Proposing Thematic Mapping for Integrated Risk Communication: A study of British & Japanese perspectives in flood-prone communities

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A B S T R A C T

Modern flood risk communication continues to lack the input of different stakeholder levels and as a result, there has been an insufficiency to construct communication that is inclusive of all stakeholders. There is also still an absence of consideration of context-specific information that helps to shape the communication crafting process. This study sought to establish the above through the creation of a thematic map (a visual display based on themes), merging top-down and bottom-up approaches to create a clearer picture of important factors for risk communication within the specific contexts being observed. The research team conducted 16 semi-structured interviews and focus groups with 4 different types of stakeholders at 2 rural sites in the UK and 2 rural sites in Japan. The results outlined five key themes that underpin integrated risk communication, establishing the thematic map – Individual Circumstances, Community Structure, Impact Scale, Response Capacity, and Social Barriers. These findings are important in beginning to help conceptualise how current DRR efforts can be enhanced and in presenting an integrated approach to risk communication that helps to reduce unnecessary complexity and inaccessibility. However, further replications of the study are needed at other sites across the world to test the robustness and adaptability of this kind of modelling.

1. Introduction

Effective risk communication in the context of flooding is integral to ensuring successful Disaster Risk Reduction (DRR) as it facilitates essential information exchanges across varying stakeholder levels, which ultimately leads individuals towards making informed decisions about their safety during emergency situations – the core information about best practice prior, during or after flooding is understood and can be successfully acted upon by laypeople [1]. This research considers both top-down and bottom-up modes of communication. Top-down communication represents communication from sources like local council officials, agencies, and expert bodies, while bottom-up communication represents communication from varying community members like residents or specific resident groups. Top-down communication involves the flow of information from individuals with civic power and subject expertise to those without these traits and bottom-up communication represents vice versa. The approach used in this study combines both types of communication by integrating the views of stakeholders that have civic power (local council officials) and subject expertise (acade-

mics) with those that do not - residents (and flood action group members) with real experience of living in the areas being studied. It is believed that the synthesis of these varying inputs provides greater capacity to consider relevant variables (the important factors for risk communication), which would otherwise not be possible if there was exclusion of particular groups of individuals. While risk communication has been studied extensively, there is still no unifying idea guiding the way stakeholders approach crafting, assessing or enhancing their communications. This absence is due to varying reasons, including the rigidity of frameworks [2], the perception of hard engineering interventions as absolute solutions [3], and inconsistent governmental action on the risk communication front [4]. As countless studies illustrate, significant impact caused by disasters can in part be attributed to risk communication failure [5], so there is a gap in the literature that needs to be covered, which is not presently.

To address the above, there is a need for an integrated approach where there is greater inclusion of differing stakeholder levels within the communication crafting process to enable the consideration of more relevant, localised variables (this represents integrated risk communication). An integrated approach is a methodological decision to include the perspectives of all or close to all key stakeholders within the specific community being studied. This paper focuses on communication so when the term integrated risk communication is used, it refers to the methodological inclusion of the full scope of wide-ranging, multi-level community perspectives in the context of risk communication. The approach taken has to also be flexible, and rather than serving to direct individuals to act in certain ways (like is done via a top-down approach where people are told what to do by council officials), it must seek to enable discussion about key factors influencing DRR efforts like preparation or response – DRR discussions should not be exclusionary. The appeal in focusing more on improving communication is that it is more financially feasible compared to investing only in hard engineering structures like sea walls, which can be counterproductive as the visual presence of these physical structures can disempower communities through creating complacency and a false sense of security [6]. Furthermore, considering that climate change is responsible for increasing flood risk, and efforts to address this have been either sluggish or ineffectual [7] the need to establish a clear conceptual and thematic map to illustrate the key component elements of integrated risk communication is integral. This is especially the case as the increase in flood risk is occurring rapidly meaning that there is a growing number of stakeholders being impacted by this life threatening issue, illustrating the urgency in the need to act [8].

To accomplish the above, this study proposes thematic mapping as a novel means to achieve integrated risk communication. The thematic map is a creative visual display that shows linked themes that influence risk communication in a particular area. It facilitates integrated risk communication by unifying differently levelled stakeholder inputs from whom the thematic strands are drawn. Thematic mapping can be thought of as an extension of thematic analysis, where the themes that have been uncovered are collated together to form a visual representation of a broader concept. In essence, a thematic map (the output of thematic mapping) is a visual display based on interconnected themes that, in this context, outline factors that influence risk communication in a particular area. Such an approach has never been taken in risk communication research. Other disciplines like Media Arts have used similar approaches, which they called thematic modelling to process themes and generate visual displays as a way of representing important information [9]. The reasoning behind taking this approach is that as exemplified above; there is a need for simplicity in the manner in which risk communication is conducted in, especially when integrated risk communication seeks to unify the input from different stakeholder levels that use contrasting language and have varied levels of knowledge [10].

The desire for using thematic mapping also originates from the reality that themes are easily represented through visual displays and set definitions, which helps to create an accessibility in understanding for varying audiences [9]. The duty of scientific research is to create access to knowledge for everyone seeking it, and this is why such an approach has been taken here. In attempting to construct a thematic map, it is useful to begin by observing two different countries and their risk communication approaches, in this case, the UK and Japan. Through learning about the unique circumstances across specific sites in these countries, it is helpful in shaping an understanding of why certain approaches are more effective elsewhere, or about elements of risk communication that may be missing from a certain place. Broadly, this approach is reflective, in that it is willing to change and adapt based on new knowledge and information. It is not fixed and changes as communities and their needs change. In essence, a thematic map for one locality may be totally different from another as their unique circumstances dictate what is relevant. The casual comparison of these countries is particularly beneficial as it is highly likely that, as climate change impacts worsen, the UK will face at least more intense levels of flooding than already felt or similar levels as those experienced presently in Japan [8]. If it is the case that there are significant differences in approaches being taken as part of DRR in these countries, then it may be productive to utilise some of the Japanese DRR methodologies and apply them within a UK context if they can be adapted as part of preparation for the future.

Presently, information relating to flood risk originates from national organisations and agencies like the Environment Agency in the UK and the Japanese Meteorological Agency - these have responsibilities surrounding the active monitoring of weather and other environmental indicators [11,12]. As these organisations handle highly technical data, they are predisposed to using a mixture of scientific and non-scientific language in their communications with the local councils as well as the general public, which is likely to be problematic as this type of language may be inaccessible for many laypeople [13]. This is corroborated by the growing presence of flood action groups (FAGs) or equivalents across both countries as these are likely fulfilling roles abandoned by local councils due to resource limitations or other constraints [14]. The growing presence of these groups further establishes the need for the creation of a thematic map to outline what effective risk communication should look like as such a map would be helpful in adding some academic input into their work, which could strengthen how they approach residents or how they develop engaging DRR activities [15]. Moreover, greater interaction between FAGs and academics is likely to prove mutually beneficial as this could shift academics into bottom-up roles where they become part of the local community and rather than just being an educator, which is a label that holds connotations of superiority, they become a learner and participant [16]. Further to this, it is important for different stakeholders to engage with one another to enable social learning to take place, wherein different groups learn from each other's experiences, and newfound knowledge results in more considerate communication [17]. Such a transition would help to disrupt the conventional flow of risk

communication, which would serve as progress considering that the top-down model where national agencies and councils cascade information to the local community has not led to a sense of empowerment or resilience, which is desperately needed [18].

In synthesis, this paper is a methodological proposal largely within the context of flood risk communication and disaster risk reduction. The thematic mapping is entirely based on the input of the specific communities that were studied in specific areas across the UK and Japan. Its methodological principles of integrating a wider stakeholder base (including those involved in both top-down and bottom-up communication), outline a novel and simplistic approach to the communication crafting process – the creation of a thematic map that illustrates important thematic strands within a community, that need to be addressed to maximise the effectiveness of the risk communication being produced. Such an approach is context-specific, helping to bring wider communication voices into the process of crafting risk communication and challenging the exclusion of certain groups. Thematic mapping in this context helps to engage with the depth of qualitative datasets [9], where participants have conveyed their views on the subject of flood risk. It allows for themes to be found, and meanings to be established. This is important because meaning-making mechanisms underpin human perspectives and worldviews, which guide their daily decision-making especially in the context of resilience building [19]. If these meaning-making mechanisms can be identified then this may facilitate a greater capacity for policymakers or academics to address issues communities face and communicate solutions or empowerment strategies in way that is most suitable to the particular area and people, which is exactly what this research seeks to achieve.

The following are the questions that this research poses and aims to answer:

1. What factors influence the effectiveness of risk communication?
2. How do different stakeholder levels impact and become impacted themselves by the factors that influence risk communication?
3. How can integrated risk communication be thematically modelled and conceptualised?

