Visualizing Peace Transitions: Interactive Visualizations to Support Innovation and Adaptive Management in Peace Processes

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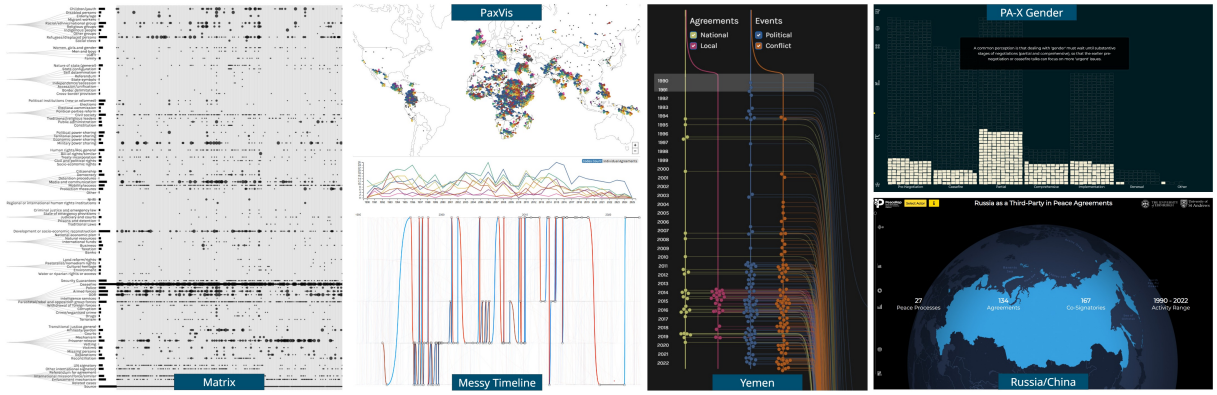

Figure 1: Examples of PeaceRep Visualizations.

Abstract

This poster presents nine visualization projects that were developed through an 8-year interdisciplinary collaboration between visualization and peace studies researchers to help practitioners and policymakers in their complex workflows. Our work demonstrates how different visualization purposes - *analysis* for domain experts, *tracking* for decision-makers, and *conveyance* for broader audiences - require distinct design considerations when handling the subjective, incomplete, and disputed nature of peace agreement data. The visualizations have proven effective in supporting real-world peace mediation and policy analysis, demonstrating visualization's potential for addressing critical humanitarian and societal challenges. https://peacerep.org/peacetech-tools/

Index Terms: Visualization, PeaceTech, Peace.

1 Introduction

Data provides reliable evidence in armed conflict resolution, a field otherwise dominated by emotions and politics [1]. Visualization can play a pivotal role in analyzing, tracking, and conveying such evidence, particularly given the qualitative, incomplete, and disputed nature of peace data. However, existing peace and conflict visualizations typically use generic and/or static design approaches, rather than focusing on iterative, human-centered solutions developed through an interdisciplinary collaboration.

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This poster presents nine interactive visualization projects from an 8-year collaboration between visualization researchers and the Peace and Conflict Resolution Evidence Platform (PeaceRep) at the University of Edinburgh[1]. Built on the PA-X Peace Agreements Database [3] - the largest collection of its kind, with over 2,000 formal peace agreements since 1990 - our visualizations enable analysis, tracking, and conveyance of peace process related data for practitioners, policymakers, and researchers in the area. Through human-centered design, these tools have proven effective in supporting real-world peace mediation by revealing complexities and patterns that are inaccessible using traditional approaches.

2 Projects

Our nine visualization projects serve three core purposes with distinct design considerations:

Analysis for domain experts emphasizes exploratory interaction to reveal data complexity. The **Messy Timeline** [2][2] shows the back and forth trajectory of peace processes over time. The visualization challenges assumptions about the linear progress of peace negotiations and demonstrates that 'successful' processes follow diverse paths, providing reassurance that progress manifests differently across contexts. It has helped to emphasize that peace agreements are not signed in isolation and are not sufficient on their own to resolve conflict - they are always part of a wider unique process and there is not a single 'successful' trajectory. The **Matrix**[3] illustrates the coding structure of the concepts/themes found in peace agreement documents. This can allow users to identify patterns

[1] https://peacerep.org/

[2] https://www.peaceagreements.org/visualizations/messy-peace-processes/

[3] https://www.peaceagreements.org/visualizations/data-overview-visualization/

in when and where specific issues are addressed throughout peace processes, track persistent issues over time, and understand the evolution of issues across negotiations.

PaxVis [5][4] reveals geographic patterns in peace agreements and shows issues addressed (e.g., power-sharing, human rights frameworks) as colored flower petals. This highly exploratory tool enables users to identify key conflict issues in specific areas and processes, and how issues addressed in processes may shift over time.

