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The **Associated Programme on Flood Management** (APFM) is a joint initiative of the World Meteorological Organization (WMO) and the Global Water Partnership (GWP).

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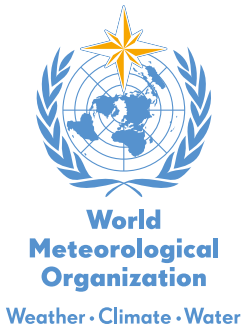

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To the reader

This publication is part of the *"Integrated Flood Management Tools Series"* being compiled by the Associated Programme on Flood Management. The *Role of the Media in Flood Management* Tool is based on available literature and draws on the findings from relevant works wherever possible.

This Tool addresses the needs of practitioners and allows them to easily access relevant guidance materials. The Tool is considered as a resource guide/material for practitioners and not an academic paper. References used are mostly available on the Internet and hyperlinks are provided in the *References* section.

This Tool is a *"living document"* and will be updated based on sharing of experiences with its readers. The Associated Programme on Flood Management encourages flood managers and related experts engaged in the evaluation and auditing of flood management programs around the globe to participate in the enrichment of the Tool. For this purpose, comments and other inputs are cordially invited. Authorship and contributions will be appropriately acknowledged. Please kindly submit your inputs to the following email address: apfm@wmo.int under Subject: *"The Role of the Media in Flood Management"*.

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1 INTRODUCTION

1.1 Communication, dissemination and mass media

1.1.1 Communication and dissemination: Definitions

1 **Communication** is the imparting or exchange of information between individuals or groups through a common system of symbols, signs or behaviour (Merriam-Webster, 2013a; Oxford Dictionaries, 2013). In recent decades, different conceptual models have been developed to explain the process of human communication. One of the best representations of the flow of information in flood communication is the Interactional Communication Model proposed by Schramm (Schramm, 1954). As shown in **Figure 1**, flood communication can be explained as a circular process, where the sender transmits a message to the receiver, who, after interpreting it, reacts giving feedback. In this two-way mechanism, the parties perform the actions of both encoding and decoding the message, thus overcoming the stiff distinction between active sender and the passive receiver and making the communication process interactive.

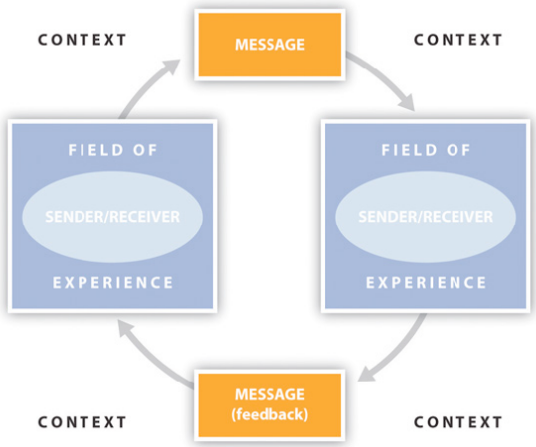

Figure 1 — Interactional Communication Model

2 **Dissemination** is the delivery of the message to the audience (Davidson and Wong, 2005). From a theoretical point of view, this word indicates the broadcast of the information without direct feedback from the public, implying the impossibility of verifying the correct understanding of the content by the recipient (Peters, 2005). Nevertheless, considering the importance of what is at stake, flood communication can be deemed has having been accomplished only after the message has been received and totally comprehended. It is therefore essential that a following-up system to check reception of the information be in place, especially for those regions and segments of the population that are difficult to reach and/or require special attention. Such a monitoring operation would make it possible not only to immediately identify and rectify likely shortcomings, but also to receive the audience's opinions and suggestions (Davidson and Alex, 2002).

1.1.2 Mass media: Definition and evolution

3 The concept of "mass media" can be easily understood by breaking the expression into its constituent parts. A medium (plural *media*) is a channel through which people send and receive information, while mass indicates that the audience is composed of a large group of people. Therefore, "mass media" refer to forms of communication designed to reach great numbers of recipients *(University of Canterbury, 2013; American Sociological Association, 2013).*

4 According to this definition, mass media present a central characteristic: they rely on one-to-many communication, that is, one sender (such as a newscaster, writer or director) transmits a message to multiple receivers simultaneously. This entails on the one hand a one-way flow of information, as the source does not receive a direct feedback from the public; on the other hand, the message needs to be crafted in an impersonal way, being supposed to adapt to an unknown recipient.