2. Background: risk communication research dimensions

This section of the research paper covers the outcomes from the literature review that was conducted prior to the data collection phase of the study. The review is a reflection of research dimensions (important ideas or elements) that are highly salient within risk communication literature. To facilitate a robust literature review, literature databases like Google Scholar, Web of Science and JSTOR were mainly used to access academic literature in this field – disaster science. Using key words such as risk communication, flooding, disaster risk reduction, natural disasters, UK, Japan, preparedness, and response, up to 100 research papers were reviewed to understand which concepts are most frequently discussed in academic literature relating to the collective topic of flood risk communication for disaster risk reduction. The five most frequently occurring topics were Trust, Coping Appraisal, Behaviour Change, Scale, and Awareness. And these five were chosen to base the literature review on rather than discussing more or less research dimensions because it was determined that they offer a sufficient outline of the relevant background for understanding this study topic, as well as offering the depth needed to employ deductive reasoning as part of this study – in being able to set a foundation of ideas to help inform the process of analysis. In practice this means that the ideas presented below help to narrow down the types of ideas that are being looked for within thematic analysis, that gives rise to themes, but as opposed to themes, these ideas are based entirely on findings from academic literature, not directly from stakeholders who offer context-specific insight (helping to inform the themes).

2.1. Trust

The presence of trust is considered foundational to effective risk communication as it plays a role in determining whether a particular source of information is perceived as credible or not [20]. Based on this simple determination, a person's decision to engage with a particular source is influenced by whether there is trust, which means that creators of risk communication need to be considerate of factors that influence trustworthiness. This is particularly important considering that there are varying different modes of communication and as such stakeholders need to contemplate the reasons for choosing certain ones over others, which can be challenging as this requires significant information processing, leading to levels of polarisation towards certain information sources [20]. Engdahl and Lidskog [21] argue that trust is influenced by an emotional component, therefore, to form trust with a source there needs to be a level of emotional processing that takes place to fully engage with its contents. This is supported by some Japanese literature where it has been found that trust formation towards particular information sources is created through discussions that take place between community residents who end up validating a specific information source for others [22]. Based on this, it is important to address how trust can be manifested as it would be undesirable for certain information sources such as official statements from council members to be seen as untrustworthy, which is already the case within some communities [23].

It is also useful to consider barriers within communities that limit or reduce trust in risk communication. For example, one key factor is language proficiency. Research by Rossetti, O'Brian and Cadwell [24] reflected on the relationship between the comprehension of risk information and trust in the key messages, finding that translation of risk information into other languages spoken in a community holds potential in fostering a greater sense of trust. This can be important in localities where communities are more heterogeneous with diverse groupings of individuals as there may be a multitude of languages spoken with varying proficiencies. Regardless of demographics, an increase in availability of risk information in foreign languages ensures that DRR action is proactive. In largely homogenous communities prone to seasonal tourism, where suddenly there is a large influx of foreign-language speaking individuals who have language-access needs that should be addressed as exemplified by popular tourist sites in Japan [25] this is especially crucial. On this basis, it is relevant for communication crafting processes to take account of translation as a means to connect with more stakeholders in communities to foster trust in risk information. Ultimately, engagement with the specific needs and perspectives of a community is pivotal in forming an understanding about the social variables that matter to community members, and how this can be

reflected within modes of risk communication so that the credibility of information being presented is not doubted and undermined as this will lead to absence of desired DRR action.

2.2. Coping appraisal

The ultimate role of risk communication is to successfully inform individuals about hazards and help to facilitate meaningful responses to these [1]. By enabling this, risk communication leads to an increased level of coping appraisal, wherein individuals feel able to manage if a natural disaster occurs. Some studies have found that there is a correlation between a low level of awareness and diminished coping appraisal, which is notable considering that when risk communication is inclusive of severity information, this leads individuals to seek out more information to compound this felt absence of security as proposed by the Protective Motivation Theory [26]. Through engaging in information seeking behaviour, coping appraisal is raised as the newfound information serves to reassure, which is pivotal for being able to overcome some of the emotional intensities surrounding disaster occurrence. This is helpful for DRR as there is a need for well-informed individuals who are also confident in taking action like FAGs members as such individuals or groups play vital roles in supporting communities. Despite this, it is sometimes helpful to permit fear of threat so long as it does not become overwhelming as this can be a good motivator to act (regardless of the level of perceived coping appraisal) [27].

Coping appraisal has also been correlated with the level of preparedness individuals feel, wherein low coping appraisal means a low sense of preparedness is felt [28]. As such, it is vital to address underlying issues that diminish individuals' coping appraisal to establish resilient communities as part of DRR. A challenge that is faced in trying to empower people is that in areas where there is a low likelihood of disaster occurrence, there is also a low threat perception so people do not see the reasoning behind engaging in preparedness activities [27]. It is problematic when there is resistance like this as there is little that can be done in such communities once a natural disaster strikes so it is essential that preparedness is engaged in. In Tokushima Prefecture, Japan, researchers found that through risk information repetition based around the perspectives of residents, the level of disaster preparedness could be strengthened suggesting some kind of motivating function held by repetition [29]. Despite this, it should be noted that participant's capacity to engage in preparedness is also influenced by physical factors such as an ageing body. Some stakeholders do have a high coping appraisal in terms of psychologically feeling that they can contribute, but being physically limited in the contributions that they can actually enact [30]. This distinction is important, because a growing body of evidence suggests that elderly individuals are viewed as being a homogenous group by risk communication and this perception is flawed in that there are significant differences in coping capacities and other relevant traits, which should not be understated when observing this demographic [1]. Based on this, it is beneficial to engage with a greater depth of details in terms of the circumstances of stakeholders so that a better evaluation of coping appraisal within the community can be achieved.

2.3. Behaviour change

To enact behaviour change, awareness of desired behaviour is needed, and this can be achieved through engagement in education programmes for community members. Nakano and Yamori [31] proposed the adoption of the Proactive Attitude Paradigm in educating individuals about DRR actions (they educated teachers in Nepal in their study) as their research observed that if individuals are given the opportunity to teach others about DRR they gain a better understanding than through simply being taught themselves. This has significant meaning because it signifies the need for a community led approach, wherein community members interact with others and empowerment is generated through a bottom-up movement of information [16]. This is important because relying on material forms of risk communication such as leaflets or media as a sole force for stimulating desired behaviour is not realistic as this approach is not interpersonal, which some community members require to feel compelled to engage and the communication should be inclusive of the needs of all – this is especially true for isolated individuals who want some social interaction [32]. In essence, there is a need for a greater kind of learning experience so that desired behaviour in community members is supported. There can be no expectation of engagement in DRR or responsiveness to risk communication if there is little effort to approach and empower community members.

It is also unrealistic to expect positive behaviour change if risk communication neglects to consider the specific needs and circumstances of disabled individuals within communities. Disability is a spectrum that includes varying types of interrelated disorders with unique manifestations of symptoms and experiences [33]. This is vital to acknowledge as research and media have documented that disabled individuals are predisposed to being left behind during emergencies/disaster scenarios, and such action is unethical and potentially illegal [34]. All community members including those with disabilities have a capacity to provide useful insight towards understanding how best to maximise DRR action and protect their communities, and they all have a right to safety [33]. Moreover, it is also pivotal not to make the mistake of considering disability as one segment of a duality – being disabled versus not being disabled – as this skews thinking away from acknowledging the fluidity of experiences that different disabilities entail. For instance, those with mobility impairments can benefit from the creation of accessible evacuation routes [34], while those who are blind can benefit from audio descriptions that serve as evacuation guides [35]. Even beyond physical disabilities, there are also those that have mental health needs, which require alternative, unique adjustments, which illustrates the vast variability of factors relevant to ensuring that positive behaviour changes are manifested. Thus, it is necessary for communication crafting processes to truly engage with individuals that have various forms of disability to ensure that communication is accessible, catering to the needs to differing stakeholder audiences in communities.

2.4. Scale

The perceived scale of a natural disaster impact influences whether DRR actions are engaged in as people's risk perception influences the level of engagement in preparedness activities [36]. This is best evidenced by individuals that have past experience of disas-

ters as they remember the devastation and negative feelings associated with that experience, which serves to motivate engagement as a means to avoid repeating those negative memories [37]. However, it should be noted that this is not universally representative as motivations behind action vary. Tokumizu [5] outlined the importance of scale within the context of the Okawa Elementary School incident in Japan where a tragedy occurred in 2011 when the Tohoku earthquake and tsunami killed 74 students due to mistakes made by teachers in responding to the risk. The case study illustrates the need to be aware of disaster scales because this informs the sort of risk averse behaviour that should be taken. In the case study, teachers underestimated the height of the tsunami wave and chose not to evacuate the students to higher ground, which was an inadequate action [5]. The above is essential to note because it shows the reasoning behind needing integrated risk communication – to safeguard human lives. The engagement in preventative actions within the community such as participation in evacuation drills or attending emergency planning meetings helps to build awareness and clarification seeking behaviours, which at a later point can serve to protect others. Despite this, there are challenges in portraying a sense of risk to individuals, especially during times that are relatively calm, which can give a false sense of safety [6]. Some studies have suggested simplifying language to convey urgency [15], while others have expressed the need for alternative language altogether so that the information being communicated feels different, like the use of uncommon adverbs [38]. Both these points are valuable to consider as inaction in the face of risk needs urgent addressing. It is clear that whatever methodology that is employed in presenting risk needs to resonate with stakeholders, so that after being informed, there is an active effort to seek out further information and a desire to inform others to share the benefits of being informed with the community [39].

