

A Smart Guide to Flood Risk Communication



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Photos courtesy of: GCU staff

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Definitions

The aim of flood risk communication is to help people understand their flood risk and so ensure they stay safe and protect themselves and their property. Therefore, this report defines flood risk communication as *increasing an individual's awareness and understanding of their own flood risk to empower them to act*. This document and its associated diagrams are referring to *good weather communications* only. It does not directly explore flood warnings, nor recovery communication. The report is *not* referring to flood risk communication when there is an immediate flood threat, the area is currently being flooded, or a flood event has occurred in the immediate past.

Introduction

Research evidence shows that effectively communicating flood risk in good weather to raise awareness and motivate people to act is very complicated. Raising awareness of flood risk by *only* communicating flood risk and its likelihood does not lead to action. In fact, evidence shows communicating risk and likelihood alone can be counterproductive, and unintentionally *lower* both flood risk perceptions and people's motivation to act. Therefore, future flood risk communication must be mindful of potentially unintended consequences if it is to be effective. Selecting methods and approaches appropriate to the communication's specific aims and objectives is critical to ensure people do not ignore, deny, or misinterpret communications.

This report and its associated diagrams summarise what we found in our recent research study, reported in detail in the [CREW](#) publication *Effective future communication of flood risk in Scotland* (Henderson et al., 2022). The data collected during that study included research evidence from a Rapid Evidence Assessment (REA) conducted in July 2020, which reviewed nearly 3000 academic papers and over 300 other publications. The REA was supplemented in 2021 by 22 stakeholder interviews and 2 workshops involving 17 technical and non-technical participants.

This short summary report complements the [SEPA](#) Flood Risk Management Plans and is designed to be used in conjunction with SEPA data and products, including the National Flood Risk Assessment, maps, rainfall, river and tidal data, relevant strategies, guidance and website information support. This report explains the background behind the associated 10 communication diagrams. Diagrams 1 to 6 present general guidance for the practitioner/communicator. Diagrams A to D are examples of the application of the 6 guidance diagrams to a hypothetical flood risk communication activity. These diagrams aim to support community organisations, local authorities, regional and national organisations to access the academic research findings from the main study. The following sections summarise the research evidence presented in Diagrams 1 to 6. The sheets and associated evidence are organised under the following structured objectives, supporting the communicator to consider:

- **Why** the communication is necessary and what is to be achieved e.g. to raise awareness; change behaviour; increase resilience etc. (Diagram 1);
- **Who** the communication is intended for, including things to consider about the background of the target participants, and which gatekeepers (i.e. key community contacts who already engage with multiple individuals/groups) could support engagement and dissemination (Diagram 2);
- **Where** the target place and associated social networks might impact on communication attempts (Diagram 3);
- **What** risk perceptions the communication is addressing, and issues to consider around communicating their probability and uncertainty (Diagram 4);
- **How** best to communicate that risk effectively, through examples of approaches to flood risk communication practitioners may use already or wish to explore, and the evidence of their effectiveness (Diagram 5);
- **When** the communication might be most effective (Diagram 6).

Explaining the six guidance sheets

1 Why communicate? The aim of the communication

Aim: To support flood risk communication practitioners as they establish the need for the communication and what objectives they intend to achieve (Diagram 1).

Objectives:

- Determine what the communication should achieve;
- Establish whether a response is required i.e. whether a one-way and/or a two-way communication approach would be appropriate;
- Highlight pros and cons for one-way and two-way approaches to enable the communicator to determine the level of budget and skilled resource they will require to achieve their aim(s);
- Give some examples of each approach.

1.1 The research behind this diagram

Research evidence source - Main Report Sections 2.1; 2.2.10; 2.2.11; Section 3.

The purposes of any flood risk communication can be broadly grouped into either *one-way* or *two-way* communication. This helps define the best communication methods for the aims of the flood risk communication. *One-way* communication sends information out to participants with no response expected from the recipients. It can be effective to some degree in raising awareness; sharing facts/information; and in issuing immediate warnings. However, it has had little success in influencing attitudes, preparedness and/or behaviour. *One-way* communication requires less resources than *two-way* communication, but it can run the risk of undermining engagement and encouraging the development of coping strategies which ignore, dismiss or deny the risk.

Research evidence shows *two-way* communication in the form of participatory approaches are best practice when developing effective flood risk communication. *Two-way* communication approaches encourage engagement and feedback from the individual to the communicator, and

have been found to be more effective at both raising flood awareness and supporting preparedness. However, *two-way* communication can be expensive, and those participating are often 'self-selecting' individuals and/or gatekeepers who are already engaged or interested in their flood risk. To reflect further on the diversity and needs of *who* the communication is targeting, see Diagram 2.

2 Who the communication is targeting

Aim: To support flood risk communication practitioners as they determine the characteristics of the groups and individuals they need to reach (Diagram 2).

Objectives:

- Demonstrate the diversity of the needs and interests of the potential participants;
- Highlight characteristics to consider when engaging and communicating with *Community* participants (i.e. non-technical groups including the public and non-flood specialists);
- Highlight aspects to consider when engaging with a *Technical* audience, including specialisms, terminologies, resources and responsibilities (i.e. flood risk and flood-related professional specialists);
- Encourage communicators to determine and partner with other organisations delivering ongoing communications and activities to the target participants;
- Connect with gatekeepers across the third, public and private sectors to communicate flood risk effectively and consistently across time and place.

2.1 The research behind this diagram

Main report Sections 2.1; 2.2; 2.2.1; 2.2.8; 2.2.9; 2.2.11

The Scottish public have a highly diverse range of education, income, housing, vulnerabilities, cultures, languages, and capabilities. While technical audiences are part of the public, they also have additional professional knowledge, language, specialisms etc. which make it essential to consider them as an additional separate target group in flood risk communication.

2.1.1. Community (non-technical) participants

Research evidence shows that if the information being communicated is regarded by someone as alarming, difficult to achieve, or unaffordable, individuals are less likely to engage with that communication in future (see also Diagram 4). Therefore, when communicating flood risk, raising awareness alone is not enough to empower everyone to act. In fact, flood risk communications may even be counterproductive, inadvertently encouraging individuals to adopt a strategy for coping that *denies* the risk and discredits the science or the source. Using two-way communication (see Diagram 1) can mitigate this by engaging people in conversations, listening to concerns, and supporting them in their current circumstances. Such engagement is particularly important amongst the socially vulnerable, often the hardest-to-reach with flood risk communication. Socially vulnerable groups include those on low incomes, ethnic minorities, older people, and those with long term health conditions.

The *Scottish Index of Multiple Deprivation (SIMD)* provides a detailed profile of social vulnerabilities in any given area, ranking income, employment, education, health, housing, crime and geographic accessibility relative to all other Scottish neighbourhoods. It also indicates the number of people living in the area, how many are of working age, as well as indicating hyperlocal income and employment deprivation. It does not give figures for age, gender, ethnicities, disabilities and long-term conditions, or household type. Understanding that additional background is essential to effective flood risk communication.

Age: Almost a fifth of Scottish people are over 65. Older people have highly variable capabilities. This variability is reflected in their individual ability to access and respond to flood risk communication. Older people's capacities and functioning inevitably decline over time, increasing their vulnerability to flood risk whilst reducing their capacity to act, so communication must be recurrent and sustained.

Gender: Women tend to perceive their flood risk as higher than men do, but also feel less able to implement measures to protect themselves than men. Women are also more likely to head single-parent households and to live in poverty with their children. Further, women are increasingly living alone - almost half a million women live alone in Scotland and this is increasing amongst older women. These factors all impact on women's ability to access and respond to flood risk communication.

Minority ethnic groups: There is a disproportionately higher representation of people from ethnic minorities living in poverty in Scotland. Some may face language and cultural barriers to accessing and acting on flood risk communication, compounding the effects of poverty.

