TABLE OF CONTENTS

04 Introduction
05 AI's Technical Complexities & the Risk of Exclusion
06 AI’s Datasets and Their Role in Inclusive DRR
07 Exacerbating Existing Power Inequalities
08 Ethical Challenges at the Crossroads of AI and DRR
09 Examples
10 Recommendations
11 Summary
12 References
13 References (cont.)
Introduction: AI's Potential and Challenges in DRR

Artificial Intelligence (AI) has emerged as a formidable tool, being used across various domains, including Disaster Risk Reduction (DRR) [1]. AI’s capacity to process vast data in real-time and its innate adaptability make it instrumental in elevating the effectiveness and efficiency of DRR strategies. However, its assimilation into DRR poses certain challenges. While issues like technological unemployment, profiteering, and misuse are prevalent across sectors, a unique challenge for the DRR community is the fear that AI might inadvertently exacerbate inequalities during disasters or crises [2].

Given these complexities, this briefing seeks to explore the potential risks and challenges of integrating AI into inclusive DRR. We will closely examine AI’s impact on the participation, representation, and decision-making of marginalised communities within DRR. As these communities often face neglect due to various socio-economic and political reasons, it is imperative to ensure that their vulnerabilities aren’t accentuated during disasters.

The goal of this briefing is to deepen our understanding of AI’s current role in DRR, project its potential future trajectories within this sector, and address arising concerns.

At the core of our discussion is the acknowledgement of profound ethical, social, and political repercussions stemming from AI’s incorporation into DRR [3]. This briefing posits that these considerations must lead sector-wide dialogues and strategies, both in design and execution phases. By proactively addressing these concerns, we aim to highlight key themes essential for an AI deployment that is not only effective but also equitable and inclusive.

This briefing offers a review of AI in this very specific context (its interaction and impact on marginalised or at-risk communities in times of disaster or crisis) and does not aim to discuss AI’s merits or drawbacks more generally. AI holds the promise of revolutionising disaster risk reduction for everyone but also bears significant risks in its development and use.

As we wade through the intricacies of AI in DRR, our ultimate goal should be to ensure an AI framework guarantees equitable treatment and care for all, irrespective of their societal, economic, or political background. This briefing intends to initiate a broader conversation, given the depth and subtleties of the conversations required. The urgency of these dialogues cannot be overstated, especially with the relentless (and largely unchecked) advancements in AI technology.
AI's Technical Complexities and the Risk of Exclusion

Artificial Intelligence (AI) encompasses a branch of computer science aimed at devising systems that can emulate tasks typically demanding human intelligence, including visual perception, speech recognition, and language translation [4]. Central to AI are algorithms and computational models, many of which, like neural networks, draw inspiration from human brain functions. By training on extensive datasets, these algorithms discern patterns and forecast outcomes. AI's rapid progression offers a paradigm shift in sectors from healthcare to transportation [5]. Yet, it presents challenges including bias in decision-making, privacy issues, and potential job losses, underscoring the need for prudent oversight.

In the realm of disaster risk reduction and related disciplines, AI's capabilities are revolutionising practices [2]. By processing vast datasets on weather and geological patterns, machine learning can predict hazards like hurricanes, paving the way for timely interventions. Post-disaster, AI-driven drones can rapidly assess affected zones, evaluating damage severity and assisting in setting response priorities [2]. Furthermore, AI simulations can spotlight vulnerabilities in infrastructure and communities, directing the construction of durable structures and effective evacuation plans. During crises, AI can streamline resource distribution, ensuring swift delivery of essentials to critical areas [1].

Several other facets primed for AI augmentation include:

- Enhancing communication: Natural language processing can facilitate real-time translation in global relief efforts, while chatbots could relay crucial information.
- Social media monitoring: AI could spot distress signals and other sign of survival in impacted regions.
- Infrastructure health checks: AI could monitor key infrastructure like dams and evaluate areas based on historical and real-time data for potential risks.

However, AI's adoption in DRR isn't devoid of challenges. Issues like data privacy, accuracy, and upholding ethical standards call for a balanced approach, emphasising transparency, accountability, and cultural awareness [1,2].
AI’s Datasets and Their Role in Inclusive DRR

AI methodologies utilise vast datasets to instruct their algorithms. This data is crucial, guiding AI in pattern recognition, forecasting, and shaping decisions. However, these datasets can unintentionally perpetuate and magnify underlying biases [6].