2.5. Awareness

Risk awareness enables individuals to make informed decisions and take ownership over the outcomes. Moreover, by being aware, individuals can effectively challenge ineffective policies and governmental approaches to DRR, improving formal processes for future generations [40]. Despite this, awareness is a poor indicator of the effectiveness of risk communication because of the Attitude-Behaviour Gap, which in this context represents the discrepancy between having knowledge about DRR strategies like preparedness and effective response, but not taking any action to facilitate or enable these [41]. Studies looking specifically at increasing risk awareness or education are somewhat limited as these increases do not mean that communities are overly well prepared [42]. The varying studies done investigating reasons for the inaction have suggested that variable factors can play a role in disincentivising action, such as conflicting priorities or complacency [43]. Regardless of the reasons, it should not be understated that the level of awareness is increasing, yet there is a disparity between this and the level of action that is being seen – significantly less action is being taken than expected in communities that are risk aware [44].

In spite of the above reality, it is still worthwhile to ensure that community members are well informed or more importantly, that communication is reaching different types of stakeholders, as once this is achieved then action can be taken to increase preparedness capabilities. One form of improving awareness that has been suggested is the increased use of informal information channels such as word of mouth communication between friends [45]. Such communication is likely to have a positive impact as social relations have been found to raise social capital and empower individuals to engage with DRR efforts [45], although, such information channels carry the risk of information inaccuracies being transferred, which would be undesirable. Ultimately, greater awareness amongst community members is important, but this awareness needs to carry a responsive utility. For example, if there is torrential rain and the water level is visibly rising, this should indicate potential flooding and use of sandbags may be justified – the awareness informs the appropriate actions to fulfil DRR. It should be noted that while disaster situations are serious events, such a recognition should not result in the exclusion of children from discussions on this subject. The reality is that natural hazards do not discriminate based on age, and as such there is a need to consider ways of including children in communication crafting processes to build an awareness about appropriate action in emergency situations [46]. While studies suggest that child displacement during emergencies is relatively low [47], there is great benefit to crafting ways of conveying complex information in more accessible ways. This is especially important considering that in many developing countries, which are already more vulnerable to natural hazards, there are larger populations of children as a proportion of the overall population [46]. As such, there is an incentive to construct educational interventions that raise the awareness level of children in particular communities where the role of children within DRR action is more extensive due to unique local circumstances – like high early mortality and birth rate. Through more diverse awareness-raising interventions, transferable actions can be developed, which may have application capacity elsewhere in the world, increasing the community benefit.

2.6. Synthesis

In essence, the five research dimensions above serve as key topic areas within literature that will guide the process of thematic analysis. By considering these dimensions there will be a clearer approach when reviewing transcripts, through regular reflection on whether there is presence (direct or indirect) within them.

3. Methods

3.1. Participants

This research focused on casually comparing rural areas in the UK and Japan, so this formed a key part of the participation criteria, with participants needing to be individuals that resided in rural areas in these countries (see Fig. 1 for site locations). Each participant had to be linked to one of four areas selected as research sites (UK: Sturmer & Egham; Japan: Inami & Minamiawaji). These sites were selected as this research is focused on flood risk, and each of these areas has a history of flooding and a heightened flood risk so it was determined that they would serve to stimulate conversations about this subject. In addition, it was important for this research
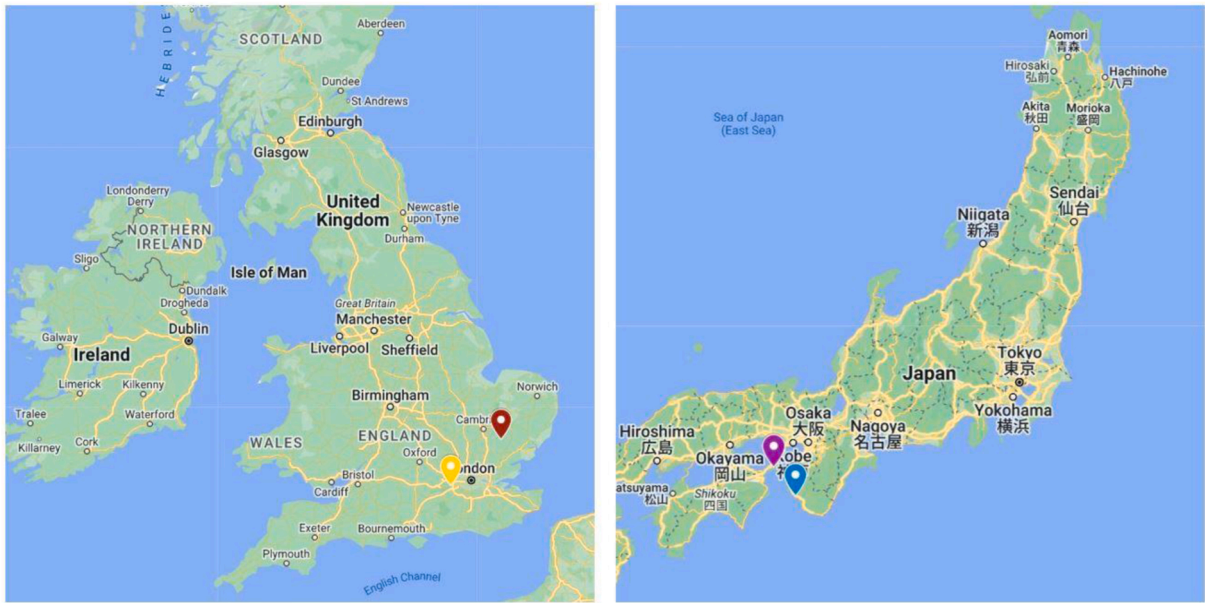
Fig. 1. Maps of the UK and Japan with pinned fieldwork sites (Red: Sturmer, Yellow: Egham, Purple: Minamiawaji, Blue: Inami). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

to focus on rural as opposed to urban areas as rurality is linked with low population density, which increases the possibility of identifying community dynamics and engaging with the impact of social deprivation (a prevalent feature of such communities) on DRR efforts (see Table 1 for further site details). In each community four different types of stakeholders were interviewed: local council officials, academics, flood action group members, and residents not part of flood action groups. These stakeholder groups were chosen as they represent the different levels at which risk communication occurs, which offered useful insight into the integration of risk communication with unique views being reflected via each stakeholder group about their experiences in their communities (see Table 3, 4, 5, 6 and 7).

There are some differences that need to be noted in terms of flood action groups (FAGs) across the two counties. In the Japanese context, the equivalents of this are called 'Jishibo' and perform similar functions to FAGs in the UK, but in a more formalised manner. They directly collaborate with local authorities, supplementing their DRR efforts by supporting preparedness building amongst communities and receive some subsistence. For the sake of ease, the acronym FAGs has been used to represent groups in both the UK and Japanese contexts. A desktop study was performed prior to data collection to outline the contextual picture of the key target sites. From this review of the sites it was determined that the UK and Japan are both governmentally centralised countries with significant civic powers being held by the central government, with local councils having reduced responsibilities. As such, communication operates on similar types of levels, moving between residents, resident groups, and local council officials, but the nature of this communication varies due to the cultural differences that exist between the two countries – factors such as local customs, legal differences, as well as the prevalence and intensity of disasters, influence communication flow. For example, in Japan there is a more clearly defined seniority structure within communities, with individuals taking on leadership roles that have attached duties, while UK communities are less organised in the context of DRR. The chosen sites represent areas which are similar with a demographic of a predominantly elderly people, a low population density, as well as facing a significant risk of flooding (see Table 1). As such, there were key opportunities for useful comparisons to be drawn from observing stakeholder views, especially considering that any differences that arise are likely due to highly localised variables that fall outside of the similar circumstances outlined above.

It was essential that each participant fit within one of the stakeholder groups above, otherwise they could not take part in the study. This participation criteria meant that the study was open to most individuals within each of the four communities, however; as this was a preliminary study of these two countries (and these specific sites), the aim was to get a single stakeholder per group as a

Table 1
Locality-specific information.

Research Site	Population	Demography	Settlement Type	Hazard Exposure
Egham	6000< (low density)	Mainly elderly settled population	University town (rural)	River and flash flood risk
Sturmer	Approx. 500 (low density)	Mainly elderly settled population	Small village (rural)	River and flash flood risk
Minamiawaji	45,000< (low density)	Varied population with mainly elderly residents by the coast	Coastal city (rural)	Tsunami and storm surge risk
Inami	Approx. 8000 (low density)	Mainly elderly settled population	Small coastal town (rural)	Tsunami and storm surge risk

minimum, therefore there were no incentives used to increase the sample size at any point. Any specific demographic details about participants such as age or gender were not monitored as gaining perspective about each stakeholder view served as the priority in this research. This study included 39 participants in total and their recruitment utilised two main methods. Some were already contactable as they took part in previous research of the research team, while others were found through direct email correspondence (e.g. the participation of local council officials was requested through the use of their public office emails). Within any initial correspondence about the study, all participants received a brief to help them make an informed decision about their participation. There were uneven numbers of participants representing the varying stakeholder groups, but this was acceptable as this study engaged with the depth of participant responses to various questions and uneven participant numbers did not have an effect on this that would skew or influence the content of the output. As a final note, ethical approval for this research was sought and received from the respective ethics committees of University of East London and Kansai University, Japan.