5 Nevertheless, in recent times important technological innovations (such as the invention of mobile phones and the Internet) have brought revolutionary developments to the way we communicate, even to the extent of making the traditional designation of mass media unsuitable. Besides the classic one-to-many communication, these new means allow one-to-one and many-to-many communication, involving a two-way flow of information and blurring the distinction between the producer and consumer of messages. Consider, for instance, the different uses of e-mail: it can represent a channel for interpersonal exchange with a single person, but also a way to reach thousands of people at once (for example, as newsletters, advertisements, alerts) and to receive their response. Another interesting example is social networks, which interconnect a mass audience, at the same time giving individuals the choice of various forms of communication (one-to-one, one-to-many, many-to-many) (Livesey, 2011).

6 These new forms require rethinking the idea of mass media to distinguish between old (or traditional) and new mass media. The main difference consists in the fact that, whereas the term old media indicates those means of communication based on a one-to-many and mono-directional process (for example, television, radio, books), the term new media includes many-to-many communication in a two-way circulation of information (Internet, social networks, chatroom, blogs). In addition to this, some characteristics are peculiar to the new media (Van Dijk, 2002):

- Integration, also known as convergence (that is, the merging of distinct technologies into a unified whole (Merriam-Webster, 2013b)), allowing to overcome previous spatial and temporal

limits and to achieve a wider geographical and demographic reach, jointly with a higher speed of communication, even at a distance. Integration is made possible by digitalization (the processing and storing of data in the form of numbers), entailing an enormous memory potential, involving new transmission technologies such as optical fibre cables, microwave satellites, and optical lasers;

– Interactivity, indicating the fact that users can send inputs and receive a response to them in a bidirectional or even multidirectional communication, leading to a broader participation by the public.

1.2 What role could mass media have in flood management?

7 Since the twentieth century media have been assuming an increasingly important role in society. On the one hand, they are often described as a mirror, portraying existing norms, qualities and problems that could enable society to evaluate and adjust itself accordingly. On the other hand, their ability to distort reality and their influence on the public are widely recognized (Ekron, 2011). Generally, the responsibility of media towards society consists of three main functions (Finnegan and Viswanath, 1997):

– **The knowledge gap:** The media have the significant task of disseminating information to help fill knowledge gaps and raise the awareness of the population. To achieve this goal, it is necessary to consider some factors affecting the impact of media, such as the appeal of the message, the degree to which information channels are accessible and desirable, and the amount of social conflict and diversity in a community;

– **Agenda setting:** The media select what issues to promote for the audience and how to frame them, which can help to determine what people perceive as a priority. When the public discourse around a certain topic is organized so as to provoke a sense of outrage and threat, people will pressure their leaders to put that question at the top of the political agenda;

– **Cultivation of perceptions:** Audience perceptions are shaped by the way media present information. When communicating a message, media transmit not only certain content, but also their interpretation of it. They propose a specific image of the world which incorporates a set of meanings, values and social norms. In so doing, they may determine people's beliefs, attitudes and behaviour towards new problems and situations.

8 In the context of flood management, the media occupy an intermediate position between decision-makers and the population, a position that confers upon them the essential but delicate responsibility of bridging between the two parties.

9 This complex task requires the accomplishment of all the three social functions listed above (knowledge gap, agenda setting and cultivation of perceptions), obliging media to assume an active role in every phase of the management process, from prevention and awareness-raising, to emergency warnings, to relief measures and restoration. In particular, the field where media could make a substantial difference is the shaping of perceptions, contributing to what is called "Social Amplification of Risk Framework" (SARF).