Disabilities and long-term conditions: People with disabilities and long-term conditions are also more likely to live in poverty, and they may have additional communication needs which have to be considered when designing flood risk communication.

Household type: Almost half of all Scottish households (46%) are one adult homes. Over a third of Scottish households live in rented accommodation. For those in Housing Associations, the Association can act as a conduit for flood risk communication with tenants. Renters with private landlords (approx. 14% of properties in Scotland) may be more difficult to engage, however, due to their transient accommodation and ambiguity over flood responsibilities in that sector.

2.1.2. Technical participants

Differences across disciplines, terminologies and approaches between and even within Scottish institutions and organisations involved in flood risk communication were uncovered during our research. Understanding these differences is essential to communicating effectively across local authorities, private and public sector organisations. Our research study mapped the partnerships mentioned by the first 17 interviewees, all professional technical individuals working for organisations directly or indirectly engaged in flood risk communication. These 17 participants listed over 80 partnered organisations. Given the small sample size, it is likely that this represents only a snapshot of the real number of organisations in the wider flood risk communication network in Scotland. Many of the individuals within these organisations are in reality non-technical participants in flood risk communications, as there is a vast range of expertise and roles within most of these stakeholder organisations. Even amongst those who are technical specialists (i.e. flood risk and flood-related professionals), their knowledge, expertise and understanding of flood risk communication was found to be variable. *Organisations and Specialisms* in Diagram 2 relate to these very different organisational and specialist focuses amongst the technical participants in flood risk communication in Scotland.

Our study also found significant differences in *language and terminologies* amongst the technical specialists we interviewed. The participants themselves highlighted inconsistencies in terminology across technical disciplines and in policy language. For example, they explained how return periods were applied differently by engineering, hydrology and insurance specialists.

To ensure flood risk communication is effective, avoid duplication, and make messaging accurate and consistent,

all organisations should understand each other's *roles and responsibilities*. Further, our study found that technical specialists were not necessarily equipped with the professional skills and confidence to deliver two-way communication initiatives, and hence professional facilitation of flood risk communication is advised to ensure its effectiveness.

2.1.3. Work with potential gatekeepers

Our research found encouraging levels of partnership amongst organisations from every sector involved in flood risk communication in Scotland. This partnership network will continue to grow and strengthen, particularly in local areas, through organisations engaging with others. Such wider engagement will facilitate greater access to diverse technical and non-technical participants, including harder-to-reach groups.

3 Place and social networks: Where flood communication happens

Aim: To support flood risk communication practitioners by identifying the facilitators and challenges to communicating in *Place*, and the impacts of local social networks (Diagram 3).

Objectives:

- Raise awareness of rural and urban differences;
- Examine the facilitators and barriers to engagement in rural and urban places;
- Understand the importance of locally shared learning and shared resources in shaping reactions to flood risk communication;
- Determine positives and challenging aspects to engaging social networks with flood risk communication.

3.1 The research behind this diagram

Main report Sections 2.2.3; 2.2.4; 2.2.7

Local people understand their local environment intimately as a result of their daily lived experiences, and may therefore have a more nuanced local knowledge than regional and national organisations. For example, our research evidence suggested that place-based community expertise can contribute to more accurate and effective mapping of flood risk through collaborative community

exercises. By engaging local people in developing their own flood risk communication tools in participatory ways, the relevancy of flood risk communications and personal responsibility for action can be increased.

3.1.1. Place

Personal flood risk resilience (i.e. an individual's confidence in themselves and their resources, their capacity to cope and their belief in the effectiveness of the measures they use) is unequally distributed amongst different groups within every community. Rural places have been found to have greater knowledge and understanding of flood risk than urban communities, though some urban communities have heightened awareness of flood risk due to their proximity to rivers and coastlines. In rural areas, livelihood dependency (i.e. making a living from the local land) and the tendency of individuals to be employed in multiple part-time occupations gives rural communities alternative perspectives on local problems. This engagement with the environment can be very positive, but can also generate place-based social norms and values that prioritise local livelihood sources and local shared knowledge, including myths and the mistrust of authority, to the detriment of mitigation and adaptation initiatives.

Rural absentee owners of holiday accommodation, tourists, and short-term tenants (e.g. city workers; students; the homeless) also present a challenge to community flood resilience in place. Such residents are often less integrated in local social networks and can be constrained in what protective actions they can take in response to flood risk communication, leaving them unable to be empowered to take action.

3.1.2. Social networks and shared social learning

To be effective, flood risk communication must come from trusted sources. Evidence shows that local social networks of neighbours, friends and families, and the social capital such networks hold, play an important role in influencing the flood risk preparedness behaviours of individuals. Shared local learning from social networks is an important tool for effective flood risk communication as it can influence an individual's belief that they can cope with their flood risk. Sharing responsibility for flood risk can help reduce the negative impacts of social vulnerabilities. It can also enhance feelings of solidarity amongst the community, framing the experience of working together to engage with flood risk as positive, supportive and unifying.

However, while social networks can contribute positively to people's coping beliefs, they can also reduce our risk perception if we externalise responsibility for flood risk action to our surrounding social network. Similarly, while strong social networks can offer beneficial resources like volunteers and local leadership, local social networks can also form selective groups or cliques that exclude others, share the mistrust of authorities, and be conduits for inaccurate advice.

4 What you are communicating: Risk perception, probability and uncertainty

Aim: To support practitioners' awareness of what impact flood risk perception has on understanding of, and engagement with, flood risk communications, highlighting facilitators and challenges in communicating probability and uncertainty effectively (Diagram 4).

Objectives:

- Raise awareness of the psychology of flood risk perception and what motivates individuals to engage or disengage with communication, including how it impacts on their intention to act;
- Highlight the facilitators and barriers to understanding communications about probability;
- Explain how uncertainty can be communicated more effectively.

4.1 The research behind this diagram

Main report Sections 2.1; 3; 3.1; 3.2

People will interpret the same flood risk communication differently because flood risk perception is highly personal and subjective. When a person perceives a risk is not only relevant to them but also requires them to respond, that individual must also have three other critical components in place to motivate them to act, namely 1) the confidence they can cope; 2) the belief the measures they implement will work; and 3) the belief that they can afford the costs of those measures (e.g. time, effort, money). These components are interwoven with complex networks of thoughts and responses that generate (or not) the motivation to act in response to flood risk communications. If the participant perceives the risk to

them as very low, and/or they can't afford the costs a response would require, and/or they have low confidence in their ability to cope, and/or they have a low belief in the effectiveness of any response they make, then the individual may not be motivated to act.

Flood risk communication must therefore be perceived to be relevant. It must reassure individuals they can cope. And it must give the participant confidence that responses will be affordable, appropriate and achievable. Failing to offer this reassurance risks the participants' denying the relevance of it, externalising the responsibility for action to others, or believing nothing they do can affect the outcome.

4.1.1. Probability

Communicating *probability* is complex. Individuals strive for predictability, and most cannot understand that behaviours like keeping the same numbers in the National Lottery gives you the same chance of winning as playing the same numbers that won the week before. Probability is an inherently difficult concept for non-technical and even many technical participants to understand. Hence, communicating probabilities using return periods (e.g. 1-in-100 years) has supported a common misunderstanding that another flood of similar magnitude will not occur again within that time period, or that a flood is 'due' if a return period has elapsed flood-free. Our evidence supports using other ways of communicating probability to avoid misunderstandings and recommends that return periods are not used. Instead, alternative methods like focusing on magnitude rather than probability/likelihood could be effective.