3.2. Interviews & focus groups

The study employed a combination of semi-structured interviews and focus groups as these were deemed as realistic and suitable qualitative methodologies to enable engagement with the depth of localised participant knowledge regarding flooding and risk communication. Other qualitative methodologies were determined to not have been appropriate for research of this kind. Each focus group/interview composted of an individual/individuals from one of the four stakeholder groups as participants were divided according to this identity. For example, focus groups/interviews held with academics where held separately to those with council officials, flood action group members and non-member residents in each area being studied.

The UK set of interviews and focus groups were conducted in early November 2022, while the Japanese sets were conducted in early March 2023. Prior to interviews/focus groups, a comprehensive literature review (as aforementioned in the 'background' section) was conducted to engage with some of the key research dimensions regarding flood risk communication in the UK and Japan, as this enabled a deductive approach to be taken within the thematic analysis. Interviews and focus groups lasted approximately 1 h and questions differed slightly depending on the stakeholder group of participants. This difference was appropriate as some questions were not relevant to all participants (see Table 2 for overview of some of the questions asked to different stakeholders). During interviews and focus groups audio recorders were used to capture all that was said, and to ensure that nothing was missed in notetaking. In the UK all members of the research team asked questions, made notes and took turns chairing the sessions, while in Japan only two members asked questions due to the language barrier (these two members were Japanese speakers). Any questions by others in the research team where asked on their behalf, and responses to all questions asked during the interviews or focus groups were translated live so that everyone could follow along. Once participants had taken part in an interview or focus group, each transcript representing their views would be pseudonymised through the use of a special transcript code. Further to this, when transcript extracts were drawn, they would be given a letter referring to a specific stakeholder group, encrypting the person who had made the statement.

3.3. Thematic analysis

Each interview and focus group audio transcript was turned into written copies using a transcription tool. All written transcripts were then checked against notes made during the interviews and focus groups as well as against the audio transcripts as a final precaution. The written transcripts were assigned a letter code as part of the pseudonymisation process, and were embedded within NVIVO software, which was then used to review each transcript. As mentioned above, a deductive approach was taken when reviewing the transcripts for themes via NVIVO. The literature review (discussed in section 2 of this paper) formed a key part of this deductive process as it illustrated some research dimensions that represented important factors for integrated risk communication, which helped when identifying sub-themes (codes) – any key answers to questions of similar topic that consistently repeated across partici-

Table 2
Participant question extracts.

stakeholder group	Questions
Academic	• What is your connection with the local community? • How have you involved yourself in helping? • Who is in charge of taking the responsibility? • How seriously do these different governmental organisations take community communication? • What is the role of an academic?
Council official	• How would you describe the information flow in terms of risk communication and flooding in general between the council and local residents? • How would you describe the role that the council officially has in terms of informing people? • What is the relationship between the council and other governmental bodies as well as the residents? • How does the council assess the effectiveness of communication? • What is the perception of the council towards flood action groups?
Flood Action Group	• Why is it important to engage in preparation? • What is the perception of the roles that academics and council officials should be playing? • Who should lead disaster (flood) management and response? • How do flood action groups engage with residents in comparison to council officials?
Resident	• What experiences of natural disasters (flooding) do you have and how have these impacted you? • How easy is it to follow advice about flood evacuation or preparation? • Would you know what to do in the event of a natural disaster (flooding), and if so please elaborate? • How much trust do you have in the information channels that are available to you?

pant responses became labelled as sub-themes. This process was repeated several times to ensure that all responses relating to a specific sub-theme were captured and any weak sub-themes that were not substantiated sufficiently by extracts were omitted. A threshold of 10 quotes from transcripts was used to determine whether a sub-theme was sufficiently substantiated to justify being used. This number arose following the review of sub-themes where 10 was the median number in terms of numbers of quotes supporting a particular sub-theme. Those sub-themes with relatively lower levels of supporting quotes (i.e. fewer than 10) were excluded from the process of clustering sub-themes to generate the overall themes (see Fig. 2). By taking this approach, more robust themes were generated. When only well-supported sub-themes remained, these were reviewed against each other so that clusters could be formed. These clusters represented the overarching themes that identified with the meaning behind participant responses – Individual Circumstances, Community Structure, Impact Scale, Response Capacity, and Social Barriers. Collectively, these themes represent the key factors influencing risk communication (serving to answer RQ1).
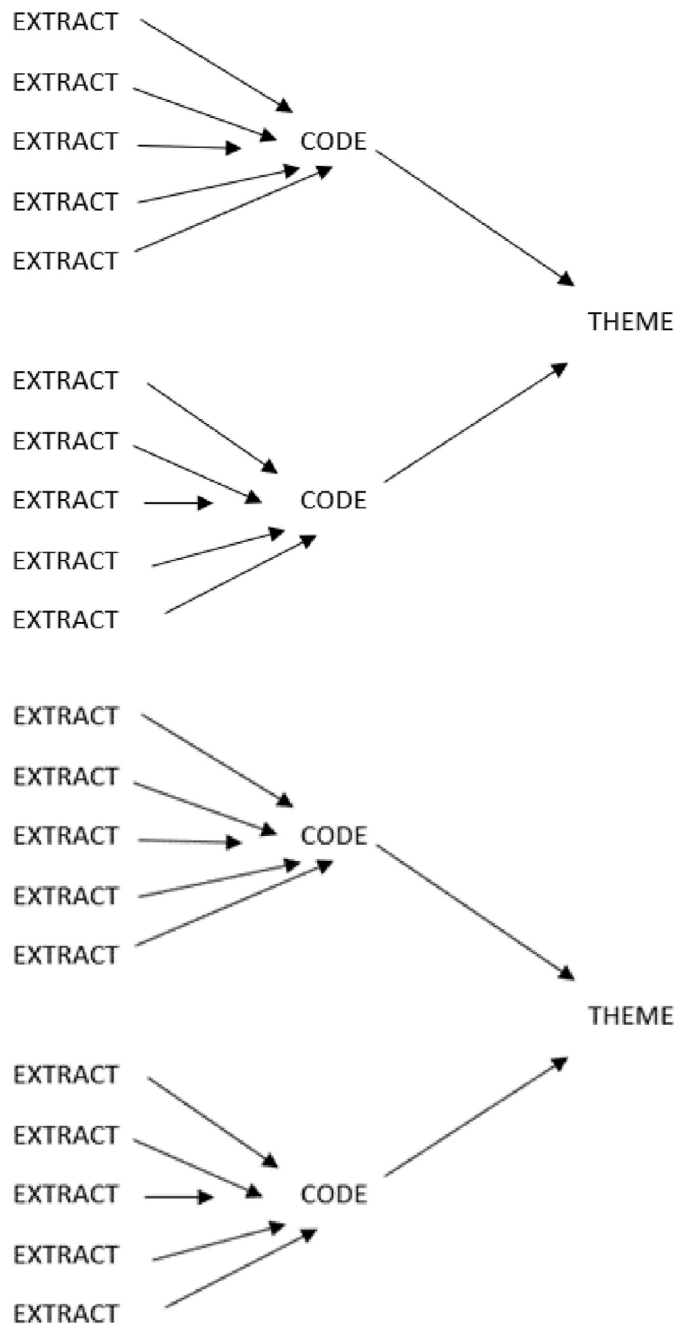

Fig. 2. Thematic Analysis process.

4. Results

The following section will illustrate the outcomes of the thematic analysis and transcript review. It will first outline the specific context of this study that risk communication operates in (the unique elements relating to the specific communities being observed) and then respective themes that arose from interview and focus group responses will be discussed.

4.1. Contextual overview

It is relevant to outline some key contextual features of the communities that were observed in the study. Information such as the feelings associated with disaster risk, modes of communication utilised, and motivations behind taking action, are distinguishing features of the communities in this study. By observing these features, it becomes more possible to consider the needs of the respective communities, and later it is also more apparent how the thematic map aids in facilitating these needs.

This research paper emphasises that it is context-specific, therefore, it is helpful to outline the context of the areas being observed – the emotions people feel, the motivations for action, and the modes of communication used. These three elements were chosen on the basis that they effectively encompass important aspects that influence coping capacities in disaster scenarios. By acknowledging the context, individuals crafting communication can do so with a greater clarify as to how their decisions are informed by the context-specific factors in each area [48]. As the thematic map is a flexible tool, the contextual overview serves to inform how a thematic map should be adjusted to fit the changing needs of an area. If, for example, risk communication guided by a thematic map is aimed at individuals whose primary motivation for taking action is based on a desire to keep their assets safe, communication might benefit from reflecting this, rather than being focused on other motivating factors like fear of the threat or a desire to be part of something meaningful in their community.

In Japanese communities there was a strong focus on having the community radio as a regular source of daily news and updates, however, there was some concern over its audibility as other noises and weather had a significant impact on this, which meant that this source of information was not always reliable. This is notable as research suggests that over-reliance on particular information sources increases vulnerability as there may be an absence of safeguards, which is undesirable [4]. Considering that hazard risk carries a level of unpredictability, it could be beneficial to have a varied range of communication mediums to counteract this. The use of a community radio in this instance was unique in that it engaged with the whole community via an auditory means (most other modes of communication are visual). Aside from this, all other modes of communication illustrated above were present across both countries, however, social media was spoken about significantly less as most community members that participated in the study represented an older demographic which has a traditionally lower representation on social media, especially in rural areas where access to the internet is also more limited [49]. This is important when crafting communication, as stakeholders need to be aware about whether their medium of communication is being utilised effectively as to ensure positive impact (the actual spreading of the key information amongst the community).