TRACKING—Tracking actor involvement and process outcomes in conflict resolution is an important task for practitioners and policymakers. They need to be able to compare temporal patterns across multiple dimensions, identify network relationships between signatories, and correlate spatial-temporal events. Traditional text-based analysis of reports makes these multi-dimensional analytical tasks difficult at scale, particularly for these users as they are often under strict time constraints. To address this, the following visualizations provide quick access to data that can be filtered, linked, and compared, allowing to track progress across a variety of datasets and indicators, which can then support policy analysis and practitioner decision-making. The **Actors across Processes** tool[5] uses coordinated views, combining a beeswarm timeline and multiple network representations. Users can select actors and peace processes to reveal signing patterns over time, which enables the identification of potential mediation entry points based on historical collaboration patterns. The **Ukraine Conflict Map**[6] employs layered geographic visualization with temporal filtering and multi-source data integration. Users can toggle between conflict event layers and filter by time/event type. The visualization triangulates various conflict and humanitarian datasets on a single canvas, revealing data gaps and complementary coverage that individual sources cannot provide. The **PA-X Tracker**[7] uses coordinated dashboard views that contain network diagrams, timelines, and indicator trend charts that contextualize peace agreements within broader institutional and conflict events. Users can track levels of conflict intensity before and after an agreement has been signed, examine how political/security/economic/humanitarian indicators change over time in the context of the peace process, and compare processes in different contexts historically and geographically. PA-X Tracker supports adaptive management, comparative analysis, and on-boarding of practitioners who can quickly familiarize themselves with these processes.

CONVEYANCE—Due to the complex nature of peace and conflict resolution that is understandably present in the PA-X dataset, some of our visualizations use 'scrolly-telling' techniques in order to convey these complexities to the user gradually, through the combination of explanatory text, images, and visual data representations. This approach allows us to communicate expert analyses from researchers on the team in a digestible manner for a variety of users. The **Yemen Timeline**[8] provides an overview of the Yemeni conflict evolution. The visualization shows a timeline of peace and transition documents, through which the user can scroll and contextualize these agreements within other relevant political/conflict events in Yemen, to highlight that these agreements are not signed in isolation. In the **PA-X Gender**[9] visualization, our aim was to compare peace agreements that contain references to women, girls, gender, and/or sexual violence with agreements that do not address these issues. In particular, we wanted to emphasize that out of 2,055 peace agreements in PA-X, only 464 (23%) contain such references despite being a key conflict-related issue. Lastly, the **Russia-China as Third-Party Actors**[10] visualization allows the user to scroll through expert analyses of Russia and China as third party signatories to peace agreements, and explore trends in these two actors' activities over time.

[4] https://www.peaceagreements.org/visualizations/agreements-process-map/

[5] https://www.peaceagreements.org/visualizations/actor-networks/

[6] https://www.peaceagreements.org/tracker/ukraine/map/

[7] https://www.peaceagreements.org/tracker/

[8] https://peacerep.github.io/yemen-timeline

[9] https://tvancisin.github.io/pax_gender

3 DISCUSSION

Our work demonstrates how human-centered design can address unique challenges in peace visualization, revealing insights for the visualization community alongside future research directions.

Design Insights for Visualization—Working with peace data reveals distinct requirements: handling disputed and subjective information, serving diverse stakeholders with conflicting needs, and balancing analytical depth with accessible communication. Our analysis/tracking/conveyance taxonomy provides a framework for similar applications where single-purpose tools are insufficient.

Ethical Considerations—Visualizing conflict data raises ethical issues that are often overlooked in visualization research. We follow the Do No Harm principle [4], considering unintended consequences of representing lived experiences as data. Additionally, Global North/South power dynamics in data collection and the need for multilingual accessibility present ongoing challenges. Visualizations have a tendency to present data as the ground truth, with little transparency in data pipeline decisions and the underlying human contributions [6]. To address this, we are developing a provenance visualization that explicitly reveals the gap between real-life events and the data driving our outputs, suggesting a model for trust and transparency in the data and subsequent tools that use it.

Future Directions—Visualization atlases [7] offer potential for consolidating individual projects into coherent platforms that serve diverse audiences. However, this requires balancing global perspectives with context-sensitive analysis - a key challenge for humanitarian visualization platforms. Future work should therefore interrogate how a more flexible structure for peace transition atlases might support meaningful integration while balancing flexibility and depth.

[10] https://www.peaceagreements.org/visualizations/third-party-scroll/

[11] https://peacerep.org/about/people/

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