4.1.2. Uncertainty

Uncertainty can impact negatively on people's motivation to act in a number of ways, including by discrediting the accuracy of projections; reducing the clarity of the message; generating a perception of evasiveness and/or ambiguity in the science; and delaying policy responses to flood risk. Research evidence suggests that there are several ways to influence people's acceptance of uncertainty, including highlighting the positives; making it relevant by relating it to human experience rather than relying on scientific data; and approaching uncertainty through dialogue as part of a conversation to address people's concerns. Somewhat counterintuitively, caveats and limitations given as part of scientific communication have also been found to increase perceptions of the trustworthiness of journalists and scientists.

5 How to communicate: Tools, approaches and information

Aim: To support flood risk communication practitioners by exploring a range of communication tools and approaches, including a summary of the research evidence on their effectiveness (Diagram 5).

Objectives:

- Present different flood risk communication tools and approaches;
- Summarise the research evidence on their effectiveness;
- Give a range of examples of how these approaches can be used to engage the public.

5.1 The research behind this diagram

Main report Sections 2.2.4; 2.2.8; 2.2.10; 3.3.1-3.3.

Flood risk communications should be positively framed and encourage collective action to enhance community resilience and so promote an empowering shared social identity of preparedness. Where possible, flood risk communications should be developed locally in collaboration with the 'at-risk' community to maximise their effectiveness.

5.1.1. Dynamic maps and 3D visualisations

Dynamic maps and 3D visualisations can be effective flood risk communication tools when based on robust data with accompanying clear guidance and explanations of limitations. They can be made more effective in future by co-designing with target users, and by inviting participants to work with the tools in supportive facilitated sessions.

5.1.2. Broadcast and print media

Broadcast and print media are effective mediums for flood risk communication, and present opportunities to build a positive narrative within Scottish flood risk communication through showcasing effective adaptation and other solutions. The use of multiple types of broadcast and print media when communicating flood risk information can increase their reach. Sensationalist reporting should be avoided to minimise negative reactions.

5.1.3. Sustainable flood memories

Community-based approaches creating sustainable flood memories show potential for effective flood risk communication, as preliminary evidence suggests that such methods (e.g. digital storytelling, flood walks, imagery like marks on buildings and other community-generated artefacts) can build archives of historic flood experience which encourage shared local learning, including demonstrating protective solutions and adaptations that can be used in future floods events. Once created, these archives are useful tools for other non-flooded communities who may be facing flood risk in future.

5.1.4. Serious games

Serious games have the potential to be effective flood risk communication tools, but this approach has yet to be systematically evaluated to determine its impact. Small studies suggest it is capable of increasing players' understanding of their own flood risk, and can give players insight into the complexity of flood risk decision-making faced by professional stakeholders. Serious games have also been shown to increase players' insight into flood dynamics.

5.1.5. Websites and apps

Websites and apps are limited to the digitally literate and hence may have limited effectiveness as stand-alone flood risk communication tools. Their effectiveness can be uncertain as evaluations of their performance often focus on usage data rather than on their impact. They can usefully complement and support other flood risk communication approaches, however, and facilitated sessions can assist those who struggle with digital literacy.

5.1.6. Social media

Social media is limited in its effectiveness as a communication tool as it only targets users of that platform and so should only be used alongside other approaches when communicating with technical and non-technical audiences. However, community-led social media like Facebook pages, Twitter and Instagram accounts do engage with some local people, and have value as one of several digital and non-digital communication approaches.

5.1.7. Participatory approaches

Maladaptive coping strategies like externalisation can be overcome, in part at least, through skilled community

engagement, and overcoming these maladaptive strategies will in turn facilitate shared responsibility. Training skilled facilitators to nurture participatory processes in flood risk communication may be more effective than the common current practice of relying upon flood risk specialists to engage communities. Expertly-facilitated participatory approaches may increase the likelihood of individuals acting positively and appropriately in response to flood risk communications.

Consistent flood risk communication messaging on shared responsibility from policymakers to practitioners is important, and professionals and communities should consider coming together to share their perspectives during the co-designing of flood risk communications in participatory ways. As well as appreciating each other's perspectives, this approach also facilitates the identification of different risks across different groups and locations, enhancing relevance and message accuracy. Examples of participatory approaches include arts-based co-creation of flood risk-related artefacts, mapping flood walks to share lived experiences, and citizen science initiatives to engage communities with technical audiences.

6 When to engage in 'good weather' flood risk communication: A checklist

Aim: To support flood risk communication practitioners by highlighting when communication is less likely to succeed (Diagram 6).

Objective:

- Present a checklist of different environmental considerations when deciding dissemination timings for flood risk communication tools and approaches.

6.1 The research behind this diagram

The limited space in the main report prevented a detailed consideration of *when* the most appropriate time was to engage the public during windows of good weather. Reanalysis of the qualitative data and literature emphasised the importance of these good weather communications in preparing the public to act during flood events (Interi et al., 2020). However, the literature also showed that such good weather communication must be repeated and sustained, as the impact of one-off

national campaigns diminish over time (O'Sullivan et al., 2012). Importantly, there is no 'perfect' time for everyone as no 'one-size-fits-all' (Orr et al., 2015). For example, it might be sensible to avoid school holidays, but that may not prevent some groups of people from engaging and might enable others to come who couldn't during term-time. The timing and frequency of communications should therefore be decided collaboratively and take into account the needs of the communicators, the needs of the participants, and any other concurrent external events involving the target groups.

Our stakeholder research found that communities take different times to recover from a flood event, as explained in the [CREW](#) report on [long-term impacts of flooding](#), and therefore will take different times to be ready to engage with 'good weather' flood risk communication. Issues with the timing and frequency of flood warnings (perceived 'false' alarms) can disengage individuals (Geddes et al., 2017) from all flood risk communication, leading to 'good weather' flood risk communication being ignored, too.

When to communicate flood risk can be further complicated by other urgent messaging dominating public discourse. Communications that engage individuals in reacting to multiple crises are prevalent today, such as the pandemic and ways to mitigate the imminent large rise in household fuel bills. Therefore, strategic, national, regional and local approaches must be coherent and cognizant not only of each other, but also of the competing pressures on the individual if they are to ensure that individuals engage with relevant flood risk communication in the coming decades.

The nature of that communication is also important. Public consultations, for example, should be performed when the institution can quickly follow-up with action, or communities and other stakeholders are at risk from disengaging from the flood risk communication process (Loroño-Leturiondo et al., 2019). Furthermore, the evolving climate emergency means flood risk is changing and projections are constantly evolving. Today's projections may be out-of-date tomorrow. This can particularly impact groups like new home owners, who may assume they will never be at risk due to the detailed knowledge available to planners when their homes were built.

Our evidence suggests that while there may be no 'perfect' time to engage people in understanding their flood risk and actions they should take, there are clearly less effective times. The most effective approach to establishing when technical and non-technical target groups should be engaged in flood risk communications can only be defined by asking those participants.

7 Case study examples

To demonstrate the effectiveness of Diagrams 1 to 6 and to highlight the range of communication types they support, the research team used them to develop four hypothetical case study examples. This was achieved by applying the Diagrams to a range of communication needs which were grouped under either Communication Methods (Diagrams A and B) or Target Participants (Diagrams C and D). The aims of these case studies are described in the following subsections.

7.1 Communication methods case studies

7.1.1 Co-creating flood risk communication: developing a new website (Diagram A)

The hypothetical case study in Diagram A plans the development of a localised flood risk communication tool to create a sustainable communication method that raises awareness of flood risk and support available.

7.1.2 Co-creating a digital archive (Diagram B)

The hypothetical case study in Diagram B aims to capture the communities' lived experience of a flood event in a flood archive, and use this communication tool to raise flood risk awareness amongst technical and non-technical audiences.

7.2 Target Participants

7.2.1 Raising flood risk awareness amongst older people (Diagram C)

The hypothetical case study in Diagram C aims to engage local vulnerable older people in interactive events to raise awareness of flood risk communications and support them to engage in managing their preparedness.

