A Patent Application for NEXTGEN Flood Early Warning System

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This design fiction re-imagines an important informational element of the flood early warning system in order to unpack some of the questionable assumptions that society makes about disaster. In presenting an updated, ironic, vision of an alternative system, we highlight some of the ways that received ideas about the root causes of disaster, who is responsible for public safety, and the role of private sector innovation, are so embedded in the design of technologies used in crisis management that they have become taken for granted. This work demonstrates the potential for design fiction to serve as a tool in the evaluation and critique of safety-critical information systems and as a communication tool for conveying the complex findings of disaster research. It also points to new avenues of exploration for crisis informatics work on public warning systems.

CCS Concepts: • **Human-centered computing** → **Participatory design**; **Scenario-based design**; • **Social and professional topics** → Patents; • **Computer systems organization** → **Embedded systems**; *Redundancy*; Robotics; • **Networks** → Network reliability.

Additional Key Words and Phrases: crisis informatics, early warning systems, design fiction, patents, flooding

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1 INTRODUCTION

Computing researchers have argued for decades that the design of everyday technologies contain assumptions and values about users, use context, and society writ large [2, 28]. However, such assumptions have a way of fading from view when the technologies that carry them become part of the infrastructure of modern life [44]. As human-computer interaction continues to address the social impacts of computing, it is vital that we evaluate our technologies in order to surface potential biases, their consequences, and develop alternatives as necessary [43]. This is particularly true in the case of safety-critical technologies such as those studied by crisis informatics [42]. Here we use a fictional patent application for a flood early warning system (FEWS) to unpack social views of disaster and communicate complex ideas from computing research in new ways.

Globally, floods are among the most frequent and deadliest form of disaster [17]. Flood frequency is increasing along with severity due to climate change, environmental degradation, and unsafe building practices [14, 17]. Flash flooding, caused by bursts of intense rainfall causing waterbodies to rapidly overflow, are the most dangerous kind of flood [24]. To wit, identifying and communicating

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flood danger is of paramount importance, making FEWS important public safety tools. Alerts from FEWS are triggered by river gauges, rainfall thresholds, or complex flood forecasting techniques[23]. These alerts are delivered by a range of methods from klaxon sirens to wide-area SMS. When an alert is issued, the public is expected to take protective action including evacuation, moving to higher ground, or sheltering in place depending on each resident's proximity to the floodwater. Successful FEWS provide clear, accurate, information to the public far enough in advance of the event for them to take protective action [27][35].

Target 7 of the United Nations Sendai Framework for Disaster Risk Reduction [16] highlights flood early warning systems as a target investment by the international community. It calls for "substantially increasing the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people" [16]. A recent study found operational FEWS in almost 70 countries around the world, but noted significant variation in technological sophistication and forecast quality [36]. FEWS are a "non-structural" flood risk reduction measure that also includes flood insurance schemes and public awareness campaigns. "Structural" measures are objects like dams, levees, or new "green" approaches like wetland restoration or coastal mangrove protection. Since the late 1980's, the World Meteorological Association has advocated for "a more integrated approach, of which flood forecasting and warning is a component" [32].

While FEWS are important, no technology is neutral [48]. Information systems shape our understanding and response to disaster. Design decisions can influence which people and places are deemed "at risk", receive protection, or are given support during recovery. The increasing role of artificial intelligence in flood modeling tools (e.g. [3, 11, 41]), adds new concerns about the role of these systems in the public governance of risk. For example, 82% of Americans believe AI should be "carefully managed" [50] with particular concern expressed around AI use for surveillance (ibid). Yet, even such basic steps as developing a working definition of what AI is presents a challenge to pubic oversight and accountability (E.g.[40]). The role of private sector companies in crisis information systems, often through reliance on proprietary technologies and promises to "disrupt" the humanitarian sector, further complicates the situation.

