The effect of public places on community resilience. A case study of the role of social and digital tools in the City of Volos (Greece)

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Abstract - Community resilience provides capacity to speed up recovery from disruptions, minimizes the impact of crises and helps to plan and adapt to long-term urban challenges. Public places are vital structural elements of the urban environment and they are considered useful tools for community resilience if they have physical and social capacities, with inclusiveness as their conceptual basis. This chapter investigates the main resources and activities of community resilience related to urban public places, and explores whether public places are useful tools for risk mitigation, emergency response, recovery and adaptation. A case study in the Greek city of Volos is conducted. The study explores the existing institutional framework and community building for disaster management, it surveys public spaces in Volos, and explores their role in disaster prevention. Furthermore, the case study investigates social risk mitigation practices in public spaces, identifies challenges associated with community resilience and discusses strengths and weaknesses of using digital tools to overcome these challenges. Within this framework, the potential of using Blockchain technology for strengthening community resilience is discussed by elaborating on its features and existing applications.

Keywords - Community resilience, risk mitigation practices, public places in Volos, Blockchain technology

INTRODUCTION

Modern cities face challenges of urban vulnerability in the context of climate change and social crises. Community resilience provides the capacity to speed up the recovery from disruptions, minimizes the impact of crisis and helps to plan and adapt to long-term challenges. It involves empowering individuals and communities to take collective action to reduce exposure to different risks.

In the main institutional framework for disaster prevention in Greece, public spaces are mainly used for providing shelter, gathering of people and distribution of services, goods and information. The social role of the public spaces for building urban resilience is overlooked and it is a central feature of this chapter. In this framework the case study of public places in the city of Volos, in central Greece, investigates the social capacity of public places for risk mitigation and disaster management, analyses the related institutional framework for emergency response and community building practices. It identifies challenges associated with community resilience and discusses the existing and potential digital opportunities, which are used to overcome these challenges. Finally, it investigates whether Blockchain technology can enrich these strategies and further adds to the potential of urban public spaces to enhance their community and urban resilience of Volos. By doing so, this article aims to initiate a scholarly enquiry to understand what is possible when it comes to the potential use of Blockchain technology for strengthening community resilience in public places.

METHODOLOGY

The literature review on community resilience and the role of public places in risk mitigation and emergency response provides approaches for the case study. The case study investigates the main emergency framework and community building practices for risk mitigation and emergency response related to public places in Volos. Consequently, it identifies the main challenges associated with the existing resilience of public spaces and the limitations of already used digital tools. Furthermore, the case study discusses the possibilities for Blockchain technologies to increase the social capacity of the public places in Volos, elaborating on their features and existing applications.

STATE OF THE ART

Components of community resilience: its resources and activities

Different approaches to resilience have been widely discussed in academic and policy literature in recent years. They range from short term engineering resilience, which aims to return any system to its pre-disaster state as quickly as possible (Manyena et al., 2008), to long-term ecological resilience, which has an ability to adapt to adverse events, a capacity to self-organize and change (Angeon & Bates, 2014). Urban

resilience refers to long term resilience of city systems and is defined as “the ability of an urban system and all its constituent socio-ecological and socio-technical networks across temporal and spatial scales, to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity” (Meerow et al., 2016:45). It is described as a sustainable process leading to further improvements, and includes preparation, emergency response, recovery, reconstruction and adaptation (Alexander, 2015). Social resilience is integrated in each stage and reflects the capacity of individuals and communities to be creative during times of stability and to adapt and grow in response to disruption (Keck & Sakdapolrak, 2013).

Community resilience is related to social resilience. It is defined as “the existence, development, and engagement of community resources by community members to mitigate loss and damage from disasters, contributing to community preparedness, disaster response, and post-disaster recovery” (Magis, 2010:401).

The community resources include information, communication, social inclusion, community networks and relationships, and governance (Patel et al., 2017). Local knowledge on risks assist community to mitigate disasters and have a plan on how the disaster response can work. Governance shapes community performance. Infrastructure handles incoming information about a disaster and sends instructions on a response for public support. Community resilience should also be associated to physical resources (e.g. food, water, first aid kits, shelter, transport), which require economic investments. The integration of these resources allows communities to deal with crises, recover and innovate.