7.2.2 Co-creating a new flood risk communication strategy for Scotland (Diagram D)

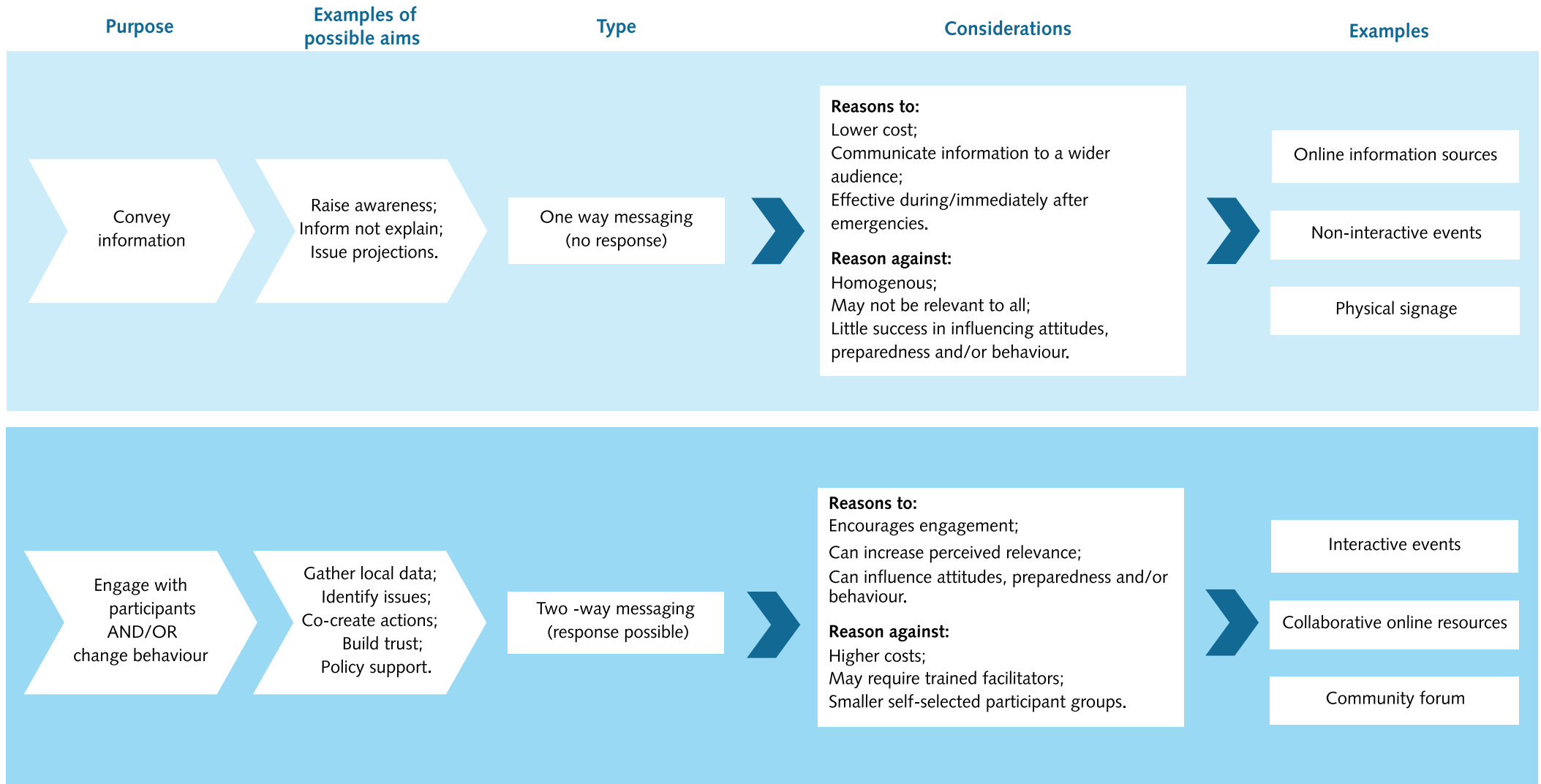
The hypothetical case study in Diagram D draws together technical participants from a range of organisations to collaborate on the co-creation of a new communication strategy for flood risk in Scotland which aims to support roles, responsibilities, information sources and ensure credible and consistent messaging.

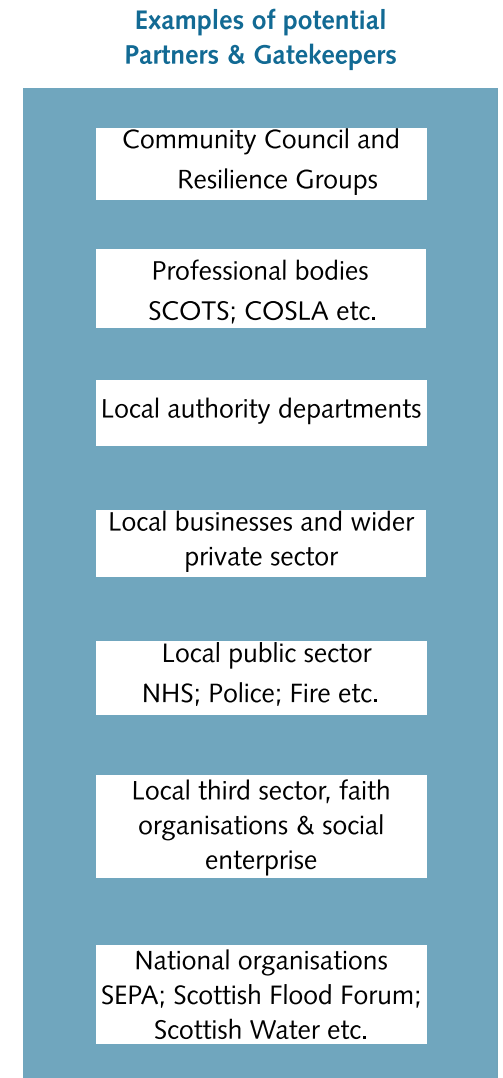
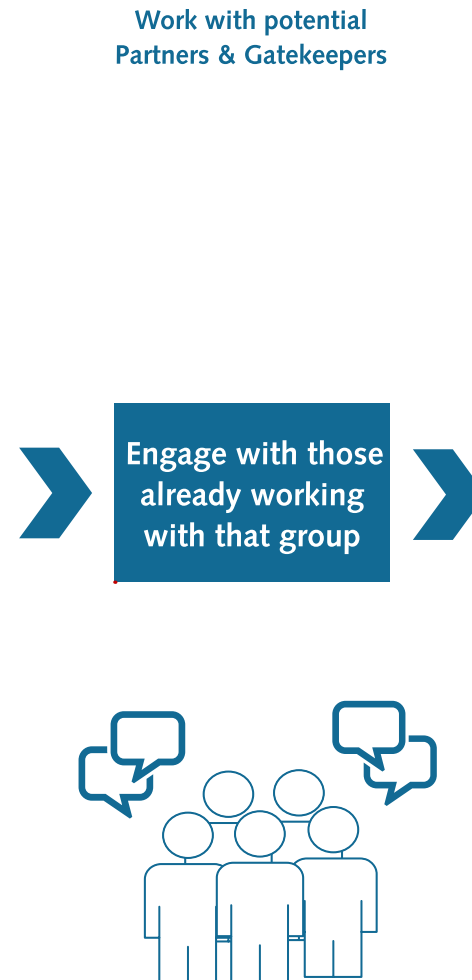
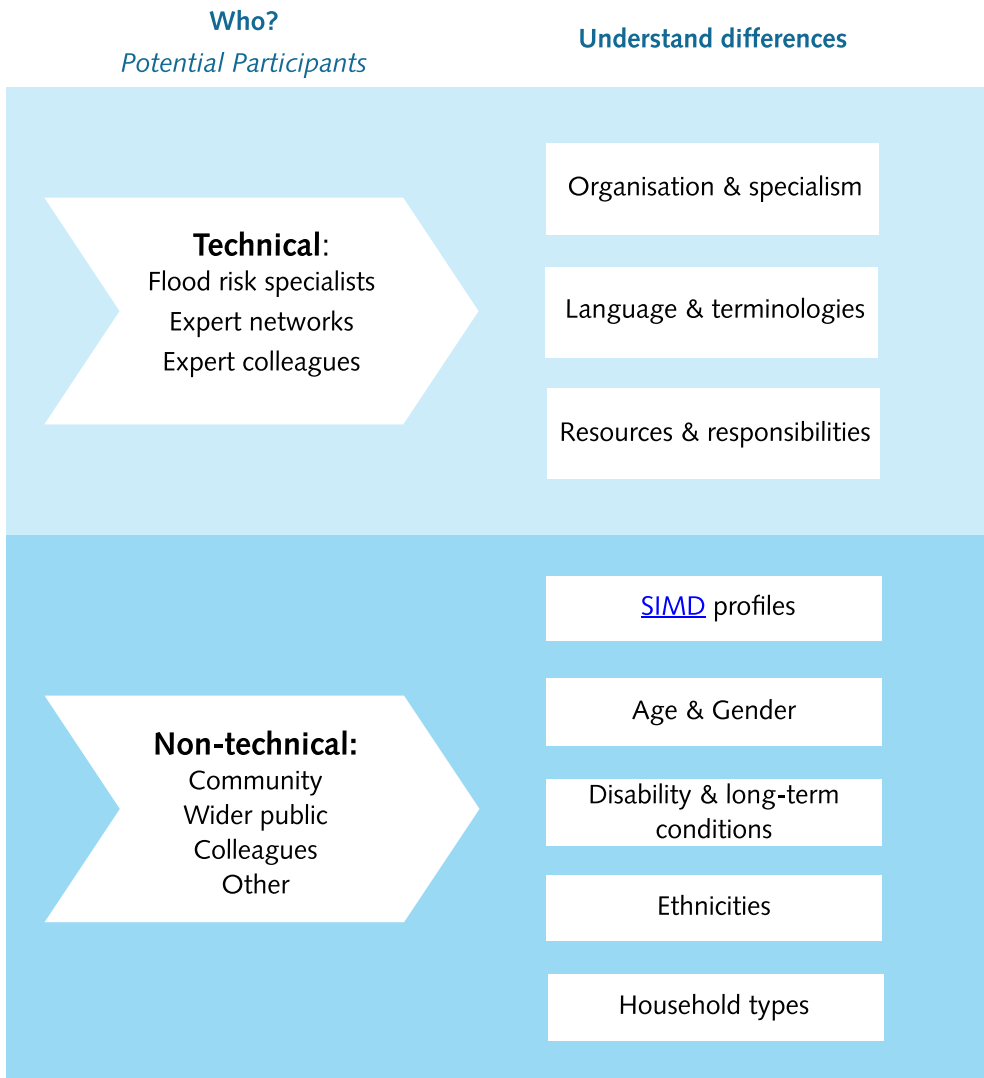
References