10 According to this theory, risk perception is amplified or attenuated by filters in the communication chain of hazard events in a way that events associated with a relatively low statistical risk gain utmost attention, while other potentially more serious dangers are disregarded. As a result, the adverse impacts of such events may extend to indirect social, political and economic

consequences, far exceeding the direct damages to people and properties (Slovic, 2000). Inasmuch as the media constitute one of the most important "stations" of amplification, they have the opportunity (and the responsibility) to select, frame and disseminate information so as to facilitate the task of flood managers towards the population. Furthermore, the amplification process could also flow in the opposite direction if media are to serve as a sounding board for the population's needs, requests and complaints.

11 As shown, many possibilities exist to benefit from the participation of the media in flood management. In order to effectively involve them in all stages (before, during and after flooding), a constructive approach should be built based on reciprocal respect, willingness to cooperate and solution-sharing. Subsequent to that, the development of a common communication strategy could represent the best way to synergize and obtain better results than the sum of individual actions.

2 RISK PERCEPTION

2.1 Risk perception

2.1.1 Definition of the concept of risk

12 The concept of risk is understood and defined in different ways by scientists, laypeople and media, depending not only on their background and position in society, but also on the specific use of the term in each particular sentence. In fact, the same actor could utilize the word at several points in a single paragraph, every time with a different nuance of meaning, this often not being acknowledged by the authors themselves. For instance, "risk" could indicate a hazard (for example, *"Which risks should we rank?"*), a probability (for example, *"What is the risk of getting AIDS from an infected needle?"*), a consequence (for example, *"What is the risk of letting your parking meter expire?"*), or a potential adversity or threat (for example, *"How great is the risk of riding a motorcycle?"*) (Slovic et al., 2002).

13 The various conceptualizations of the idea of risk and the numerous hints it can assume in a single context may cause problems in communication. Understanding what every actor means with the same word could help to realize the intentions, priorities and perceptions of the other parties and prepare the ground for setting a common framework of reference. To this aim, in the following paragraphs the distinct perspectives on the concept of risk by scientists, public and media are described, highlighting similarities and differences that could constitute a starting point for the elaboration of a shared terminology.

A | Scientific perspective

14 The scientific community defines risk through the following equation (United Nations Office for Disaster Risk Reduction (UNISDR, 2004)):

Risk = hazard x exposure x vulnerability

15 where

- **"hazard"** indicates *"a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage"*, expressed as the probability that this event occurs;
- **exposure"** corresponds to the *"people, property, systems, or other elements present in hazard zones that are thereby subject to potential losses"*, and
- **"vulnerability"** means *"the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard"* (UNISDR, 2009).

16 Describing risk as the multiplication of the probability of a potentially damaging event and the magnitude of its consequences presents the advantage of easing comparability among different hazards. Dealing with measurable factors and numbers allows, for instance, the performance of cost-effectiveness analyses (that is, how much risk reduction can be realized with a certain budget), which often proves to be very useful in decision-making contexts (for example, to understand whether public money is spent well or wrongly) (Baan and Klijn, 2004). Nevertheless, statistical data omit or underestimate other elements that could influence risk judgments, such as feelings, past experience, potential impacts, and the like; this explains why laypersons' views often differ so widely from the technicians' perspective.

B | Public perspective

17 Laypersons within the population generally have a more comprehensive conception of risk, taking into account numerous qualitative aspects, such as the level of control of the risk, expected gains, perceived degree of free choice, equity, and the like (Baan and Klijn, 2004). In addition, these rational factors are shaped by emotional elements, intuitive bias and cultural values, such as familiarity with the hazard, personal ability to influence the risk, and feelings (Kasperson et al., 1988). All together, these constituents determine personal preferences, giving rise to a totally different rationality in the evaluation and acceptance of risk compared to the experts' approach.

18 An elucidative example is offered by the population's reaction to flood risk management strategies or infrastructures following the occurrence of a flooding event. What can generally be observed is that those inhabitants who have been affected claim that their Government should take care of their livelihood and safety, while citizens who have not been touched by the disaster are reluctant to contribute to the implementation of new measures. Here we see that different attitudes are produced by diverse past experiences, which cause worry and, consequently, condition risk propensity. In opposition to both, authorities evaluate the feasibility of the proposed new actions according, for example, to the economic savings for avoided damages, the costs for their realization, and the number of citizens who will benefit from them.