Community networks and effective communication are useful in understanding vulnerabilities and facilitate recovery. Social inclusion, group cohesion and building of social capital, inform, engage and empower communities to develop and implement their preparedness, response and risk mitigation. They emphasize the collective actions of individuals and communities in various activities in urban systems, creating new values as their central aspects (Gov. UK, 2016). Social inclusion is “the process of improving the terms of participation in society, particularly for people who are disadvantaged, through enhancing opportunities, access to resources, voice and respect for rights” (UN, 2016:19). Social cohesion refers to the extent of community connections and solidarity. Social capital is a process that relates to bonding or linking relationships (Mulunga & Yazdanifard, 2014).

Public participation, community engagement and co-creation process are participatory tools for social inclusion. Public participation contributes to sustainable decisions, by facilitating the involvement of all people affected, and having participants informed about the impact of their input on the final decision (Creighton & Creighton, 2008). Community engagement is a dimension of public participation and “a process of inclusive participation which supports mutual respect of values,

strategies, and actions for authentic partnership of people affiliated with, or self-identified by geographic proximity, special interest, or similar situations to address issues affecting the well-being of the community” (Jones & Wells, 2007:408). The co-creation process increases opportunities for achieving social inclusion in public places because it recognizes the decision-making rights of people, produces a new public value, promotes self-organization of community, involves a wider range of stakeholders, and empowers previously excluded members (Sanches & Frankel, 2010). Co-creation gives communities and individuals more direct involvement in defining their needs and priorities, collaboratively finding solutions, influencing decisions and achieving better outcomes. Co-creation is “an active flow of information and ideas among five sectors of society: government, academia, users, non-profit organizations, and citizens, which allows for participation, engagement, and empowerment in, developing policy, creating programs, improving services, and tackling systemic change with each dimension of society represented from the beginning” (Leading Cities, 2014:2).

Collective creativity is based on the experiences of groups and individuals and includes joint problem solving and understanding of risks. All participants collaborate and contribute through creative, knowledge sharing activities. The flexibility of the process is achieved by the integration of knowledge of different users, and the understanding that the community can change what is being created.

A combination of appropriate engagement modes also makes co-creation processes more inclusive and accessible. Inclusive strategies for engaging hard-to-reach stakeholders, establishing partnerships and carrying out collaborative work, include workshops, user generated content, digital forms of data collection, prototyping, or other activities to get them engaged around urban problems and suggest solutions.

The role of public spaces in building community resilience

The resilience of public places is closely associated with qualities of urban systems, namely reflectiveness, integration, robustness, resourcefulness and flexibility (ARUP, 2016). These qualities provide public places with adaptation capacities to deal with multiple threats because they offer social (community resilience), economic (encouraging local economy), environmental (reduce urban heat effect, provide water storage and carbon absorption) and personal health benefits (Kabisch et al., 2017). Literature findings suggest that by embracing these qualities, public places should act as “agents of recovery”. They provide essential life support (e.g. shelter, gathering of people and distribution of services, goods and information) (Jayakody et al., 2016) and essential elements of risk mitigation by strengthening social capacity of existing and new communities and building place capital through place making and inclusive practices (Jacobs, 2015).

In particular, it is noted that there is pressure on public places to provide forms of direct democracy through inclusive practices, meaning providing people’s

involvement in decision-making and the rights to participate in society (Maduz, 2010). For example, public spaces can facilitate interactions of communities in planning, selecting and governing their physical environment and social infrastructure. The collective creativity in public places encourages integration in local societies, social cohesion, knowledge exchange, cultural tolerance and can reduce social instability (World Bank, 2017). It can improve the relationship between local community and newcomers through co-creation, planning, and cooperation in hosted activities. And as a result, it can foster communities that are more socially, physically, and economically viable, increase the resilience dividend and create a place capital, a shared wealth (built and natural) of the public realm (PPS, 2011).