This design fiction is a patent application for a "next-generation" FEWS intended to provoke critical reflection on common technologies and trends in disaster management. For example, instead of triggering as a result of natural phenomena, our AI-powered system uses satellite imagery and public records to sound warnings when societal decisions around land-use planning will increase flood risk. Our provocation challenges the commonsense understanding of disasters as a natural event and points to ways that politics, economics, and culture shape disaster impact. The use of a fictional patent application raises questions about the responsibility for public safety and the role of artificial intelligence and private sector investment in disaster management. Though the piece is critical in stance and contains satirical elements, all features of our FEWS could be deployed at present. The near-realism of the system is intended to help avoid veering into parody ([30] citing [12]) and to encourage critical engagement with assumptions about disaster are embedded into important sociotechnical systems like early warning systems.

The initial idea for this design fiction came from a working group focused on speculative design and critical technical practice in disaster risk management [1]. Each author is also well-steeped in crisis informatics and speculative design [8, 25]. In the next section, we offer the design fiction, a United States patent application that describes and diagrams the embodiments of a fictional FEWS with commentary in the form of captions appended to each page of the patent application. In the author's statement we discuss the root causes of disaster, the onus of responsibility, the growing use of AI, and the increasing role of private firms in disaster management. We conclude by reflecting on the potential for design fictions like these to inform crisis informatics research.

2 THE DESIGN FICTION

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INTEGRATED NEXTGEN FLOOD EARLY WARNING SYSTEM

ABSTRACT

A flood early-warning system (FEWS) that provides accurate and advanced alert of social and environmental changes or policy and planning decisions that increase flood risk. The modular system aggregates various data streams including high-frequency satellite imagery, open government data, and public records requests. Proprietary artificial intelligence (AI) methods (patent pending) ares used to provide high-resolution and near-instantaneous determinations of dynamic flood risk. When an increase in flood-risk is detected, the modular alert system delivers warnings via mediums that include homeland defense sirens, crisis messaging systems, posts on social media, fire alarms in government buildings, and IOT-enabled devices located in government buildings and vehicles.

SUMMARY OF THE INVENTION

[**0001**] Floods are increasingly common. Many flooding events, while detectable at the source, represent the end-of-process event. Those events can be mediated, mitigated, and often avoided well before the disaster occurs.

[**0002**] This invention provides an flood early-warning systems (FEWS) focused on detecting and distributing advanced warnings about flood risk.

Fig. 1. Patent applications are intentionally ambiguous in order to maximize a patent owner's ability to pursue litigation against potential competitors. This constraint forced us to think expansively about the complex socio-environmental problem space that FEWS occupy. The patent process demands only novelty, not social accountability. Our social imaginings must be tested elsewhere, thus we present our system in broad-brush strokes rather than highly detailed diagrams.

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[**0003**] This invention improves on existing FEWS by integrating new information sources in order to significantly increase warning time. It also expands the audiences to whom flood warnings are delivered.

BACKGROUND OF THE INVENTION

[**0004**] Most early warning systems rely on sensors aimed at surveilling natural phenomena such as rainfall or river-levels in order to anticipate flood events. Unfortunately, this often leaves residents of potentially impacted areas very little time to prepare, and no time at all to mitigate the policy and planning decisions that ultimately determine the impacts of high-volume rainfall events.

[**0005**] By focusing on root causes of flooding - changes in environmental management, landuse planning, and construction decisions - this system is able to greatly increase the warning time provided to policy-makers and the public.

OBJECTS OF THE INVENTION

[**0006**] This system draws on public information made available through municipal open data programs as well as records requests to detect land-use or environmental changes, or public decisions such as legislation, zoning, or building permits that would lead to land-use or environmental change. By cataloging public records and recognizing their text, they can be analyzed for content-specific items that are important to the system overall and compared to existing data from other geographic information systems needed to evaluate flood potential such as topography, soil-type, or land-cover.

Fig. 2. The structure of the patent application allows for the background of the invention to point out the limitations of current technologies that the proposed invention is designed to address. We do this in a limited fashion in order to leave readers of the design fiction to infer their own conclusions, and leave the majority of the explicit critique of contemporary FEWS technology for the authors' statement.