19 The overriding dilemma posed by diverging perspectives on risk by scientists and laypeople lies in the difficulty of reconciling analytical facts and social priorities in the decision-making process, given the inadequacy of current indicators to equally include both at the same time **(Figure 2)**:

Technical rationale		Cultural rationale
trust in scientific methods, evidence and explanations	⟷	trust in political culture and democratic process
appeal to authority and expertise	⟷	appeal to folk wisdom, peer groups and cultural tradition
boundaries of analysis are narrow and reductionist	⟷	boundaries of analysis are broad and include use of analogy and historical precedent
risk is depersonalised focusing on measures of statistical variation and probability	⟷	risk is personalised with emphasis on impacts on the community, and family
concerns and issues that can't be described or clearly expressed are irrelevant	⟷	unanticipated or unarticulated issues or concerns are relevant

Figure 2 — Technical versus cultural rationality in viewing risks
(Baan and Klijn, 2004)

C | Media perspective

20 Situated between experts and common people, media are in a good position to see both points of view, evaluate them and choose where to stand. In fact, due to their job and role in society, journalists are forced to investigate and understand scientific explanations and latest developments, and also to listen to opinions, interests and concerns within the population. This should allow them to develop a neutral vision of risk and, as a result, bridge disagreement by acting as a communication channel in both directions, that is to say, translating statistics and algorithms into a language understandable to citizens and, at the same time, transmitting to decision-makers people's outlook, sentiments and preferences.

21 Nonetheless, we often witness a more materialistic approach by journalists, who frequently view risk through the lens of sensationalism. In effect, risk is something that can be easily associated with fear and commotion or, to use marketing vocabulary, a type of news that sells well. It is exactly the commercial constraints to which media are subject that could explain the tendency to select the most moving news and images, to use a rolling terminology and to privilege disaster-related reporting during and immediately after their occurrence rather than in quiet periods.

2.1.2 Risk perception and the "Social Amplification of Risk Framework"

22 Over the last few decades, the field of risk analysis has been extensively explored from many perspectives (statistical, industrial, sociological, psychological to cite few), due to the intensification of extreme events, resulting both from natural hazards and technological breakdowns. The necessity to deal with these dangers and their impacts has favoured the development of two new disciplines: risk assessment and risk management. Whereas the former focuses on the identification, quantification and characterization of threats, the latter centres on processes of communication, mitigation and decision-making (Slovic et al., 2002). In this sense, the latter is complementary to the former, meaning that it seeks to include the social and psychological aspects overlooked by the more technocratic approach of risk assessment.

23 The importance of encompassing these additional components in the overall management process has been acknowledged following the failure of some policies that neglected the subjective and highly contextualized nature of public perception. For instance, during the 2007 summer floods in the United Kingdom of Great Britain and Northern Ireland, a poor response by the population to the Environment Agency warnings was registered, which later found its explanation in the incapacity of the authorities to understand and tackle the different levels of awareness of the inhabitants, which made many alerts ineffective (Bradford et al., 2012).

24 This case shows that perception of risk plays a prominent role in the decisions people make, in so far as it influences their capacity to react, their preferences, their willingness to accept risks, and their support of policies (Slovic et al., 2002). Frequently, the indirect impacts of extreme events appear to depend less on the direct effects of the hazards themselves than on behavioural patterns determined by personal perceptions of risk, such as judgments on the adequacy of institutional arrangements to control the risk, the possibility of assigning blame to one of the major participants, and the perceived fairness of the risk management process. Moreover, different researches have found that, when not properly addressed, misperceptions tend to generate further public distrust in regulatory processes and their key proponents, thus making risk management even more difficult.

25 When it became clear that traditional cost–benefit analyses were not able to attribute an appropriate weight to these social and psychological variables and, as a result, hindered (instead of advancing) the implementation of effective and popularly supported policies, new studies tried to assess the topic of risk perception, by first defining what the public means by "risk" and, second, by finding out what factors underlie those opinions.

26 Among the numerous studies, a particularly successful field of research has been that of the interdisciplinary approach of SARF, elaborated by Slovic. This theory is grounded in a definition of risk perception as the *"intuitive risk judgments of individuals and social groups in the context of limited and uncertain information"* (Slovic, 1988). Two important ideas are embedded in this characterization: first, risk perception can differ from objective risk, being a spontaneous opinion; second, it is influenced by situational conditions of uncertainty and by the needs, issues and knowledge that shape stakeholders' intuition.