Different types of public spaces have different physical capabilities for providing community resilience and tend to compensate for each other when challenged by different risks. Thus, their integrated network provides diversity to the city fabric. Their role as locations of information exchange and management in particular, allow their characteristics to “blend together with the equivalent of ICT, to give or gather information, to aid co-creation of space, to allow crowd sourcing of information and opinions, and to allow affective sharing or self-monitoring of activities...” (Cyber-Parks Agora, 2017). The role of ICT in planning and maintenance of the contemporary public space, in regard to enhancing urban resilience is significant, dynamic, and fast developing. Within the broad range of ICT, one of the latest kinds that appear to be most promising and most suitable for the above tasks, through various implementations, is the Blockchain technology. This technology is comparatively new, but it has already been successfully used in various sectors such as administration and governance, land registration, citizen participation and public safety. Exploring the potential of improving and increasing resilience through Blockchains, is a significant dimension of research in the immediate future.

CASE STUDY

Characteristics of the urban environment in the city of Volos

Volos, the case study of this research, is a port city in the Region of Thessaly in Greece, and the administrative centre of the former Prefecture of Magnesia (City of Volos, 2018). It is the main urban conglomeration of the municipality of Volos, the area of which, is 385.6 km². It includes 9 municipal units (Agria, Aisionia, Artemis, Iolkos, Makrinitisa, New Anchialos, Nea Ionia, Volos, Portaria) with an average area of about 27.678 km² each (Wikipedia, 2018). Despite the recorded increase of population, only few expansion areas are provided for the city of Volos in the Master Plan of the municipality of 2017. According to it, the population increase is expected to be absorbed by a reallocation of the population from central to non-central zones within the city.

The high density of buildings, in relation to the relative lack of open spaces is the characteristic of the recent urban fabric of the city. A City Plan for Volos was

conducted at 2004, which allocated 3.53% of the area of the city to public spaces, corresponding to 7.02 m² of public space per resident. The road network occupied 22.9% of the area of the city, corresponding to 45.69 m² per resident (Lalenis, 2004). These provisions were also adopted in the Master Plan of 2017. Only 62 % of the area officially designated for public spaces has been materialized and is currently used, due to the lack of finances of the Municipality for the necessary expropriations, and the lengthy and complex bureaucratic procedures.

Most of the area used for public places exists in the central sector of Volos, including a sea promenade, different types of squares, and pedestrian routes. Other sectors of the city have very few public places and no community life associated with them. The largest number of small public parks are found in the area of Chiliadou. The area of Karla has the largest municipal central park in the city, and Nea Ionia – the poorest area of Volos - has only one public place, a square adjacent to the church of Evangelistria.

Public places in the city centre, and the ones adjacent to the important public buildings (e.g. museums) have been maintained well, they have some shading, and occasionally they are used by the local community. Locals and tourists frequently visit squares containing churches. Facilities for different activities (e.g. benches, kiosks, playgrounds and sport facilities) are provided only in some public parks. They are well maintained and visited by different social groups. Small squares, adjacent to main streets, have good shading but have no furniture for users and are poorly maintained. Public spaces in Volos were assessed by the public as of medium quality (49% of respondents), while 20% of respondents considered the quality of public places as inadequate. Reduction of unemployment and increase of tourism have been rated in local polls as priority issues for public policies. At the same polls, the resilience of urban environment was not mentioned at all by the respondents. This is indicative that the resilience plans for Volos were not adequately communicated to the public.

Past disasters in Volos, main emergency framework and community building practices.

Volos has suffered major social crises and natural disasters in its past. In the 1920s, large numbers of Greek refugees fled from Turkey to Greece after a war between the two countries. A number of 13,773 came to Volos, which was more than 40% of the population of the city at that time. "In 2016, until the closure of Balkan route from Turkey to Northern Europe through Greece, Volos experienced another flow of refugees." A refugee camp for 200 people was set up at the outskirts of the city, at a space which was previously used for car exhibitions. Concerning natural disasters, the most significant ones in the history of Volos occurred in the period 1952-1957. They included a deadly earthquake at 1952 and a big flood of Anavros River of 1956. Nowadays, air pollution from the TITAN cement factory, at the east part of the city, and its waste burning facilities is a serious health hazard for the local population.

Risk mitigation and emergency response in Volos is addressed on different levels by EU, Greek government, and municipality institutional frameworks. Xenokratis Plan is a general emergency framework of the Ministry of Internal Affairs of Greece (General Secretariat of Civil Protection, 2003). Xenokratis Plan is further specialized by each municipality according to its local risks and characteristics. For Volos Municipality, it focuses only on seismic phenomena. It includes characteristics of earthquakes, identifies risk mitigation strategies, emergency response and responsible civic and administrative departments. It describes administrative procedures, and hierarchy and level of responsibilities of civil departments. It also lists duties of the Local Government during and after earthquakes, and contains instructions concerning provision of food, water, means of transportation, fuel, temporary shelters, medical supplies, machinery for removing the ruins, sanitary provisions and transport, etc.