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[**0007**] The system also is designed to incorporate live data streams about changing environmental conditions from high frequency satellite imagery or wireless sensors. Certain environmental changes, such as destruction of wetland ecosystems, reduction in permeable surfaces by expansion of paved areas, or concrete channeling of streams or rivers are known to cause increased flood risk. This system, modular in design, can be installed to monitor some or all of these factors through remote (imagery-based) or on-site sensing technologies.

[**0008**] Data gathered through various inputs is run through hydrological and engineering models in order to determine whether changing environmental conditions (either detected through sensing or proposed through governmental decisions) raise flood risk above baseline thresholds set at system installation.

[**0009**] Technologies including natural language processing for text documents and machine-learning approaches trained using prior flood extent and damage data for the United States are used to initially evaluate various inputs and determine, in real-time, impacts of new data on flood risk potential for the target area. These will be included as documents are sent to the database.

[**0010**] When flood risk is detected to have increased above baseline, warnings are released to pre-determined audiences. The modular system allows for warning-sirens (klaxons) to be installed in areas where the most consequential decisions about flood-risk are made: the interiors of municipal planning buildings, city council chambers, and offices of engineering consulting firms. The public may choose to subscribe to email and text message alerts published when the system detects consequential decisions are imminent, giving them warning and ability to mobilize to influence elected officials.

Fig. 3. One of the initial steps in the design process for the FEWS described in the patent application was to divide generic FEWS technologies into the various elements required for successful system function. These included: sensing technologies for detecting flood potential, algorithms or simple thresholds that determine when the warning is triggered, and mechanisms to deliver alerts to the target audience.

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BRIEF DESCRIPTION OF THE DRAWINGS

[**0011**] For a more complete understanding of the invention, reference is made to the following description and accompanying drawings, in which:

[**0012**] FIG. 1 is a high-level overview of the system. This high-level overview shows the general flow of information in the invention.;

[**0013**] FIG. 2 details the objects, embodiments, and methods of the Public Record and Environmental Data Processor. This system will incorporate existing storage solutions as well as the latest in Natural Language Processing and Artificial Intelligence.;

[**0014**] FIG. 3 details the objects, embodiments, and methods of the Detection System. The methods of detection will be based on thresholds set by the local municipality.; and

[**0015**] FIG. 4 details the objects, embodiments, and methods of the Warning System. The nature of the warnings will be based on local methods of notification.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[**0016**] The arrangement in FIG. 1 shows an overview of the embodiment of the flood early warning system (FEWS). In reference to FIG. 1, one sees 4 systems that comprise the integrated FEWS. These 4 systems include the Public Record

Fig. 4. Patent drawings vary widely in terms of approach, detail, and quality. For this patent, we tried to mimic the style of similar systems such as: [15, 37, 49]. By avoiding detailed graphic representations of our proposed technology, we can maintain the patent longer and in more circumstances because our invention would be adaptable to changing technologies. This common practice in patent applications can have consequences for innovation of safety critical systems.

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and Environmental Data Processor (seen in FIG. 2), the Detection System (seen in FIG. 3), and the Warning System (seen in FIG. 4).

[**0017**] The Public Records and Environmental Data Processor seen in FIG. 2. As noted in FIG. 2, the system begins with an incoming digitized public record or piece of scientific data about the area [1]. Public records may be accessed through API or web-scraping, scanned, electronically entered, or simply photographed. Environmental data from satellite or physical sensors are also stored as records using pre-configured data models and enter the information chain via the same method. The records that originate within the municipal government offices can be standardized for more efficient processing. Similarly, records that rely on environmental sensing may be archived, allowing computational processes to focus on change detection. Once in, records will be sent through the record processor [2] where it will be readied to be entered into the finalizing process [3]. Finally, the records will be sent via an encrypted connection to the detection system [4].