Another distinguishing feature was the feelings associated with disaster risk. Some UK residents expressed the unique view that they felt little concern towards flooding due to being largely unaffected by it, which was a stark contrast to the collective feelings of fear, anger at government inaction, and concern for the future, that were expressed by the majority of Japanese and British stakeholders that participated in the study. Such negative feelings parallel the general sentiment that is seen in academic literature and media towards climate change impacts, which often manifests as climate anxiety, encompassing the internal frustration that people experience due to difficulty in conceptualising personal agency in tackling these environmental concerns [50]. Avoidance of responsibility despite awareness of the issues (as expressed by some of the UK residents) could be explained through the Terror Management Theory, which states that awareness of the threat results in existential terror that needs to be managed, and denial is an effective management strategy; in this case denial that the threat will ever materialise as residents might not see close proximity [51]. Yet, as climate change continues, its impacts worsen meaning that there will be an increased level of threat for most, especially as investment in DRR has not been proportional to the speed of human settlement development and rise in urbanity [52].

A final contextual point to consider is the motivation behind taking action as this illustrates parameters that need to be met if DRR is engaged in. The desirable outcome of risk communication is to not only raise awareness, but also to facilitate engagement in DRR activities [16]. As illustrated above, there is a multitude of motivations that underpin proactive behaviour, which means that risk communication cannot be a fixed, immutable concept. It must instead have a capacity to change and adapt to the unique needs of stakeholders as this will ensure that any engagement in DRR feels simplistic and natural rather than forced. For example, during communication crafting processes it is important to consider whether stakeholders included in discussions have a past history of experiencing natural disasters, as this might indicate an emotional connection that if tapped into, may serve to motivate. This is valuable to note as others might be more easily approached through discussing the protection of their assets, which is a more practical motivation in the context of DRR. By differentiating and recognising these differences, more tailored approaches can be taken [16]. It is essential therefore that any risk communication model takes on a reflective approach, being adaptable to the specific stakeholders it is being applied to so that engagement in DRR action can be maximised.

The tables below illustrate the most salient extracts derived from the interviews and focus groups that generated the five core themes. The following code has been used to distinguish the type of stakeholder speaking. C – Council Officials, A – Academics, F – Flood Action Group members, R – Residents that are not part of a flood action group. Each extract within the tables presented in the results section below reflects a sub-theme (as seen in Fig. 4, that is a component element within the particular theme being outlined).

4.2. Individual Circumstances

This theme encompasses the varying characteristics of community members such as demographics, past experiences with disasters and mental states that influence the way in which individuals respond to risk communication and DRR activities (see Table 3). There was a consistency between both countries in illustrating that past experiences with disasters are linked with present mental states, wherein people who remember prior disaster impacts are more acutely aware of their resultant damage and devastation, feeling more alarmed and conscious about the possibility of an upcoming disaster, which is consistent with research into past disaster experience [43]. Equally, there are also concerns that individuals shared about the loss of risk awareness due to a lack of past experience, with Japanese council members outlining that these individuals have never had to engage in responding to an actual disaster so it is not clear how well they would respond if a disaster occurred. And similarly in the UK, there are some with no experience that simply do not care about it as they feel unaffected. This stark contrast between those with and those without disaster experience is important to note because it represents unequal levels of motivation amongst communities, and this is something that needs to be addressed as natural disasters do not discriminate when they impact livelihoods, and as such it is vital to help the whole community to stay engaged [39]. As seen in Fig. 3, it could be beneficial for creators of risk communication for a particular area to find out about factors that would trigger motivation for particular community members, and construct the communication based on these – tailoring the way that individuals are approached.

Further to the above, it is also important to account for the demographics of area when crafting tailored communications. In Japan there were issues of gender and age raised, that the presence of women is low in discussions about emergency planning and that elderly individuals often struggle or are unable to evacuate. These points are crucial for risk communication as the stakeholders involved in DRR are diverse, meaning that the communication they receive needs to reflect that diversity (it has to consider the unique needs of particular groups like women, who differ from the experiences of men, and these differences have to be accounted for) [1]. Likewise, the content of risk communication has to consider the capabilities of individuals within the community. If certain actions are outlined that are best practice for some, but not others, the communication fails to empower the whole community, therefore the specific needs of the elderly have to be considered and barriers resolved, so that all can gain something. Based on this, communication needs to be flexible and adapt to the individuals. In practice, this might mean sending tailored communications to those that have difficulties with mobility and finding out the best ways they can be supported in an emergency.

4.3. Community Structure

The structure of communities influences the desire of stakeholders to engage in DRR efforts (see Table 4). In communities where the local council takes a passive role in DRR, with poor relations between the community and emergency officers, and few policies designed to support preparedness and response efforts, there is greater responsibility placed on the community members to self-organise if they desire to have DRR implementation. The governance roles and approach taken is deterministic of the sort of community action that is visible. In terms of the comparability of British and Japanese communities, it is evident that there is greater collective effort in Japan for a collaborative, unified approach to DRR that is being taken, which is logical considering that Japan is more decentralised relative to the UK so localised action is more possible [8]. Each of the varying stakeholders in Japan presents the case for forming positive relationships across stakeholder levels. Residents feel that there is greater social and physical distance between them and their council representatives yet still acknowledge their supportiveness, while FAGs are more present in the community and are happy to take the lead role in DRR so long as the formalised governmental bodies like local councils support them via their resources. Through this model of risk communication and DRR action, where stakeholders acknowledge each other's respective positions and take on the

Table 3
Theme of individual circumstances.

| United Kingdom	Japan
F: "Certainly one or two of the members of the group have had serious flooding events and their motivation is quite clear. It affects them virtually every year. And therefore, it's in their self-interest to do that [to prepare]."	**C**: "There is no big disaster these days … The awareness of residents (including staff) may be weakening. The staff who recently entered has no experience of disaster response."
C: "… without that natural flooding, people are saying that biodiversity is being impoverished, but that comes from that traditional indigenous knowledge of how things used to be in the past, that we used to live in harmony with natural flooding mechanisms, and now that harmony has been broken."	**F**: "Young people try to live on a higher ground. Elderly people do not want to move to a higher ground. They want to remain in their houses. Some elderly people are in need of care and cannot evacuate."
R: "I have been flooded twice. I got phone calls from the Environment Agency. Gather your belongings. Move to higher ground. I mean, we were waist-deep in water. My husband-to-be then, we were carrying bacon sandwiches around to different people that were flooded. And in the middle of the road, we were waist-deep in water."	**A**: "There are administrative organisations and disaster prevention planning committees, but there are few women [if any]. It would be nice if there is a woman at least [in each organisation and committee]."
F: "I then talked about the most extensive damage and hence the greatest disruption caused by the flooding occurred in Abridges Avenue, Egham High. 70 homes had to be evacuated. It became necessary to rehouse whole families and individuals. The trauma was to be followed by the financial cost of repair and recovery over many months."	**C**: "For those who are worried about evacuation such as the elderly or pregnant women, we receive a phone call from them so that we prioritise them to be put into evacuation centres."
C: "You know, that people's, I guess, levels of anxiety every time there is extended rain, including right now, goes through the roof. People can't sleep, people are worried, and that has knock-on effects with regards to depression, anxiety, and overwhelming our GP services."	**F**: "Some people are not interested and do not participate in evacuation drills. In Age ward [one of the wards in Inami town], the threat of flood damage is the largest. The consciousness is high."
R: "We've never had to worry about it [flooding], fortunately."	**R**: "I'm scared when a big disaster comes like on the TV programme which I saw last week."
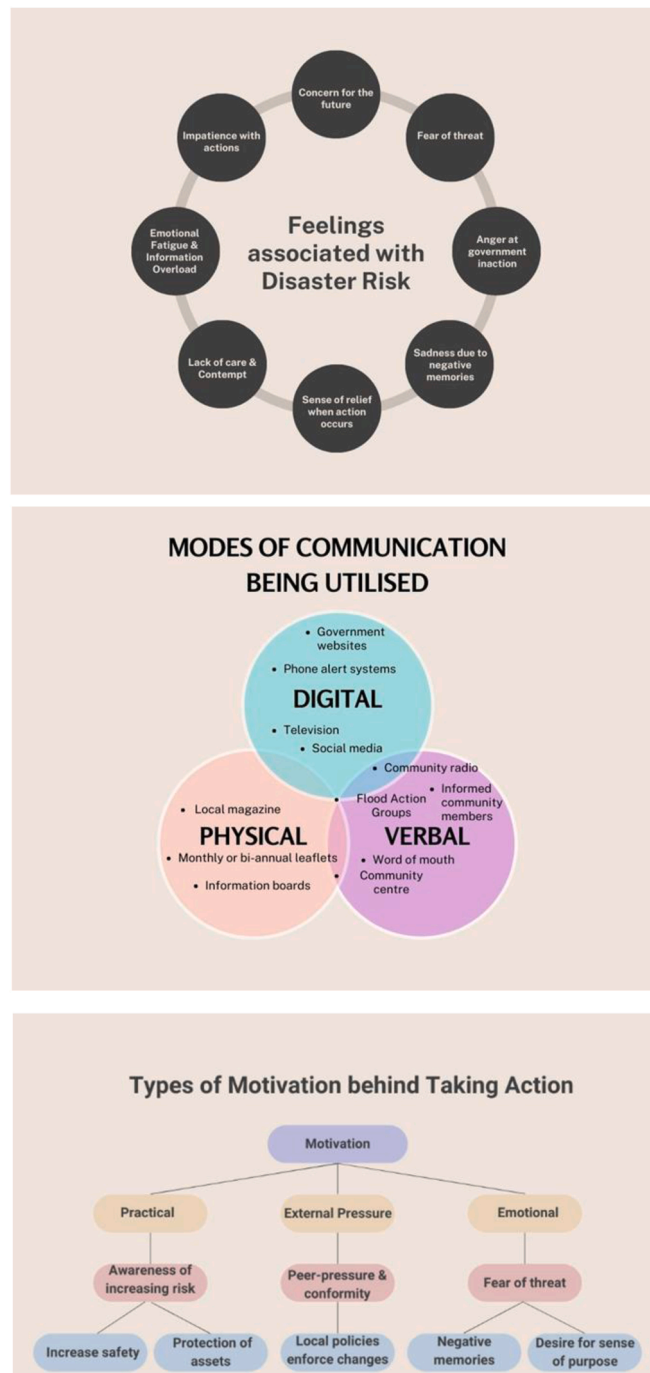
Fig. 3. The context that risk communication operates in across the observed communities.