Xenokratis Plan considers public spaces in Volos as the main providers of shelter and spaces for gathering during evacuation, providing a list of open / public spaces and evacuation routes to transfer the population away from the city towards the neighbouring city of Larisa and Mount Pelion to the north and east of the city. Xenokratis Plan does not define criteria for selection of public places for evacuation such as levels of permeability, tree canopy, population density capacity for multiple use, typography, accessibility and connectivity with the main evacuation routes. The access roads to the emergency refuge spaces are not listed. Flood zones are not specified, and consequently, some places for gathering during an earthquake have high risk of being flooded (Papaioannou, 2017).

Individual and collective action for disaster risk mitigation is essential, especially if government response to an emergency fails. It includes community engagement, public-participation and co-creation, aimed at bringing communities and different social groups in Volos together for collaborative response. The case study revealed a number of community building projects in Volos, which aim to encourage local communities to take control of changes in the city. These projects combine online with offline approaches. The 2nd CAPS community workshop was held in Volos aimed at embracing a number of top-down social initiatives, promoting active citizenship and encouraging Digital Social Innovations (CAAPSI, 2017). Several other projects in Volos aimed at improving social networking to increase community resilience and to integrating different social groups, such as Roma and immigrants, into the local community and raise their disaster risk awareness. They used physical events and digital tools for creating augmented reality. An indicative example is the EU-funded EDUCEN project which conducted a study and organized social networking events in Volos focused on the role of inclusive and participatory decision making and cultural memory in disaster management (EDUCEN, 2015). The project proposed collaboration between citizens, civil protection and local authorities to collect cultural memory about people and their behaviours in Volos disasters,

in order to build a better strategy for disaster risk mitigation and emergency management. Social groups and refugees' associations were involved in focus group discussions on how 1952-1957 disasters were perceived by different social groups. The social groups involved in the project included 1st Primary School (1933) of Nea Ionia, which was the first school in the refugee settlement and a landmark of refugee identity, and the associations "Eglezonisi" (1924) and "Iones" (1994), whose aims are to preserve, maintain and convey the history and tradition of Asia Minor to the next generation. The project also brought together the Museum of the City of Volos and the Earthquake Planning and Protection Organization of Greece (EPPO) to develop digital tools and games to advance visitors' disaster awareness, targeting teenagers, as one of the most challenging group of visitors.

Students of the University of Thessaly initiated several co-creation projects aiming to engage different social groups in urban participatory and digital design experiences at the University Square in Volos, providing hotspots that allow either local citizens or tourists to create interactive portraits of the city (EINS 2014). The VolosGeist project collected local knowledge about the spirit of Volos' neighbourhoods to build a digital memory map of the most remembered places in Volos, covering the whole city with photos from 354 places and includes a 1 minute web game. (EINS, 2014). Exchange and solidarity networks were also popular in Volos. Going back to June 2010, when a Volos-based bartering network of 50 members including local teachers, plumbers, farmers, etc. started the local bartering currency TEM (Papadopoulos, 2015). They were using TEM Magnisia website¹ for membership accounts and recorded transactions. Recently the professional network "Craftspeople" was set up to establish a mutually beneficial and professional partnership by using its own digital platform (Design for the Living World 2018).

The main challenges associated with the existing resilience of public spaces in Volos and limitations of used digital tools.

The Case Study identifies the following requirements which might improve and enrich risk mitigation practices in Volos:

- Improve administration, communication, participation, data collection and reduce costs.
- Improve communication of emergency framework (Xenocratis Plan) to the population.
- Encourage social groups in related collaborative actions.
- Undertake social mapping to gain insight into how community members perceive self-protection and their relationships with other key stakeholders.
- Generate an active network and enhance dialogue for disaster mitigation between different players (such as experts, civil protection practitioners, local decision makers, schoolteachers, community groups, etc.)

