-makers should understand the basis of significant warnings.

15.5 Accountability

There must be clear responsibility for decisions influenced by the system.

15.6 Human Oversight

Human beings should retain responsibility for interpreting warnings and determining interventions.

These principles are particularly important because the consequences of an incorrect conflict warning can be serious. Incorrectly identifying a community or group as a conflict threat could deepen mistrust and potentially create the very tension that the system is intended to prevent.

16. Implementation Challenges in Africa

The framework faces practical challenges.

16.1 Digital Inequality

Not every community has equal access to digital infrastructure.

A system relying heavily on online information may therefore reproduce existing inequalities.

16.2 Language Diversity

Africa's linguistic diversity presents a major challenge for automated text analysis.

Systems need to recognise local languages and contexts rather than relying almost entirely on English or other widely represented languages.

16.3 Institutional Coordination

Data may remain within separate organisations because of institutional mandates, security concerns or lack of interoperability.

The framework therefore requires agreed standards for responsible information sharing.

16.4 Technical Capacity

AI and geospatial systems require specialised skills.

Capacity development must therefore form part of implementation.

16.5 Trust

Communities may resist systems that appear to be designed for surveillance.

Trust must be built through transparency, participation and clear safeguards.

16.6 Sustainability

A digital early warning system should not depend entirely on short-term donor funding.

Long-term institutional ownership and local technical capacity are necessary for sustainability.

17. Proposed Implementation Model

The framework can be introduced in phases.

Phase One: Conflict and Data Mapping

Identify the conflict risks, institutions, communities and existing data sources within a selected pilot area.

Phase Two: Data Governance

Develop rules for data collection, verification, storage, sharing, privacy and security.

Phase Three: Data Integration

Develop mechanisms for bringing together community, government, humanitarian, media and geospatial information.

Phase Four: Analytical Development

Introduce AI, machine learning, natural language processing and geospatial analysis according to the needs and capacity of the pilot environment.

Phase Five: Peace Intelligence

Establish a team responsible for interpreting analytical outputs and producing context-sensitive intelligence.

Phase Six: Early Warning

Develop clear procedures for communicating verified warnings to relevant decision-makers and peace actors.

Phase Seven: Early Action

Establish response protocols connecting different levels of risk to appropriate preventive interventions.

Phase Eight: Evaluation

Assess the system using indicators such as:

- accuracy of warnings;
- timeliness;
- false-warning rate;
- community participation;
- institutional response;
- response time;
- number of preventive interventions;
- user trust; and
- peacebuilding outcomes.

The evaluation should examine not only whether the system predicted events but whether it helped institutions make better preventive decisions.

18. DISCUSSION

The proposed framework makes three main arguments.

First, **data integration is more important than data volume**.

A large amount of unverified information does not necessarily improve early warning. The system should prioritise relevant, reliable and diverse information.

Second, **peace intelligence should connect analysis with warning**.

Traditional early warning can focus heavily on indicators and alerts. The proposed model adds a peace intelligence layer in which information is interpreted in its social, political and geographical context.

Third, **early warning must be connected to early action.**

The purpose of collecting and analysing information is ultimately to support decisions that can prevent violence.

The framework therefore treats early warning as part of a larger process:

Data → Governance → Analysis → Intelligence → Warning → Action → Peacebuilding



This sequence also provides a basis for evaluating digital peacebuilding systems. A system should not be judged only by the sophistication of its technology. Its value should be assessed by whether it improves understanding, strengthens timely decisions and contributes to prevention.

19. Implications for Peacebuilding Practice

The framework has implications for governments, regional organisations, civil society, humanitarian organisations, researchers and peace practitioners.

For governments, it provides a possible structure for connecting existing information systems.

For regional organisations, it offers a way to strengthen interoperability between national and regional early warning mechanisms.

For civil society, it creates a stronger role for community-based information and local peace monitoring.

For humanitarian organisations, it provides opportunities to connect vulnerability and displacement information with conflict analysis.

For researchers, it creates opportunities to examine how AI, geospatial analysis and local knowledge can be combined without undermining community rights.

For peace practitioners, it provides a practical bridge between digital information and traditional methods such as dialogue, mediation and community engagement.

The framework is therefore not intended to create a separate technological institution. It is intended to strengthen the connection between existing peacebuilding actors and the information they require.

20. CONCLUSION

The challenge of conflict prevention in Africa is not simply a lack of information. In many situations, information already exists but remains fragmented across institutions, communities and digital platforms.

The proposed Digital Early Warning and Peace Intelligence Framework responds to this problem by bringing different sources of information into a common structure.

The framework begins with community, government, media, social media, humanitarian, geospatial and expert data. It then applies data governance and quality control before using artificial intelligence, machine learning, natural language processing, predictive analytics and geospatial analysis to identify patterns.

The analytical results are interpreted through a peace intelligence layer. This layer is important because a warning without context may be difficult to act upon.

The resulting warning is then connected to early action and, ultimately, to peacebuilding and positive peace.

The framework does not assume that artificial intelligence can predict conflict with certainty. It does not treat digital data as a replacement for local knowledge. It does not propose that technology should determine peacebuilding decisions.

Instead, it proposes a relationship between technology and people:

technology helps to identify patterns; people provide context; institutions make decisions; communities participate in action.

This relationship is particularly important in Africa, where conflict dynamics differ considerably across countries and communities. A useful digital early warning system must therefore be technically capable but also locally grounded.

The central proposition of this paper is that **the future of digital early warning in Africa should move beyond collecting more data towards building better peace intelligence and stronger connections between warning and action.**

If implemented responsibly, an integrated approach combining artificial intelligence, geospatial information and community knowledge can strengthen the capacity of African peacebuilding institutions to identify risks earlier, understand them better and respond before violence becomes more difficult to prevent.

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