[**0018**] The Detection System seen in FIG. 3 is now described. The purpose of this system is to detect discrepancies between local thresholds for flood risk and current construction plans in the municipality. Once an encrypted connection to the detection system [4] is established, the record is checked against a database containing a collection of thresholds from the local municipality [5] that is contained in the Detection System. One aspect of these data that is determined at the time of installation are tie-ins to existing information sources like satellite imagery and other types of surveillance technology meant to gauge slower-moving erosion. Once within the detection system, the thresholds are tested against the multi-variate data summarized by local activity. If the thresholds are exceeded, then the signal is sent to the Warning System [6].

Fig. 5. The embodiments section (beginning on the previous page) in a patent application provides a discussion of how the suggested patent works. In writing this section, we make a number of assumptions as domain experts about the information flows, security, technical capacity of the municipality, and other issues. We do not address all of these "expert blind spots", to borrow a phrase from Huston [21], here, but we do point readers to other discussions of the contours and limitations of crisis informatics. [34, 39, 42].

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[**0019**] The Warning System seen in FIG. 4 will now be described. The purpose of this system is to warn the municipality when local activity increases flood risk. The nature of these warnings will be local to the municipality (e.g. local tornado warning system, air-raid warning, klaxons). Once the signal is sent to the Warning System [6], several things occur. The type of devices that are activated is based on type of threshold warning that activated the Warning System [7]. Then, the type of electronic messages sent is based on type of threshold warning to activate electronic systems [8] Next, the range of physical systems [9] and the range of electronic systems [10] notify residents of municipalities who have opted-in to the system itself. The physical warning system means that the World War 2-era sirens will activate in local municipal offices [11].

[**0020**] The invention allows for a local municipality to monitor itself and its resilience to flooding conditions. This type of system builds on existing detection systems and extends them toward those events that shape long-term patterns of flood risk, rather than signal imminent disaster. From the data repository to the physical warning systems that already exist, we improve over existing systems by fostering a sense of consciousness of what is occurring within the area.

[**0021**] It will thus be seen that the objects described are efficiently attained. Because certain changes may be made in carrying out the above method, the construction(s) set forth without departing from the spirit and scope of the invention. It is intended that everything written here and displayed in the accompanying drawings shall be interpreted as simply illustrative. It should also be understood that the claims contained within this document are intended to cover the generic and specific features of the integrated early warning system. All statements about the scope of the invention can be said to fall there between.

Fig. 6. Paragraphs [0020] and [0021] are included to provide patent holders expanded protection from copycats. Similar statements are common features of US patent applications. Protecting elements of safety critical systems from easy replication is in some ways in tension with other practices in public service provision—where some elements of a system may be public domain and others proprietary "black boxes". This leads to practical challenges in provisioning, accountability, and replication.

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What is claimed:

1. This system FIG. 1 shall be comprised of a: **Public Records and Environmental Data Processor** (FIG. 2), **The Detection System** (FIG. 3), and **The Warning System** (FIG. 4).
   a) The system components operate independently and as a whole.
   b) The system is comprised of an end-to-end chain that can accept multiple kinds of forms, detect multiple types of events, and send multiple kinds of warnings.
2. As noted by Claim claim 1, this FEWS claims a **Public Records and Environmental Data Processor** (FIG. 2). The processor contains a method of receiving, storing, and analyzing public records by automated means.
   a) The processor can receive data in multiple languages and in multiple formats.
   b) The processor will store forms, appending geo-coding so that local maps can be updated immediately.
3. The **Public Records and Environmental Data Processor** (FIG. 2) referred to in claim 2 consists of unformatted (TXT) files, Portable Document Files (PDF), and Tagged Image File Format (TIFF) files. These files can be accessed through use of an application, web page, or by requesting documents physically.
   a) The processor will allow for paper forms to be inputted automatically.
   b) The processor will make database insertions from web forms and government offices directly.
   c) The processor will export individual lines in the database to those who request them in the same type of form the data was inserted.
   d) The processor, in this way, also serves as a public repository and historic research tool.
4. A **Detection System** (FIG. 3) as claimed in claim 1 wherein specified threshold breakages will be detected. For the purposes of this patent, those thresholds are between a value of 0-100. How many thresholds and their values shall be

Fig. 7. In a patent application, the claims of the system are meant to provide an argument about how the invention in question is different from prior inventions in this category. As a result, these are meant to be concise and to the point. In our background research using Google Patents search and relevant academic literature, we did not find any other FEWS not based on measuring or predicting water levels. Yet water levels are in many cases a predictable outcome of planning decisions. And, arguably, identifying risk at the planning stage could be more beneficial to at-risk communities– preventing flooding, rather than warning of it. Therefore it is interesting to note the bifurcation of intervention approaches between long-term mitigation and imminent hazard warning reflected in patent records.