¹ www.tem-magnisia.gr

- Raise disaster risk awareness on the cultural aspects of disaster management by bringing together museums and the disaster prevention community with the population. Identify and communicate how memory of past crises of disasters is embedded in history, especially for the non-locals.
- Raise disaster risk awareness of the most vulnerable groups (Roma, refugees, elders, and teenagers).

Referring to the role of public spaces in community building initiatives, there are very few community events associated with public places and they operate at a relatively small scale. The seafront promenade is considered the main location for recreation, and socializing. Christmas and Easter fairs and the Volos summer festival are held in the central streets of Riga Fereou and P. Mela, the square around St Nikolas church, Old city walls and the central pedestrian area of Volos. Weekly and seasonal street markets in Volos are used for social interaction for all groups in the community, but most significantly by older people, women and community of traders.

In this effort, public spaces in Volos, have the potential to act as an agent of recovery, facilitating social interactions for disaster risk reduction. In particular, providing entertainment, street musicians, accessibility, market stalls well managed, and park furniture with good and innovative design, (attention to seating, shading and lighting) can make a large difference to the usability and vitality of public spaces. These improvements will create opportunities for social groups for place making, public participation and co-creation of common values including addressing social challenges of disaster risk reduction.

Accordingly, the Master plan of Volos focused on improving public spaces as priority A for implementation by 2020. It includes:

- Redesign and improvement of use of public places and squares.
- Provision of new open spaces and acquisition of appropriate land for them.
- Life plus program, developing local plans for climate change mitigation.
- Flood management studies.
- Smart city platforms.

However, it is noted that formal institutions are extremely weak regarding the support of community resilience initiatives. Evidence shows that digitalization of the social initiatives in Volos is limited due to the lack of investments and it is operated mostly outside public services. The administrative organizations that could benefit from digital social innovations often do not have enough skills, capabilities and resources to make the most of this opportunity. Occasionally, it is informal structures that take leadership in organizing local communities through a process of participation, engagement and co creation. As an exception to the inabilities of the administrative structures, the University of Thessaly together with start-up companies are promoting new technologies and knowledge. Their contribution, combined with

the bottom up approach to low-cost digital networking infrastructure in Volos, is an existing strategy for community resilience.

In most community resilience projects in Volos, conducted either by the University of Thessaly or by informal local collectivities, “digital layers” had been used, aiming to provide new resources for interaction and users' empowerment. These digital tools attracted particular groups of users (i.e. young people and newcomers in Volos) because it encouraged them to be socially active, allowed for distant contacts and increased their opportunities. Nevertheless, it was proved that there were limitations in their use. IT as a tool for community resilience requires leadership and administration of the platform, and creates significant hidden costs of moderation, both for eliminating inappropriate content and for improving transparency, immutability and security of interactions. These limitations in the use of IT tools encouraged forward thinking into the possibility of using Blockchain innovative technologies for communication, and information production, sharing and management.

THE POTENTIAL OF BLOCKCHAIN TECHNOLOGIES TO ADVANCE RESILIENCE IN PUBLIC PLACES OF VOLOS

Current studies have shown that Blockchain-based solutions can advance current Internet of Things (IoT) ecosystems, based on centralized cloud servers (Kshetri, 2017). Blockchain is a linked list of blocks, which contain data and a hash pointer, indicating its previous block. There is no central server and all decisions are taken in a democratic way, when the majority of the nodes need to come to an agreement and make a decision. Every node in the system holds a separate copy of the Blockchain, data cannot be duplicated, and it maintains its integrity. Adding data to a Blockchain is simpler than deleting or changing existing data. It eliminates the need for a middleman to support communications and provides a security of stored data by using digital signatures and hashing. Each database can operate on different Blockchain consensus levels, thus allowing data to be verified and secured according to the nature of the transaction. Therefore, some studies claim that Blockchain provides a difficult to attack, permanent and resistant distributed database, containing unique features such as decentralization, immutability, integrity, traceability and security (Kukeshova, 2017; PWC, 2018). These features of Blockchains could impact society at large. They have been successfully used in different sectors including government, culture, health, real estate, transportation, citizen participation and public safety (Galen et al., 2018). Existing Blockchain applications have shown that Blockchains are successful in providing interactions, transactions, authentication, bringing in and storing values, whether it is money, goods, property, votes, etc. within the related network, accessible by anyone who is part of the chain (Crosby et al., 2015).