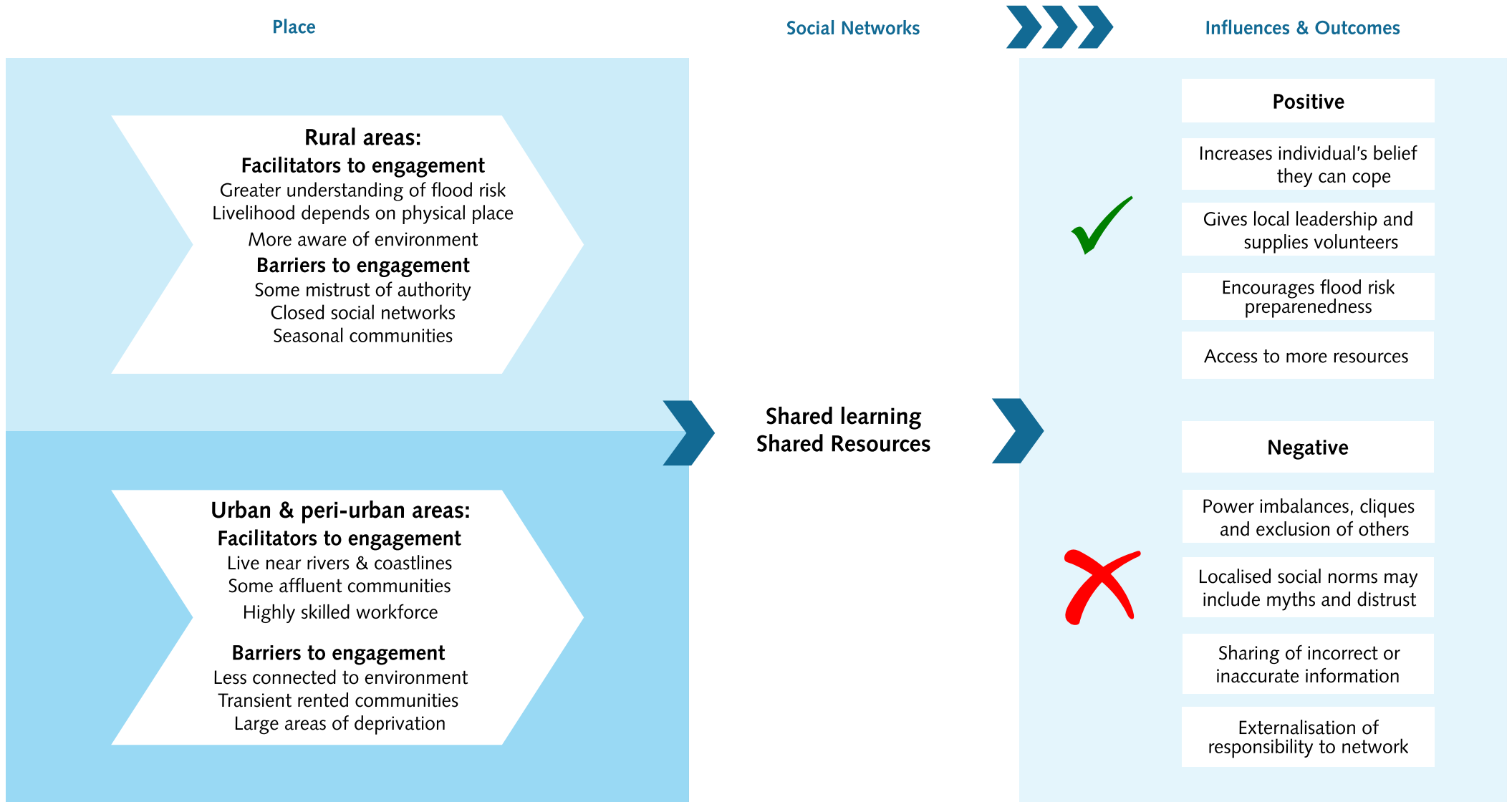
- Geddes, A., Cranston, M., Ambler, A. and Black, A. R. (2017) Assessing the effectiveness of Scotland's public flood warning service: Full report CRW2016_12. [Available online crew.ac.uk/publications](http://www.crew.ac.uk/publications)
- Intrieri, E., Dotta, G., Fontanelli, K., Bianchini, C., Bardi, F., Campatelli, F., & Casagli, N. (2020). Operational framework for flood risk communication. *International journal of disaster risk reduction*, 46, 101510.
- Loroño-Leturiondo, M., O'Hare, P., Cook, S. J., Hoon, S. R., & Illingworth, S. (2019). Building bridges between experts and the public: a comparison of two-way communication formats for flooding and air pollution risk. *Geoscience Communication*, 2(1), 39-53.
- Orr, P., Forrest, S., Brooks, K., & Twigger-Ross, C. (2015). Public dialogues on flood risk communication: Literature review. Environment Agency, Bristol.
- O'Sullivan, J. J., R. A. Bradford, M. Bonaiuto, S. De Dominicis, P. Rotko, J. Aaltonen, K. Waylen, and S. J. Langan. (2012). Enhancing flood resilience through improved risk communications." *Natural Hazards and Earth System Sciences*, 12, no. 7 pp.2271-2282.