The efficacy and neutrality of AI in DRR are largely contingent on the data backing these systems. A machine learning model reflects the fairness and inclusivity of its training data. When certain groups, such as marginalised communities, are inadequately represented or overlooked in these datasets, resultant AI systems can perpetuate these omissions [7]. These communities, which might include ethnic minorities, economically disadvantaged groups, or individuals with disabilities, may find their portrayal in training datasets influenced by the preconceptions or biases of AI developers [8].

Such misrepresentation can result in AI-driven DRR strategies neglecting the unique needs, experiences, and vulnerabilities of these communities [8]. Given that DRR strategies aim to manage risks and reduce disaster impacts, especially for these vulnerable groups, any oversight can translate to inefficiencies or detrimental results; and thus recreate and even exacerbate the risks. Hence, it becomes imperative to acknowledge and rectify biases inherent in data gathering and algorithm training [8]. A concerted effort is needed to ensure AI datasets truly capture the diversity and nuances of the populations they’re meant to assist.

The role of intersectionality must also be considered within the realm of AI and the data used to develop such systems. Intersectionality can be defined as the interconnected nature of social categorisations such as race, class, and gender as they apply to a given individual or group, regarded as creating overlapping and interdependent systems of discrimination or disadvantage [9]. If we assume that data used to develop AI will use separate data inputs for any one particular marginalised or at-risk group and won’t explore the linkages between a person or communities complexities with other systems of discrimination or disadvantage, then this could further exacerbate those risks [10].

In subsequent steps, it’s vital to ensure that AI-based DRR approaches don’t merely recognize these biases but work proactively to mitigate their influence [11]. The aim should be to create strategies that remain equitable, comprehensive, and effective for all, especially the most marginalised communities.
Exacerbating Existing Power Inequalities

The incorporation of AI in DRR has the potential to inadvertently solidify existing power disparities, particularly sidelining marginalised communities from pivotal decision-making roles [12]. This could further amplify the inequalities they endure.

AI operates through intricate algorithms and computational models. Such complexity can often obscure its functionality, making it difficult for those without technical know-how to grasp its operations and as such, create distrust of the technology [13]. This lack of clarity can hinder a holistic understanding of AI decision-making mechanisms.

Datasets, fundamental to AI performance, inherently direct its pattern recognition, forecasting, and decision-making capabilities. However, these datasets can often mirror societal biases and inequalities. Emphasising the adage, "garbage in, garbage out," [14] an AI model's impartiality is strictly contingent on its training data. Should this data encompass biases, the AI will likely perpetuate them, further jeopardising marginalised communities [12].

This absence of comprehension and clarity can further alienate already underrepresented groups. Often lacking the means or expertise to navigate AI-driven systems, these communities could be further disadvantaged, remaining distant from DRR measures that impact them [15].

To mitigate such potential exclusion, this briefing underscores the importance of an interdisciplinary collaboration. The advocated methodology aims to prioritise the voices and concerns of marginalised communities throughout the AI lifecycle in DRR – from conceptualization to execution.

Such collaboration should pool insights from AI and DRR professionals, sociologists, ethnographers, community figureheads, and crucially, representatives of those marginalised communities. This synthesis can demystify AI's intricate terminologies for non-experts. More importantly, it could foster a discourse that encompasses diverse viewpoints, culminating in a broader and more inclusive comprehension and deployment of AI within DRR.

By championing these participative strategies, the ambition is to leverage AI in DRR as an instrument of empowerment, not exclusion. This would ensure a more balanced distribution of AI's advantages across communities and foster DRR approaches that genuinely reflect and address the diverse needs and susceptibilities of their target demographics.
Ethical Challenges at the Crossroads of AI and DRR

Privacy, informed consent, and algorithmic accountability stand out as primary concerns in this intersection. Ensuring that these issues are actively tackled is crucial to safeguarding the rights of marginalised communities [16].

The expansive role of AI in automating tasks traditionally managed by humans in DRR accentuates these concerns. While AI offers remarkable potential, it simultaneously threatens job opportunities, often found in the non-professional sectors. Research has shown that individuals within marginalised communities are often more dependent on such roles [17] and as such, in the aftermath of a disaster when stable work and income is an important tool in recovery, may face heightened vulnerability [18]. If unaddressed, this could amplify the socio-economic disparities they already confront.