responsibilities that their roles require of them, communication can flow effectively. While there are some challenges in doing this like people changing roles, there is a general recognition that the social capital within communities should be utilised, and that is the approach that is taken and policies support the facilitation of this.

In contrast, the British Community Structure is more disorganised, which is characteristic of more centralised countries [40]. There is little communication between local councils and FAGs, which is problematic because it limits the information access that exists and so fewer people are aware of the specific emergency plans for their local community. And this means that it is harder for local councils to coordinate emergency responses as these rely on community cooperation, yet community members cannot cooperate easily if information is unclear or incomplete. Even within local councils there is poor communication, which adds to the issue of not knowing the best course of action to take or who to contact if issues arise, a particular issue that residents face when they try to report
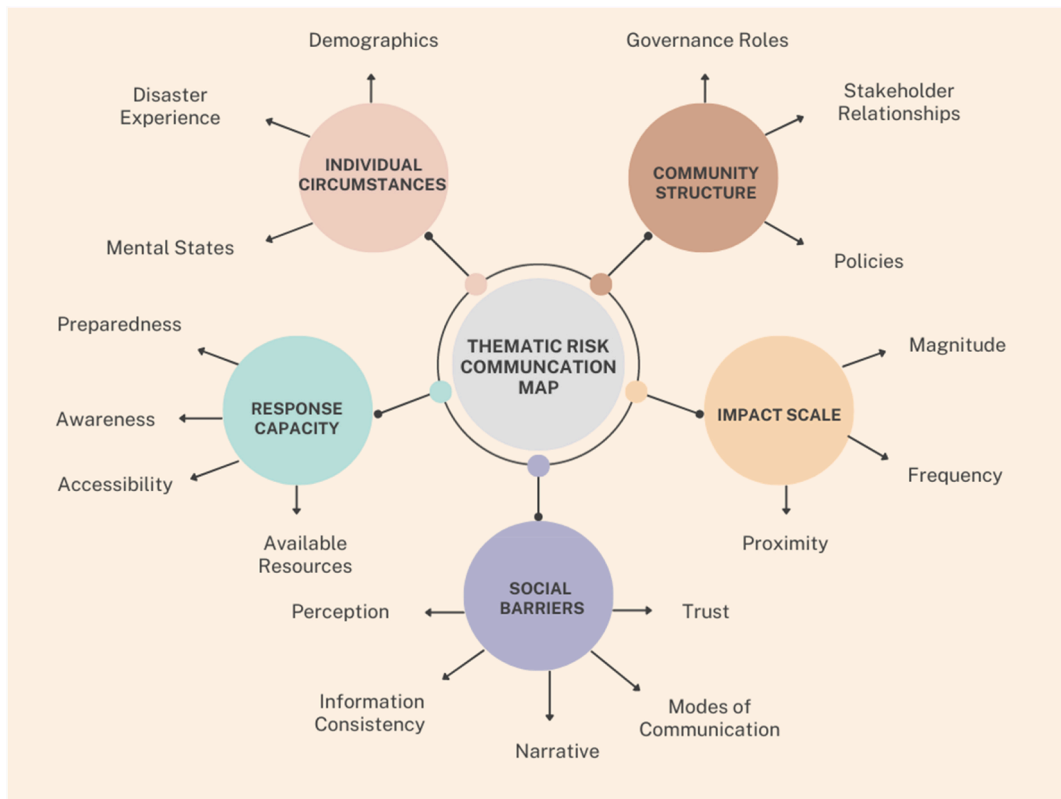
Fig. 4. A visual display of the thematic map.

Table 4
Theme of community structure.

United Kingdom	Japan
F: "They [the Environment Agency] have the equipment, they have the manpower, they have the budget, they've got all the resources … We are not seeking to reinvent the wheel … We seek to promote the work of the Environment Agency … and raise awareness."	**A**: "I think it is better to have one [community champion]. Whether they will be an ally or not makes a difference. The champion may not be meeting the needs of the community."
C: "Sturmer is a good example of them [the residents] doing it themselves … they will sort of grasp the nettle and engage directly but other communities might not be so proactive, but we will go out and we'll engage with those communities who are not and then inform them, educate them, support them with possible grant funding and things like that to help set up these [flood action] groups and protect themselves effectively and then it would be up to them to maintain that into the future depending on the level of the enthusiasm I suppose really in the community for it."	**C**: "We are paying attention so that we can develop relationships between people … Through local events, we aim to form connections. If there is a connection between people, firefighters may be able to find you in an emergency situation judging from the latest witness information."
A: "And residents, I think public residents, communities, these people are the most important key role player here because they are the ones that get engaged, need to get engaged."	**A**: "[In the role of an academic] Bridging social capital is very important. I thought playing a linking role is important. As well as enhancing DRR activities. I have motivation to connect."
C: "[Risk communication] It's not transparent and … the communication chain does not exist between council officers dealing with risk management and councillors"	**F**: "City hall should support the association [the FAG]. The main actor in DRR is the community … We residents take the initiative. The city hall should support us."
F: "… the government did introduce a scheme that if you get flooded, I believe they send builders in, they get it done and they reimburse the insuring company. But I don't know how well that's working really. I think it was a system where everyone who had insurance had to pay a premium to help people who had been flooded. So in theory your insurance premium came down. We asked if we could have lower insurance because of our flood protection but they said not until ten years."	**R**: "Due to generational shift there are many young people, so I don't know who to consult with. Previously, I should have asked the elderly as I know them personally. It was one of the features of Inami town that we know the personnel of the local government and consult them directly. Of course the younger staff answer what I ask them. But I don't know them personally, I am a bit reluctant to ask them."
A: "[There are different kinds of policies] I can't remember exactly what the official terms were for them, but essentially build a massive flood wall was one. Managed retreat was another. And the third one was some kind of adaptation of this."	**R**: "Their [the council] building moved away (used to be where we met officials). So they cannot come and help us. Everything became inconvenient. They are far away. There is a psychological distance now. But if a disaster occurs, they will support us."

flooding in their area. Such a reality is undesirable because there may be helpful policies or schemes available that tackle some of the issues through adaptation techniques or special insurance, amongst others, but if these are not presented to community members then their positive impact will not be gained, and this is wasteful as it means the community's social capital is not being fully utilised, despite the scale of flood risk increasing exponentially in the UK [52].

4.4. Impact Scale

The theme of Impact Scale represents the perceived possible disturbance to the community due to perceived hazard proximity, magnitude, and frequency (see Table 5). It is important to note that this theme represents individual's perceptions rather than actual empirical measures of the above factors (e.g., the exact distance between a flooding river and a community, etc.) as perception of risk can act as a trigger for action regardless of whether if it is an accurate perception or not. There was a notable difference in the primary factor/s that influenced participant behaviour and their receptiveness to risk communication/DRR. The British stakeholders outlined that proximity and magnitude do not play significant roles in creating a sense of risk, which could be explained by the fact that the UK general public is regularly exposed to news stories about severe natural disasters such as tornadoes in the US, severe flooding in Pakistan, or earthquakes in Turkey, which are associated with significant devastation and loss of life, the scale of which is not seen the UK. Exposure to this foreign imagery could have played a role in creating the perception that the UK is a relatively safe place that is largely unaffected by natural disasters, meaning there is little reason to have concern over potential risk [39]. This is supported by the narrative from British local councils who outline that there are often strong objections to DRR action by some when it is brought forward because people do not see the need for it, they do not see the risk it is aimed at protecting them from. Likewise, academics state that geographical proximity has lesser importance than social proximity, the perception of being close to a risk, meaning that regardless of the material reality of how close a risk actually is, individuals need to feel a sense of closeness to actually be motivated to act [43].