Why communicate? The aim of the communication

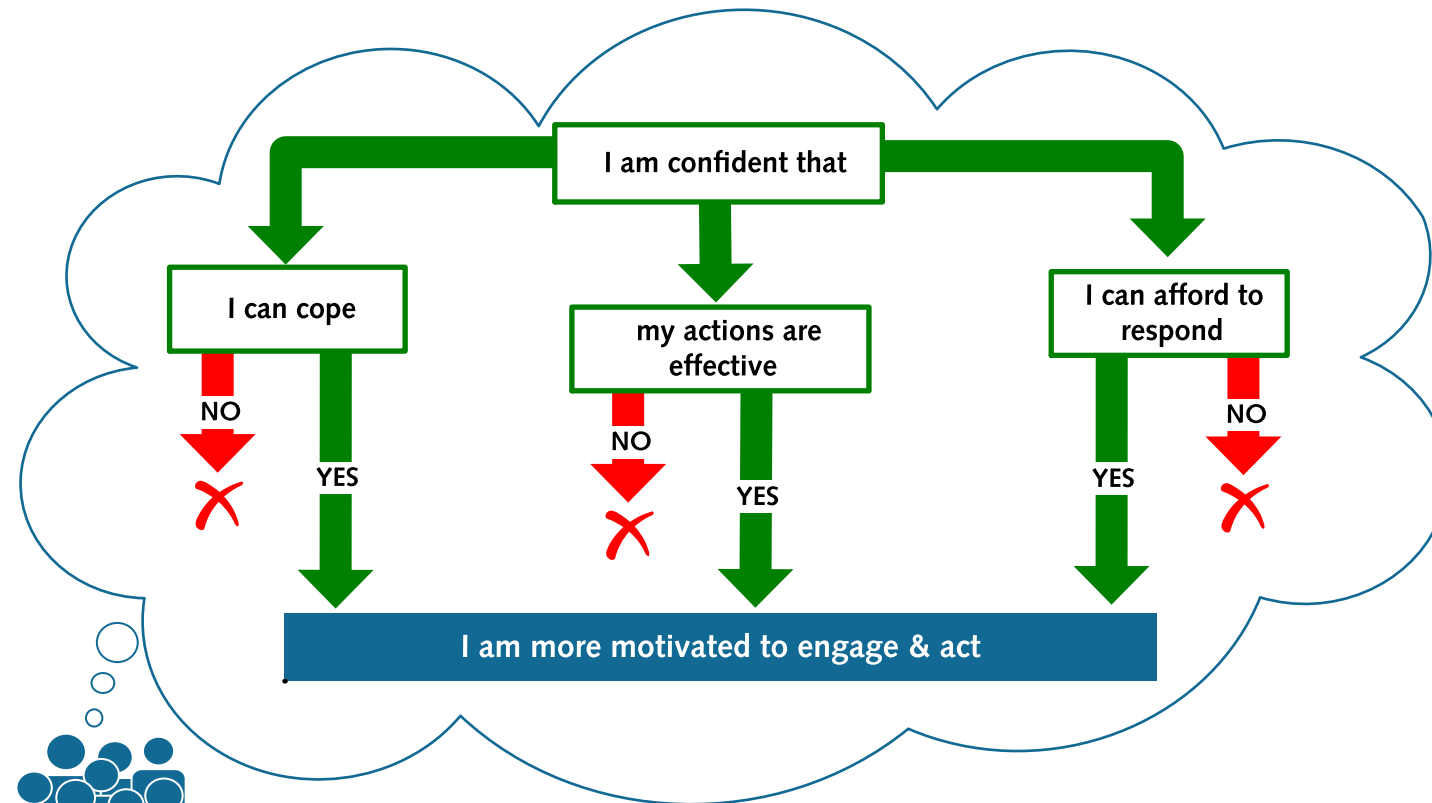
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Flood risk communications should suggest and support actions



Engage in dialogue with your participants. Ask:

- Are they confident they can cope?
- Feel sure actions they may take are effective?
- Can they afford to respond to your communication?

Consider probability and uncertainty

Probability

Do

- Use terms like 'when' not 'if' where appropriate
- Consider magnitude
- Address confusion

Don't

- Use return periods
- Only use numbers, try to add a narrative
- Assume participants understand

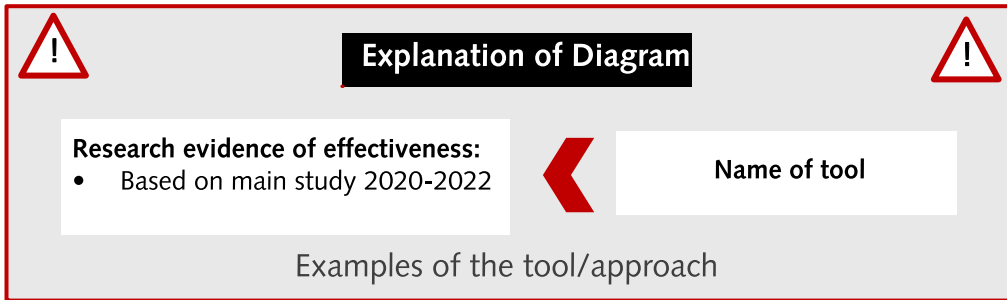
Uncertainty

Highlight positives

- Use terms like 'when' not 'if' where appropriate
- Relate relevancy to lived experience
- Start a dialogue addressing concerns

Avoid negatives

- Perceived evasiveness
- Ambiguities in science
- Reasons to delay response



Effective when:

- Based on robust data
- Clear supporting guidance
- Can be used to co-design communication



Dynamic mapping and 3D visualisations

Dynamic Coast

UN Flood Mapping Tool

SEPA flood maps

Mixed evidence:

- Effective for users who access it
- Shares examples of good practice
- Sensationalism creates fear



Broadcast and print media

Radio

Television

Newspapers

Needs more evaluation but may:

- Support shared local learning
- Share solutions and adaptations
- Build community networks