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under the purview of designated officials. These data are also supplemented with additional information systems about the local environment should the municipality warrant their use.

a) The detection system thresholds will react automatically to construction over time.

b) The detection system is a predictive artificial intelligence that uses a combination of Machine Learning, Deep Learning, and basic analytics. These are described in Patent #D9533216.

5. **A Warning System** (FIG. 4) as claimed in claim 1 wherein warnings sent via a number of modes will be sent to local residents, government officials, internet-enabled devices, mobile applications, webpages and internet communication technologies (i.e. email, social media platforms, and automated phone-banks).

   a) The warning system produces warnings of varying severity. The severity is based on the proportion of construction permits awarded to value increase toward overall threshold.

   b) The warning system's alerts cannot be opted out of by government officials.

   c) The warning system's alerts can be opted-in by local residents and specified to street, neighborhood, sector, and region.

   d) The warning system allows for local residents to opt-in for notifications when government officials are warned.

6. The local environment referenced in claim 4 refers to additional information from outside vendors that will supply lists of proposed materials to be used. Such materials will be cataloged and compared to existing impact on said local environment based on environmental reports stored with local thresholds.

   a) The local environment works with suppliers to catalog material associated with permits.

   b) The local environment's data will be used to calculate an amount-of-impact score and each score will be appended to that contractor.

   c) The local environment's list of vendors will gather materials by invoice that is automated by contractors for verification of their impact.

   d) The local environment's central repositories will frequently push updates to fine tune and adjust material impacts.

Fig. 8. The claims are independent (e.g. Claim 1-5) and dependent (a,b,c, etc). Dependent claims are additionally included in claim 6. If this were a more realistic patent application, the system would be far more detailed, breaking apart the detection and warning systems into a more granular form indicating a pipeline of tools and techniques. It is important to note that while our system is partially realistic, the ability for any AI-mediated system to accepted, process, and analyze information from multiple sources, in multiple formats, and multiple languages is well beyond the current state. Finally, the dependencies outline the various components that make up each system. One aspect of these claims that is not mentioned is that front-end software, forms, and municipal documentation must also align. This oversight here is intentional in that there are always aspects of socio-technical systems that will create far more problems for adoption than the creation of said systems.

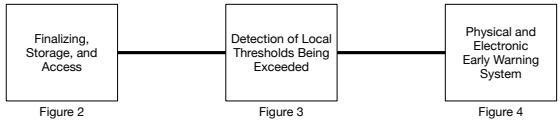

FIG. 1 The Overall System

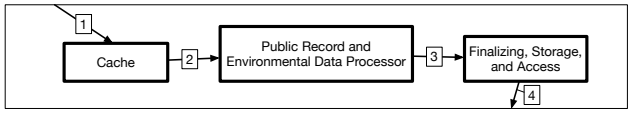

FIG. 2 The Public Record and Environmental Data Processor

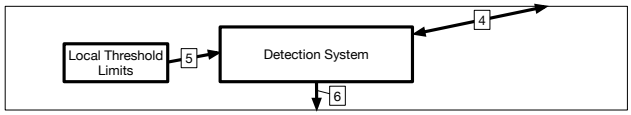

FIG. 3 The Detection System

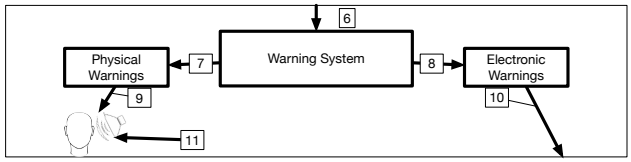

FIG. 4 The Warning System

Fig. 9. Finally, the drawings of the patent are meant to show how the proposed system works based on our claims. The top figures show the general information flow. The following figures elaborate on the information flow for invidual elements of the system. These are then backed up by the brief and detailed descriptions as well as the embodiments. The figures also serve as a further question generating device for readers of the design fiction.