In this framework the unique features of Blockchains can be used specifically for improving the resilient qualities of public spaces (e.g. integration, robustness and resourcefulness, mentioned in par. 3.2 and facilitate adaptation capacities of public

spaces, turning them into agents for emergency response and risk mitigation. As such Blockchains can improve facilitate and manage the provision of essential elements of life support and information in public places, as main places for gathering for evacuation during crisis. It can improve administration and communication of Xenocratis Plan in Volos (see par. 4.2). Thus, it can facilitate different peer-to-peer communication, resource allocation, infrastructure for collecting, storing and sharing information across a network, public participation, tracking and manage supply chains and platforms, which connect different services, adding greater transparency and security to all processes (Berryhill, 2018). Moreover, challenges of existing community projects, identified in par. 4.3, calling to improve the administration, management, sharing and verification of sensitive data, and the limitations of currently used digital tools, suggest that Blockchain technology can be a viable solution. Blockchains can provide a decentralised shared infrastructure for people in Volos to collaborate with one another, including risk awareness and self-protection.

Blockchains are capable of supporting communications and administration of community response groups, engaging local groups with civil society organizations in Volos. It can facilitate place making by providing co-creation platforms, crowdsourcing and creating learning opportunities in public places. It can be used to manage social events, to connect the most vulnerable groups in Volos, enhancing their social and environmental responsibility and to provide security, financial inclusion and transparency to the management structure.

Although the characteristics of Blockchain technologies may bring us more reliable and convenient services, the challenges behind this technology are also important. The concerns about high standards of security, speed, transparency and privacy of Blockchains have been raised in the current studies. As such, Blockchains can compromise people's rights to modify or delete their personal data because stored information cannot be changed. Blockchain can become expensive when data becomes bigger and it requires large storage space and time to synchronize and update it (Lin & Liao, 2017). It appears that decisions on the use of Blockchain technology to support strategies for community resilience in public places should be made independently, each according to the requirements of the individual projects.

CONCLUSIONS

Community resilience provides capacity for urban systems to speed up recovery from disruption, it minimizes the impact of crises and helps to plan and adapt to long-term challenges. Public places can act as an agent for disaster reduction by facilitating social interactions, inclusive practices (placemaking) and collective creativity (public participation, community engagement and co-creation) and thus contributing to community resilience. The case study showed that Xenokratis plan, the main institutional framework for emergency response in Volos, facilitates only partial resilience of the city because it focuses mainly on administrative procedures for emergency responses to earthquakes. It does not cover other possible disasters

and demonstrates poor management and communication. The case study revealed that existing social projects are successful in bringing communities and different social groups together for disaster mitigation and collaborative response. Administration, communication, issues with connection of social groups and hidden costs of moderation are main challenges of social projects for disaster management, calling for enhanced effectiveness, transparency and security of interactions and requiring innovative technologies for communication, information production and sharing.

Public places in Volos are underused, they facilitate social interactions only to a low degree and require physical improvements. The Master Plan of Volos puts as Priority A to increase the number, diversity, accessibility and connectivity of public spaces. This study proposes that a strong connection should be made between community resilience practices and public places. As such, public spaces should be provided with the sustainable qualities of resilience by design and in use. Community leadership in use and management of public places can create opportunities for social groups for place making, public participation and co-creation of common values. Different events in the public places organised by local communities can further generate an active network for disaster management. As it concerns community resilience projects in Volos, there is a presence of digital layer in each project, aiming to provide new resources for interaction. Nevertheless, the digital inclusion requires leadership and administration of the platform, improved transparency, immutability and security of interactions, while it has significant hidden costs for the moderation of the platform. These limitations in the use of IT tools indicate that forward thinking is required into the possibility of using Blockchain technologies for communication, management of information and sharing

Although the characteristics of Blockchain technologies may bring us more reliable and convenient services, the concerns about high standards of security, speed, transparency and privacy of Blockchains have been raised in many studies, noting that Blockchains have their limits in areas that intersect with social impact, including human rights. Decisions on the use of Blockchain technology to support strategies for community resilience in public places should be made taking into account the requirements and particularities of each project. At this stage, Blockchain technology is very much about potential, and this is why much of this chapter's content is about ideas leading to a broader understanding of the ability of this technology to improve community resilience in public spaces.

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