Contrastingly, Japan has high magnitude of risk with resultant damage being seen by different stakeholders via television, social media, newspapers and through direct experience of natural disasters. The risk is clearly within both geographical and social proximity so the high magnitude fosters a risk awareness that is particularly visible in the behavioural patterns of community members – moving towards higher ground or away from a natural hazard perceived in close proximity [36]. Japanese participants outlined that in areas with past disaster occurrence there is a strong presence of FAGs and those living in high risk areas are motivated to engage in DRR actions, and have an attentiveness to risk regardless of the frequency. While this is desirable, this sense of risk needs to be compounded with a sense of safety, wherein action is taken to ensure that despite having risk awareness community members do not live in fear, and instead believe in their own capacity to respond effectively, otherwise high risk areas might have substantial population decline as people move to safer places [26]. In the UK, frequency has been suggested by academics as a better way of motivating action as this might keep the sense of risk in people's minds. Council officials have outlined that presently DRR efforts rise with oncoming emergency and disaster once this has resolved, but long-term risk awareness is needed as part of effective preparedness, otherwise people might forget and when the risk arrives, they will fail to respond effectively [42]. Based on this, there is an opportunity to discover new ways keeping people conscious of risk even when they are living in periods of calm, especially considering that in the future the UK will face more severe flooding.

Table 5
Theme of impact scale.

United Kingdom	Japan
C: "There's a lot of a flurry of activity when the emergency happens. And then, to be honest, it all dissipates." **A:** "[in research we find that] there was a geographical proximity, but there was also what we called a social proximity or a homogenic proximity."	**C:** "It [interest] largely depends on the community. In areas near the sea, residents are more interested in DRR. **F:** "The three people today [the individuals being interviewed as part of the focus group] are the leaders in the ward where the risk of tsunamis is particularly large, so it is easy to share consciousness."
C: "… if they're not impacted by the problem then they don't see why they should have any involvement at all and to the extent where we've tried to deliver flood alleviation schemes, we will get very harsh objections."	**R:** "[living in a high risk area …] is a trigger to take action. Even though I live in a high place, there is a river nearby and I feel a sense of risk. I feel it is dangerous from my experience."
A: "And what we found [within research] was that what made people respond were if you had lots of small shocks. So if you have a small earthquake every so often, it was in people's minds they took it seriously."	**F:** "live on a hill, so it's safer to stay at home than to escape. Many people live on the hill side now. The population on the hills is increasing. The population is declining near the sea."
F: "I think the Thames [the longest river in England, UK, which flows through the area where the participants live] is a lovely amenity, but I think we equally we recognise that we are living next to a risk. For example, there are insurance companies that refuse to insure this house because they say, oh, no, the postcode is a flood risk. So if there's anything we can do, one to really prevent people, I think, from thinking they've been abandoned, thinking that they've been ignored, that there's been no planning, no thinking, nobody's concerned about their plight."	**R:** "The Nankai Trough earthquake [a megathrust earthquake predicted to hit the area where the participants are located sometime in the future] will be a large wave, which can continue for a while. Even you don't feel a strong tremor, tsunami may still come. So people need to evacuate even if you don't feel a strong tremor.
A: "I would say the frequency was the most important thing. Because it had to, I said people had to almost be looking over their shoulder for it all the time to take it seriously. And that's when they would act."	**C:** "Based on information such as river conditions, high tide or storm surges, we the city hall issues an "Evacuation Instruction"."

4.5. Response Capacity

This theme represents all the factors that are necessary for community members to be able to respond to flooding in their area – available resources, awareness, preparedness, and accessibility to the former (see Table 6). Response Capacity matters because it is a source of empowerment for community members, and facilitates opportunities for proactivity – if stakeholders know about DRR action, can access the necessary resources, and then use these to prepare effectively they will be more likely to respond successfully if the disaster occurs [42]. Participants in the UK and Japan outlined a similar picture about Response Capacity. It is evident that FAGs have taken on the role of raising community awareness, which is indicative of a failure in top-down communication from local councils and national agencies to whom these responsibilities for raising awareness belong. This is suggestive that in the future, Response Capacity might be based around the work of FAGs instead of formal governmental agents like councils or agencies. Such suggestion is further reflected by the outlined struggles local councils face in terms of diminishing resources, with UK councils lacking the finances to implement effective actions and Japanese councils lacking the staff to manage actions. While FAGs might be better able to understand community needs and create support networks amongst people due to a level of personability that they hold, it is concerning if they become solely active in terms of community risk communication and DRR implementation. The diminishing resources that local councils face represent an issue for FAGs as well, as the lack formalised financial channels and the need for volunteers limit the role that they can play, and increase pressure on pre-existing members [40]. While there are clear benefits to FAGs taking responsibility for raising community awareness, if local councils continue to play a lesser role in risk communication and DRR overall, the Response Capacity of communities will be undermined regardless of the scale of FAG intervention.

In line with the above, a key resource that supports Response Capacity is social capital. In essence, people are the most valuable resource – DRR is more effective if people engage in it and awareness leads to preparedness efforts [2]. To facilitate this, there is a need to make knowledge accessible to laypeople, but this is often a challenge for both British and Japanese communities. In both countries, council members outlined that creating access to information is difficult and mutual aid is needed to supplement or entirely replace their role. It is important to consider this as it leads to a failure in utilising the available social capital within the community [16]. While Japanese communities are more engaged in DRR activities relative to the UK, both countries have an issue with levels of awareness and their respective FAGs strive to improve this. Yet, in the UK there is a greater level of complacency with community members taking no action, accepting flooding as a normal reality. This attitude limits the Response Capacity of a community as effective DRR requires collective participation, and this lack of engagement can place others at risk, therefore, to maximise the ability of communities to respond to natural disasters there has to be greater effort placed in engaging non-participating members in information exchanges and DRR activities, making being part of the process matter to them.

4.6. Social Barriers

The final theme that forms an element of the thematic model represents the varying obstacles that restrict the effectiveness of risk communication (see Table 7). As seen in Fig. 4, there are various modes of communication that are utilised by stakeholders, with specific ones being preferable to some and not others. This means that when approaching communicating risks with different audiences it can be helpful to understand their communication needs and preferences as in doing this optimal information transfer is ensured – where risk information is received and adhered to [53]. If this is not considered, risk communication will fail to reach all stakeholder groups, and some will be less informed than others, which will be an unfavourable and unfair outcome. Furthermore, when approaching the use of multiple information sources it is essential that the information being presented is consistent as inconsistencies also lead to unequal levels of risk knowledge within communities. In Japan in particular, it is especially imperative that there is information consistency as there is a substantial reliance in small towns on particular modes of communication such as the community radio, and

Table 6
Theme of response capacity.

United Kingdom	Japan
R: "… part of the cause I think is finance that they haven't, the councils haven't got the money to keep the drains clear."	**F:** "The number of staff members of the government office is decreasing."
F: "The objective is … [to] raise awareness of people … we're trying to get a reality check … to be aware that this is serious and it's probably not going to go away."	**C:** "The times for a meeting to discuss are limited. We want to create a system that enables residents to call out each other but not easy. There are limits to the city hall's activities, so self-help and mutual help are required."
C: "No, there is no mechanism at the moment in place to make that information more accessible. National agencies, flood awareness and flood alert schemes can be very complicated for many of our residents, especially the most vulnerable, the elderly, people on low and middle income, BAME communities, you know, black and ethnic minority communities. They have difficulties engaging with this pretty scientific data."	**A:** "Even within Japan, words and expressions that are easy to understand depend on the region. That's why researchers need to translate to help people understand. I've been drawing out information that is not visible to people. I think that even those who have no expertise can also translate."
R: "You learn to live with it [the flooding]."	**R:** "I share with friends where the dangerous areas are when we meet locally."
F: "… those ditches all feed into the brook and we think having the woody dams [barriers made from natural woody materials designed to reduce water flow] is holding back some of the water. We know it's holding back some because we've seen them in operation after a big rainfall, we've gone and had a look."	**F:** "I am a bit more aware as a leader. Thus I have to work for the people when a disaster occurs. I always have a sense of risk. I pay attention to when the siren rings. I used to be a voluntary fire fighter. Even when the truck passes nearby my house, the earthquake crosses my head. I become sensitive."
C: "… understanding and education in terms of who's responsible for what in managing flood risk is very [important]."	**F:** "Residents should be more aware. Residents can do more, should do more. I think the residents have that potential."

Table 7
Theme of social barriers.