3 AUTHOR'S STATEMENT

In this section, we discuss four issues that our fictional patent application raises about the current state of flood early warning systems and disaster technology more broadly.

3.1 "Natural" Disasters

Current FEWS used by governments around the world are designed to sound an alarm in response to events such as rainfall or streamflow thresholds. This has the unfortunate tendency of focusing attention on the "natural" components of a disaster. Researchers interested in disasters argue that disasters are not in fact natural but largely the result of socially produced vulnerabilities [20, 22]. These vulnerabilities could be decisions about where and how to build homes and other infrastructure, investments in disaster preparedness, and political and economic inequity [7, 26]. The line of argumentation stressing disasters as natural obscures the economic, cultural, and political factors that allow natural hazards, such as heavy rainfall, to become disaster. Factors leading to disaster extend to city and regional planning and environmental management thereby shaping who is most impacted [22]. Instead of seeing disasters as uncontrollable "acts of god"[45], as they are so often referred to, this view highlights our capacity to prevent disasters or mitigate their impacts.

The AI-enabled FEWS described in our patent application alerts residents to changes in the environment, through sensing technologies, or changes in public policy and planning, through public records access, that will lead to increased flood risk. These changes include such things as: unsafe removal of vegetation, river channeling, approval of building codes in flood prone areas, or the use of unsafe construction materials. A corollary to the argument that views disasters as social in origin is that all disasters are slow-onset [18]. That is, contrary to classifying some disasters like earthquakes or floods as rapid-onset–arising quickly and often with little or no warning, as opposed to droughts which stretch out over months and years–the social perspective on disaster recognizes that vulnerability to disasters accumulates over long time periods. Our speculative FEWS identifies such vulnerability as it arises, rather than when the moment of flooding is imminent and too late to prevent. As a result, the system focuses attention both on the social determinants of flooding and the moment when it is still possible to intervene in decision-making processes. In doing so, the design fiction calls attention to the ways in which designs of current flood early warning systems reinforce the problematic view of disasters as natural events.

3.2 Who is responsible for public safety?

Contemporary early warning systems place the burden of safety primarily on individual members of the public [47]. People living in areas where floods are imminent are meant to be able to hear the warning sirens, know the correct way to respond, and take the appropriate action immediately. These expectations serve to limit the roles of local and state governments and other actors in public safety and places extra burden on vulnerable communities who, for a number of reasons, may lack the necessary resources or capacities to take protective action. In the aftermath of disasters, such questions of who is to blame are commonly debated and intensely political [31]. Our "NextGen" early warning system shifts responsibility for reducing disasters on public officials and government agencies who have the authority and mandate to enact policy, channel collective resources, and set minimum standards for disaster management. We locate our state-of-the-art sirens where they are needed most, in government offices, on the desks of planning officials, and in public hearings over land use and development. We also provide informative email and text message alerts to the public to let them know when relevant planning decisions are being made and there is opportunity to

intervene. Here the public's responsibility is collective, and focused on reducing flood risk through democratic participation, rather than taking individual action when flooding is imminent.

3.3 Artificial Intelligence in Disaster Risk Management

Our patent application describes, in an intentionally vague manner, two uses of artificial intelligence. First, the processing system uses AI to evaluate large amounts of public records data for potential changes to the natural or built environment that may impact flooding. Second, the detection system determines the extent to which observed or proposed changes in the target area increases flood risk to a level that would trigger warnings. The lack of detailed description provided is common in public descriptions of crisis-related surveillance technologies. This may serve to hide the efforts of large numbers of contingent "ghost workers" [19] who labor behind the scenes to prepare training data for machine learning systems or reflect that the actual processes at work are far less accurate or advanced than claimed [13]. In these cases the opacity of AI systems is often a tactic deployed by their creators, rather than an inherent feature of the systems [5].