Consequently, this document emphasises the need for forward-thinking policies and solid regulatory structures. The objective extends beyond mitigating AI's drawbacks, aiming for a fair distribution of its potential advantages. These advantages, spanning enhanced DRR efficiency to novel data analysis channels, should not be monopolised. Ensuring accessibility for all, especially marginalised groups, is crucial. Similarly, the established regulations should prioritise the well-being of these groups, guaranteeing they're neither disproportionately impacted nor side-lined by technological evolution [19].
Examples

As discussed throughout the report, AI, when not designed inclusively or with a keen understanding of the specific needs of diverse groups, can inadvertently discriminate against or overlook marginalised populations. Some examples of how this could affect specific marginalised groups include:

Older People
- **Limited Tech Familiarity**: Older people might be less familiar with or have limited access to technology. AI-driven apps or platforms could therefore exclude them.
- **Data Representation**: If AI models for disaster prediction or response are not trained on data that includes older individuals, the unique needs or health considerations of older people might be overlooked.
- **Communication Barriers**: Voice assistants or chatbots might not be optimised to understand or communicate with older voices or unique health-related concerns.

People with Disabilities
- **Inaccessible Technologies**: AI tools might not be designed with accessibility in mind, making it difficult for those with visual, auditory, or other disabilities to use them.
- **Bias in Data**: The underrepresentation of disabled individuals in training datasets might lead to AI not recognising or serving them effectively.
- **Mobility Concerns**: Automated disaster response might overlook areas that are optimised for disability access, making relocation or evacuation problematic.

Migrants/Refugees
- **Language Barriers**: AI tools might not support the multitude of languages spoken by migrants or refugees, hindering communication and support.
- **Bias in Allocation**: There might be inherent biases in AI-driven resource allocation which could prioritise 'native' populations over migrants or refugees.
- **Documentation Challenges**: AI systems that require official IDs or documentation might exclude refugees/migrants who lack such paperwork.
- **Cultural Insensitivity**: AI tools might lack sensitivity to the diverse cultural norms, traditions, or trauma faced by refugee populations.
Recommendations

From the preceding analysis, we put forward the following recommendations for policymakers in the intersection of AI and disaster risk reduction:

- **Bias and Inequality Mitigation:** AI practices in DRR frequently rely on extensive datasets for algorithm training. These datasets might inadvertently reflect and reinforce latent biases or inequalities. It’s imperative to recognize and counteract these biases, striving for training datasets that genuinely echo the diversity of the populations in question.

- **Inclusion of Marginalised Groups:** Marginalised communities (such as ethnic and racial minorities, socio-economically disadvantaged individuals, and those with disabilities) often find their representation in training datasets lacking. This can potentially overlook their unique needs in AI-informed DRR strategies. Prioritising their active involvement in dataset creation and refinement is crucial.

- **Transparency and Accessibility:** Given the intricate nature of AI systems, there’s a potential for reduced transparency and accessibility, especially for non-tech-savvy individuals. To counterbalance this, involving marginalised groups throughout the AI lifecycle in DRR—from design to implementation—is recommended.

- **Interdisciplinary Collaboration:** Engaging experts from AI, DRR, social sciences, and representatives of marginalised groups can unravel AI’s intricate aspects. Such a multi-disciplinary interaction fosters a dialogue that furthers an inclusive grasp and use of AI in DRR.

- **Ethical Considerations:** Pondering the ethical challenges tied to AI’s role in DRR is paramount. Issues encompassing privacy, informed consent, and algorithmic responsibility should take centre stage in policy crafting. It’s advised to frame proactive policies and sturdy regulatory structures to protect the rights of marginalised groups and facilitate an even-handed dispersion of AI’s advantages.

Incorporating these guidelines will help position AI's role in DRR as an empowering force, fostering DRR approaches that address the concerns and susceptibilities of every community.
Summary

Artificial Intelligence holds significant potential to advance DRR practices. Yet, the integration of AI comes with inherent challenges, most notably in securing the representation of marginalised groups.

A comprehensive strategy is paramount to avoid the inadvertent exclusion of these communities. This briefing advocates for an interdisciplinary approach, weaving together insights from fields like computer science, social sciences, and ethics. Such a collaboration not only aids in navigating the multifaceted challenges posed by AI in DRR but also in identifying any unforeseen implications of AI application, leading to more holistic strategies.

Ethical considerations stand at the forefront of AI development and application. Beyond the technical prowess of AI systems, their ramifications on privacy, informed consent, and accountability must be diligently assessed. This ensures AI technologies resonate with societal values, prioritising the rights of all, especially the marginalised.

Emphasising inclusivity is paramount in AI-centric DRR frameworks. This involves designing AI tools that counteract potential biases and actively integrating marginalised communities in decision-making. Such an approach fosters DRR measures that are equitable, participatory, and rooted in social justice.

Navigating these key areas optimally leverages AI to enhance resilience universally. This isn't solely about refining DRR practices but ensuring that such enhancements serve all, especially underserved communities. Through this lens, AI becomes a beacon for a more balanced approach to disaster risk reduction.
References


References