United Kingdom	Japan
F: "I don't trust what the local borough council does, I don't think they necessarily know what's going on and I think they were a bit slow to respond."	**F**: "I do not trust the city hall's information so much. I think it's rough information. However, I trust the Japan Meteorological Agency's information."
F: "Sometimes people don't want to get involved with the council … they don't like the bureaucracy"	**C**: "In the case of Japanese, they trust information from the local government even if they have doubts."
R: "Not everybody has got access to the internet."	**F**: "Experts talk too much."
A: "You know, word of mouth still counts for an enormous amount. And whether word of mouth is literally spoken or whether it's on social media, that still seems to have huge impact on people."	**A**: "People find it tough when they are engaged in activities because they are told to do so. When people have discretion, their motivation increases, which then leads to better DRR."
C: "… there is very, very limited information and activity in between the emergencies. I think it's because our council, like many councils in the UK, is cut to the bone in terms of services and our staff officers are firefighting constantly, so they're not necessarily thinking ahead to the next flood and getting the community ready for the next emergency, which is inevitable, it's going to happen."	**C**: "The majority of the residents only listens to Community Radio, and does not seem to see information such as homepages. Elderly people don't see much homepage. Most of the residents in this town are elderly."
R: "I mean, as I say, I don't lose any sleep about it."	**R**: "I don't use a smartphone very much. I mostly use LINE app [downloadable communication software popular in Japan, much like WhatsApp in the West]."

if the information presented deviated significantly from that of national agencies this could reduce the effectiveness of DRR efforts as residents would not be following accurate guidance or up to date guidelines. In both countries, elderly communities were less inclined to use digital information sources such as social media or websites, which is important to consider for two reasons. First, if local councils or national agencies are not aware that these sources of information are underutilised by elderly communities then their key messaging will not be seen or heard, and DRR efforts will be diminished. And second, the overreliance on non-digital sources of information carries vulnerabilities as there is a lack of a failsafe in the form of an alternate source of communication in special circumstances (most notably in situations like national quarantine periods – Covid-19 pandemic), resulting in a possible absence or reduction in awareness. To counter these possible issues, local councils might consider how elderly communities can be helped to engage in a more varied pallet of information sources.

Beyond the above, trust served as another social barrier to engaging with risk communication. Unlike the presentation of trust in the literature review as an independent research dimension, trust serves as a subtheme within the thematic map, as it is closely linked with other elements that form the theme of Social Barriers such as perception of or the narrative within risk communication. This is best represented by the dissonance in perceptions of different stakeholders across both British and Japanese communities. In Japan, one of the councils perceived a good level of trust in their information provision, yet this is inconsistent with the views of some community members who distrust council information, choosing to trust other sources – national agencies. The same mistrust was present in the UK, where engagement with the council was undesirable due to the perceived level of bureaucracy, which made the prospect of engagement unappealing. The resultant disconnect in perception is problematic as there is a need to form co-operative relationships to fulfil DRR efforts, and if council attempts to inform communities are met with doubt or resistance then risk communication flow needs to be directed by alternative entities such as FAGs (who are already stepping in to do this) or greater investment is needed into increasing the trustworthiness of information sources [21]. Further to this, proactive action (such as the tailoring of narratives) is necessary to break down barriers in engagement. In the UK, some residents illustrated an absence of care towards disaster risk, which was linked to a perception of low disaster severity – the idea that action is unnecessary if the risk does not appear to effect the person. Such perspectives need to be addressed especially as the number of flood-prone communities is increasing and laypeople may not fully aware of their personal risk. Yet, the action that is needed may have to come from FAGs as council resources are often limited, leading to a reactive approach, and experts such as academics are viewed by some community members as speaking more than actually being involved in action – this is especially evident considering that many communities need expedited action, while research can be slow, failing to satiate the desire for expedience in many cases. As such, a proactive review of social barriers is incredibly beneficial in helping to resolve risk awareness inequalities, especially amongst older populations in small communities.

5. Discussion

5.1. The thematic map

This research has proposed a thematic map (a display of themes and subthemes linked together), exemplified by Fig. 4, as a representation of the connections and underlying factors that are integral to establishing integrated risk communication. The idea of thematic mapping may appear as simplistic in that it is a collection of ideas framed together to produce a much broader concept, however; to get to this point (the creation of this map) a narrative within transcripts was followed rigorously, which was crafted by stakeholders from the 4 sites across the UK and Japan. This thematic map is their collective conception of all the varying, salient ideas that need to be considered when communicating about flood risk in their areas. Each theme tells a fragment of the story, and together they frame the complexity of risk communication in a way that is simple to view and understand, making this a truly accessible map. In line with the research of Hargood, Millard and Weal [9], this type of mapping enables those crafting communication to tap into deeper meanings held within community narratives, which offer insight into felt experiences and pathways of desire (what individu-

als want to happen in their communities). By helping to frame these important areas of consideration, approaches to communication may feel more area-specific, taking into account the context through actively considering the inputs of different stakeholders, rather than being a rigid, generalised framework.

This thematic map presents that integrated risk communication requires its creators to be aware about the community-specific information that helps to frame how this communication can be tailored to the community-specific needs of varying stakeholders. As outlined by Kellens, Zaalberg and De Maeyer [53], a direct engagement with community members, allows for identification of how risk information should manifest itself in terms of knowledge gaps, desired knowledge, or simply useful information to know during emergencies. It is believed that the above provides a blueprint for greater engagement with community members and improvement in understanding of the whole community. Individual Circumstances provide ideas about the audience that the communication will reach or target. By being aware about the specific needs of individuals, this will inform the information sources that are favourable, the ideal ways of motivating action, or the emotions that serve as a barrier to engagement. Likewise, awareness about Community Structure will help to delegate responsibilities amongst stakeholders and frame the communication within the framework of policies that bind the community. Themes of Impact Scale and Response Capacity will inform the level of risk that the community faces and the realistic steps that can be taken to maximise DRR success. Beyond these, throughout this process, Social Barriers need to be identified and steps need to be clearly outlined to resolve these so that all other aspects of risk communication are not undermined.

6. Conclusions and limitations

This study sought to illustrate how the integration of varied stakeholder views and the representation of this through a creative, thematic map can serve as an aid to the communication crafting process. It presented a new methodological approach for crafting more integrated risk communication by which the communication crafting process and the representation of key factors can be simplified, in a way that does not impose ideas on those involved in the crafting process, but rather outlines all the key aspects to the process that, if considered, enable greater stakeholder inclusion and wider consideration of key variables in the specific context of a particular area. While it is accepted by the research team that a study of this size (39 participants representing 4 different areas) cannot serve to fully substantiate the output of such a map or overstate its representativeness of these areas and others across the world, this does not reduce the value of the deep narrative and storytelling that has been drawn. The insights from participants are helpful in framing the interactions between different stakeholder levels and identifying ways of improving communication in the areas observed. The map expresses the multifactorial nature of risk communication, which is essential to acknowledge if desired progress in DRR is to be made, considering that stakeholders can benefit from visual tools like a thematic map to guide the ways in which they craft their risk communications.

The findings of the research across the different sites suggest that the UK and Japan are different and similar in various ways in terms of how their risk communication is conducted and influenced by context-specific factors. It is evident that past experiences of disasters are sources of motivation to engage in DRR in both countries, however, this should not be relied upon as risk communication needs to engage with all community members, especially including those without prior disaster experience whose behaviour in emergency situations is less known. It seems that in the UK disaster frequency is a more impactful motivator for engagement, while in Japan factors such proximity and magnitude were more salient. Another key similarity was the role of FAGs in these countries as these groups are playing a significant role in facilitating risk communication and increasing response capacity (more collaboratively in Japan). And as final note, it is vital to acknowledge that across both countries there are similar social barriers (like trust) that are limiting the effectiveness of risk communication efforts, which require review to ensure that DRR is not inhibited. In essence, the key conclusion of this study is that there is a need to consult a wider range of stakeholders within risk communication to access vital context-specific information that will inform a more tailored approach towards crafting risk communication. And thematic mapping has capacity to aid in this process of crafting an integrated approach.

There is a need to repeat this study with several alterations. This research did not monitor demographic characteristics within recruitment, and as a result, the majority of participants were older, meaning the themes that were drawn from transcripts do not offer insight into the views of younger demographics which could be different. The research team acknowledges that it is a challenge to be fully representative in developing a thematic map within any area as samples of participants are predisposed to omitting highly marginalised groups that exist on the fringes of communities, especially those of intersectional identity and outliers within highly homogenous places (e.g. the only White person in a wholly Asian town). These groups or individuals contain valuable and unique input, yet they may be so small that it is not practically possible to include them within a sample through standard recruitment approaches, so creative thinking is necessary in future studies to attempt to capture the input of such groups or individuals. To further establish the validity of this research there is also a need to repeat the methodology across varying different locations within the UK and Japan, but also across the world to further test the robustness of the thematic map – if similar narratives arise elsewhere. Ultimately, this map is a flexible tool that will look different and change depending on input from the varying communities being studied – it is context-specific. It is not a strict guide and is therefore adaptable to accommodate the unique requirements of risk communication crafting processes, helping to strengthen the existing system.

CRediT authorship contribution statement

Maciej Pawlik: Visualization, Project administration, Methodology, Investigation, Formal analysis, Conceptualization, Writing – original draft, Writing – review & editing. **Kaori Kitagawa:** Conceptualization, Investigation, Methodology, Resources, Supervision, Writing – review & editing. **Hideyuki Shiroshita:** Conceptualization, Funding acquisition, Investigation, Methodology, Resources, Supervision, Validation, Writing – review & editing. **Ravindra Jayaratne:** Conceptualization,

Funding acquisition, Investigation, Project administration, Resources, Supervision, Writing – review & editing. **Soma Nomoto:** Conceptualization, Investigation, Project administration, Resources, Software. **Yoshihiro Okumura:** Funding acquisition, Resources. **Kazuhiro Kono:** Funding acquisition, Resources.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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