Crisis informatics research has raised several concerns about the lack of transparency surrounding AI systems used in disaster response [39]. First, the aspiration of these systems– to do good by saving lives of those in imminent danger– risks circumventing necessary discussions of their shortcomings, assumptions, or biases in the haste to respond to the speed at which disasters occur [46]. Other concerns have pointed to the ways in which the lack of diversity in the field [6] and the predominance of wealthy countries in AI research (even as AI products are marketed globally) [19] may lead to biased systems such as the exacerbation of racial injustice [4][29] or urban/rural divides [9]. We also worry that the lack of clarity about the functioning of AI systems in disaster management, combined with fantastic claims about their efficacy, could reduce the agency of local communities to advocate for their own perspectives on resilience [10]. This design fiction thus helps to express ongoing concerns over how emerging technologies are altering societal approaches to disaster management [34].

3.4 Commercialization and Innovation in Emergency Management

The choice of a patent application as the particular form for our design fiction reflects a sense of unease about the ways in which private sector emphasis on innovation and disruptive technologies, along with proprietary systems are gaining ground in humanitarian circles. Recent examples of this range from technology companies with troubling human rights records providing information service to disaster responders [33], high-profile cases of VC-funded AI firms misleading their government customers about the workings and effectiveness of their black-box disaster information tools [13], or large humanitarian agencies launching internal "innovation accelerators" to, amongst other things, "disrupt hunger" [38]. Such strategies risk offering technical solutions to what are ultimately social and political issues and as a result may distract attention from efforts to build strong public sector entities in disaster management. We note that these shifts come at a time when overall funding gaps for humanitarian aid are high and strategies that focus on innovation and disruption may displace less glamorous but proven investments in the capacity of public agencies to mitigate and respond to emergencies. While there is certainly opportunity for technological innovation and private sector involvement in disaster technology, it is important that these approaches be part of a coherent overall approach, and that emerging technologies be vetted carefully.

Choosing a patent application for this design fiction also allowed us to consider the unresolved tensions between the social and technical dimensions of flood risk in a novel manner. This exercise in making "the familiar strange" ultimately highlighted for us how patents are built around a light scaffold of idealized use. By largely omitting consideration of the social dimensions of a technical system, the patent contributes to the bifurcation of the intellectual work of technological

development from the social realities that shapes its use. To be sure, there are compelling reasons why this may be so. But we also see how patents may potentially bound our understanding of challenging problems such as disaster response. The limited narratives of idealized use implied within patents bear a strong resemblance to those found in public RFPs, product sales pitches, and so on– reinforcing the idea that the influence shaping our understanding of intervention spaces may at times be broader than the technical specifications they contain. In appropriating the patent application as a genre for critical speculation, we contribute our ability to re-imagine complex and socially important design spaces.

3.5 Conclusion

This design fiction is intended to raise critical questions about the causes of disaster, responsibility for public safety, the use of artificial intelligence in crisis management systems, and the role of private sector investment and innovation in disaster response. In doing so, we have demonstrated that even the design of widespread and conceptually simple technologies like early warning systems embed important assumptions about the politics and social life of disasters into their design. To be clear, we do not question the functional utility of FEWS as they are typically conceived. A well functioning early-warning system no doubt has the potential to save lives during a flood. However, our design fiction points to some of the limitations of these technologies and suggests both greater circumspection about their deployment within a wider strategy of flood risk management. It also raises novel areas of further exploration in the design of public alerting systems. It is somewhat ironic that though simulations, tabletop exercises, and other forms of speculation are common in emergency management and disaster response planning, HCI research in the area of crisis informatics has, to date, produced relatively few studies that engage these approaches. We hope that, in addition to inspiring critical reflection about commonly-used disaster technologies, this design fiction encourages wider adoption of speculative approaches in crisis informatics.

ACKNOWLEDGMENTS

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