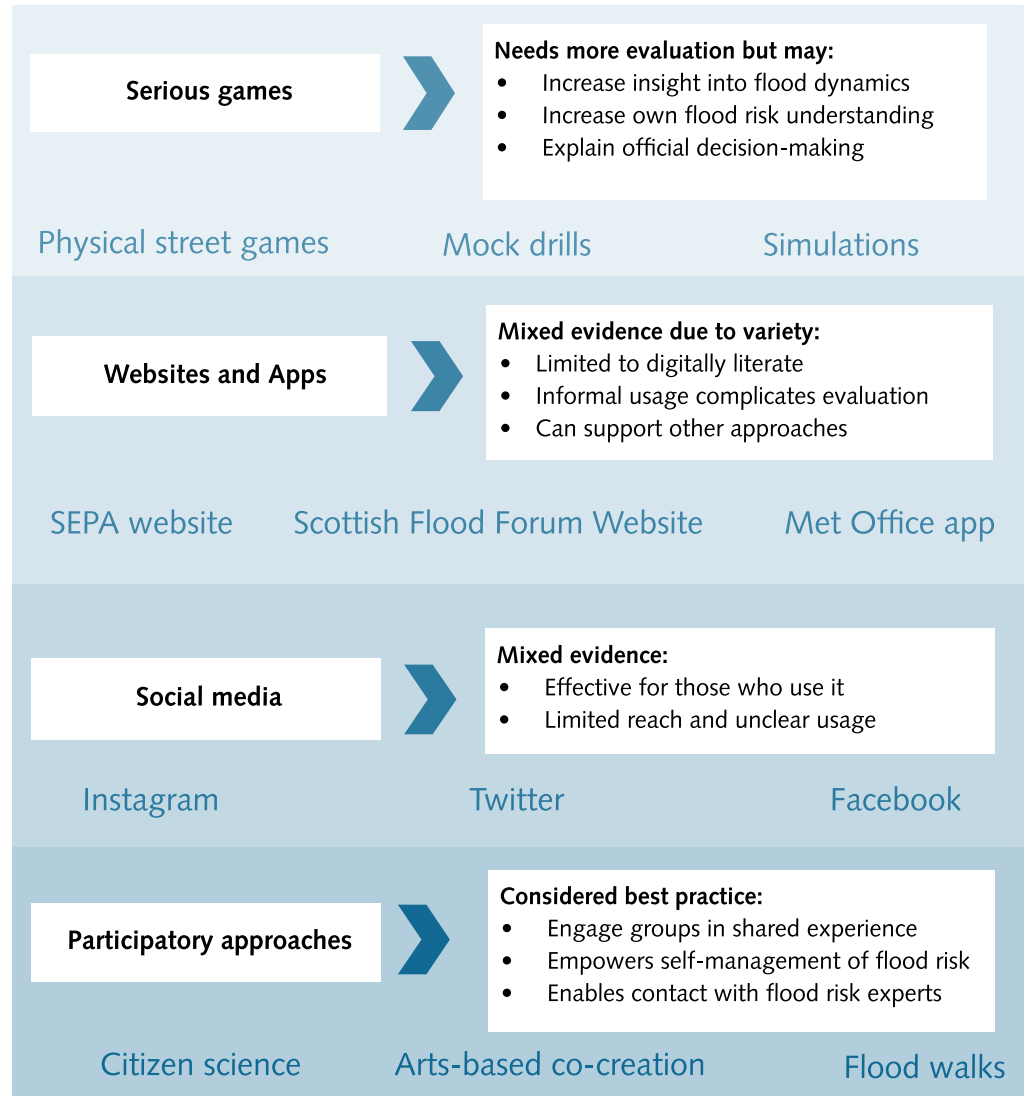


Sustainable flood memories

Flood heights on buildings

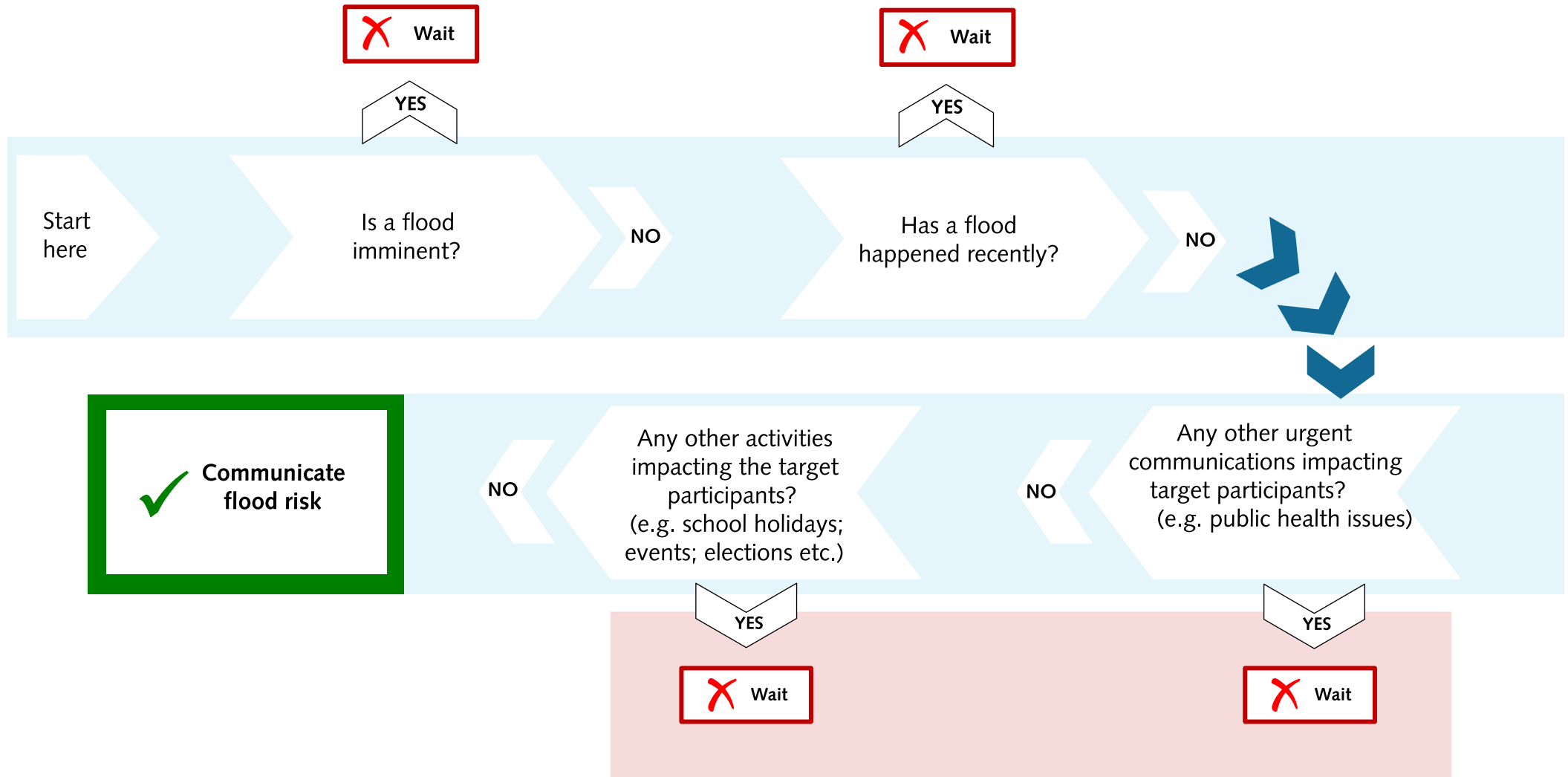
Photographs

Digital storytelling



When to engage in 'good weather' flood risk communication: A checklist

6



Methods Case Study: Co-creating flood risk communication: Developing a new website

A

Purpose: Why communicate?

Why: A budget has been allocated to create a localised flood risk communication tool to raise awareness of flood risk and support available. It has long-term maintenance costs and a custodian organisation in place.

One-way tool: *Raise Awareness.*

Reasons for website: Low long-term costs (limited sustained budget); has to be accessible to wide audience

Two-way co-creation: Engage local communities in the design.

Reasons to create it collectively: Large creation budget; increases awareness of tool; engages local language and history for authenticity; encourages preparedness amongst participating community members; creates new social networks; develops knowledgeable resident gatekeepers.

Who are you targeting?

Target audience of the website: *Everyone (adults and older children) who is digitally literate, lives in the communities/region covered, and has access to the internet.*

Gaps: Those who do not have access to the internet; digitally illiterate; those who do not see adverts for it.

Target participants for co-creation:

- Community groups; Community Councils; Chamber of Commerce; Local authorities; Third sector organisations;
- Information providers including SEPA; Scottish Water; Transport Scotland; NHS;
- Funding agencies and website development experts.

Gaps: Marginal and hard-to-reach communities; those who do not see calls to participate.

Where are they? Place and networks

The communication approach: Online (website).

The communication creation process: Local places and accessible spaces in the affected communities/region(s) using existing social networks, both community-based and professional/technical, to engage participants.

What are you communicating?

- Easy to find links on what action to take and any support available;
- *Uncertainty* and limitations in the data will be clearly explained to all participants (technical & professional as well as community participants) and approaches for explaining this co-created for the website;
- *Probability* will be clearly explained and approaches for explaining this co-created for the website.

How will you communicate?

The communication approach: Online (website).

The communication creation process: Using mapping & visualisation tools for projection information and local flood knowledge gathered from shared local learning, flood memories, and artefacts (e.g. photos), the participants will co-create the website content, while technical consultants create the website architecture.

When will you engage?

- One year after significant floods in the region;
- During early autumn after the schools go back;
- Community co-creation workshops will run in evenings and weekends, with some daytime events for professional staff and older people;
- Building events into current programmes building community resilience.

Methods Case Study: Co-creating a digital archive

B

Purpose: Why communicate?

Why: A flood risk community has been given a small budget following another flood in the area with the aim of improving their flood risk awareness.

One-way tool: *Digital archive*

Reasons for archive: Low long-term costs (limited sustained budget); accessible to wide audience; highly locally relevant; built from lived experience so audience can identify with the content.

Two-way co-creation: Engage local communities in building the archive

Reasons to create it collectively: Archive is based on local flood history; learning from the past can encourage preparedness amongst participating community members; creates new social networks; builds community resilience; highlights gaps and future needs in the area.

Who are you targeting?

Target audience of the archive: *Everyone (adults and older children) who is digitally literate, lives in the community, and has access to the internet.*

Gaps: Those who do not have access to the internet; digitally illiterate; those who are unaware it has been created.

Target participants for co-creation:

- Community groups; Community Council; Chamber of Commerce; Local authority staff; Third sector organisations;
- Organisations who can provide historical information e.g. SEPA; Scottish Government;
- Funding agencies and website development experts.

Gaps: Marginal and hard-to-reach communities; those who do not see calls to participate.

Where are they? Place and networks

The communication tool: Online (website).

The communication creation process: Check existing community websites/Facebook groups; use posters with QR codes; local places and accessible spaces in the affected communities/region(s) using existing social networks, both community-based and professional/technical, to engage participants.

What are you communicating?

- Historical data will be presented to demonstrate the frequency of past flood events;
- Uncertainty around the probability of future events will be discussed with key technical stakeholders to build in the understanding of differences in magnitude, and explain uncertainty in future projections.

How will you communicate?

The communication tool: Online (website) archive of videos, audio interviews with local people, images, written accounts, news articles.

The communication creation process: The participants will interview local people, collect historical information and data; collate images, news reports and accounts, and photograph remaining evidence of floods (e.g. marks on walls; landslip scars). This data will be fed into the website architecture created by the website developers. Contribution of materials will be ongoing via a portal for the foreseeable future.

When will you engage?

- It will begin in late spring, after Easter, on the anniversary of the flood;
- It will be ongoing for the foreseeable future, with funding in place for the next 3 years at least;
- Community co-creation workshops will run in evenings and weekends, with some daytime events for older people;
- Creation events will be added into existing local programmes building community resilience.

Participants Case Study: Raising flood risk awareness amongst older people



Purpose: Why communicate?

Why: Older people have been identified as a disengaged and hard-to-reach socially vulnerable at-risk group residing in a flood-prone rural area by a local authority, who have allocated a small budget to addressing the issue.

Two-way communication: Engage local vulnerable older people in interactive events to raise awareness of flood risk communications and support them to engage in managing their preparedness.

Reasons for engagement: Budget sufficient to employ a facilitator; capture their lived experience to help inform preparedness support; increase awareness amongst the participants of their current and projected risks; highlight support available to the participants; create new supportive social networks.

Who are you targeting?

Target participants for co-creation:

- Socially vulnerable older people on low incomes;
- Older people who live in rural homes in the flood risk area;
- Hard-to-reach older people who are not currently engaged with any agency/organisation;
- Physically vulnerable older people who have limited functioning;
- Older people with limited social resources and few social contacts;
- Older people who live alone.

Gaps: Unknown, transient, or socially disconnected older residents; those who do not see/read/hear calls to participate.

Where are they? Place and networks

The communication approach: Face-to-face (e.g. home visits); by telephone; leaflets through doors; through key community contacts

The communication creation process: Local places and accessible spaces in the at-risk area, using the power of existing social networks and local organisations, retailers, and small businesses to identify and engage participants.

What are you communicating?

- *Uncertainty and probability* will be clearly explained to all participants, who will be encouraged to share their lived experiences and concerns;
- Support for action (adaptation and mitigation) will be explained;
- Participants will be equipped with effective responses appropriate to their own situation to enhance their confidence and ability to respond to their own flood risk.

How will you communicate?

- The events will include interactive sessions like storytelling and reminiscence of previous flood events in the area; role playing activities; training in understanding terms and tools for finding their own flood risk; social networking with other residents and business that can support them;
- The events will be incorporated in existing programmes like lunch clubs and events for older people to encourage participation;
- A train the trainer model will train local people to deliver the programme, ensuring it is sustainable and ongoing, both building resilience and enhancing the social capital of the community.

When will you engage?

- Months after the last flood in the region;
- During the day, starting mid-morning and not running later than mid-afternoon to encourage participants to attend;
- The participants will engage in a series of events happening regularly (every 3-6 months) that will remain ongoing to maintain their flood risk awareness.

Participant Case Study: Co-creating a new flood risk communication strategy for Scotland

D

Purpose: Why communicate?

Why: To increase the effectiveness of future flood risk communication in Scotland, a new communication strategy will be co-created to co-ordinate roles, responsibilities, information sources and ensure credible and consistent messaging, building future examples of good practice.

One-way communication: To raise awareness of strategy amongst partner agencies.

Two-way co-creation: Engage technical participants from a range of stakeholder agencies in its design.

Reasons to create it collectively: Ensure the strategy is effective and fit-for-purpose for all stakeholders; Get 'buy-in' from essential stakeholders and national organisations; engaging local communities and businesses encourages them to 'spread-the-word' about flood risk.

Who are you targeting?

Target audience of one-way communication: *The public (adults); Anyone involved in communicating flood risk; Everyone employed in the stakeholder organisations.*

Gaps: Those who do not have access to the internet; digitally illiterate; those who are unaware of the development and/or where to find the information.

Target participants for co-creation:

- Community groups; community councils; Chambers of Commerce; local authorities; third sector organisations; strategic national organisations including SEPA; Scottish Water; Transport Scotland; the NHS; the Scottish Government.

Gaps: Small and/or hard-to-reach organisations who do not have the resources to be involved; those who are unaware of the development; those with special needs who require specialist communication approaches.

Where are they? Place and networks

The communication approach: Face-to-face; online (websites and social media).

The communication strategy creation process: Existing collaborative events and meetings; bespoke workshops and away-days specifically to co-create.

What are you communicating?

- The aims and objectives of the strategy;
- Key messages differentiated for different technical and non-technical audiences;
- Measures to enhance capacity;
- Communication processes over short and long term timescales;
- The important role of the participants, how their actions will create impact;
- The responsibilities of their organisations and the investment in co-creating this strategy;
- *Uncertainty and probability* will be clearly explained to all participants to share a common definition.

How will you communicate?

One-way communication: Online (websites); news releases.

Two-way communication: Using workshops, conferences, seminars, meetings, public consultation to provide opportunities for sharing ideas and engaging the widest possible range of stakeholders in the co-creation of the strategy.

When will you engage?

- Across a reasonable time period (1-2 years) to facilitate the involvement of a range of organisations with competing business pressures at different times of the year.
- Taking advantage of existing meeting and collaborative mechanisms and tools, such as existing strategic groups and professional/technical meetings; professional conferences; existing collaborations.

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