27 The theoretical starting-point of SARF is the observation that certain hazards and events that experts assess as relatively low in risk can become a particular focus of concern and sociopolitical activity in a society, while others that experts judge more serious receive comparatively less attention. The explanation behind this dynamic lies in the assumption that risk events are portrayed through various risk signals (images, signs, and symbols), which in turn interact with individual psychological, social, institutional, or cultural factors in ways that either intensify or attenuate public perceptions of risk.

28 The metaphor of amplification is adopted from the classical communications theory to describe how communications of risk events pass from the sender to the receiver through a chain of intermediate stations, where each link contains filters through which information is sorted and understood. Hence, in every passage through a new amplification station the message undergoes transformations that increase or decrease the volume of information, heighten the salience of certain aspects and weaken others, reinterpreting and elaborating symbols

and images, thereby affecting interpretations and responses by other participants (Slovic, 2000). **Figure 3** depicts the amplification process.

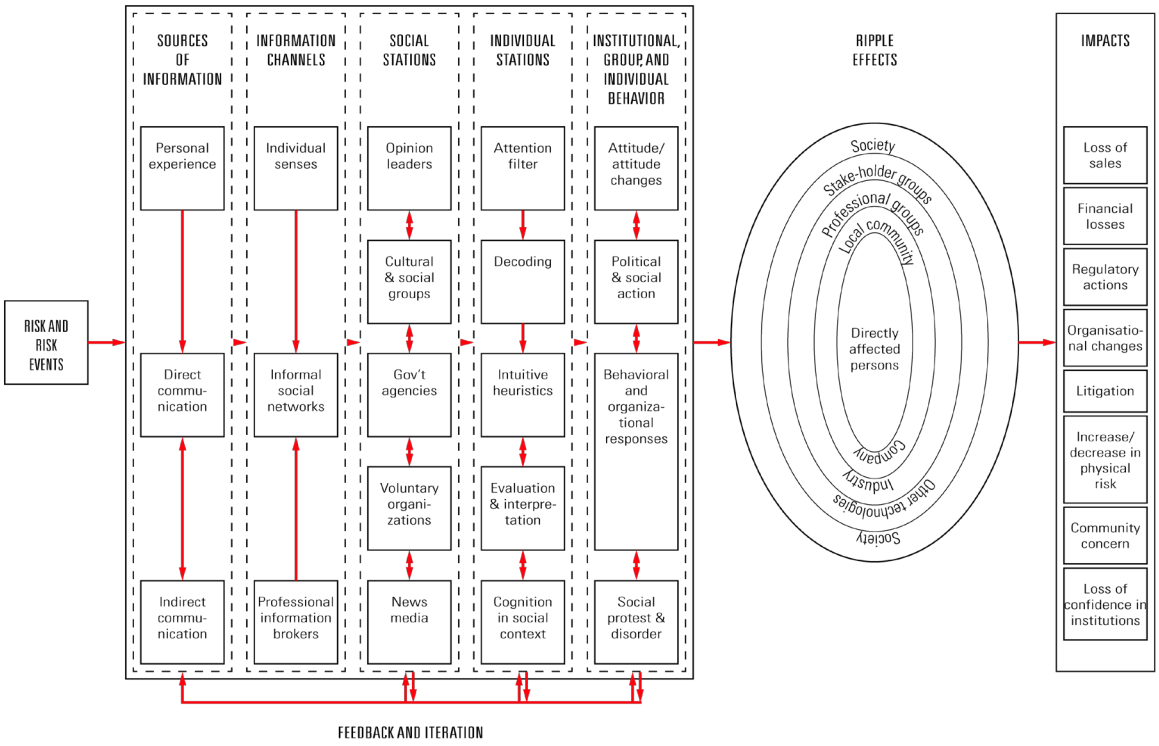

Figure 3 — The Social Amplification and Attenuation of Risk (Slovic, 2000)

29 Reading **Figure 3** from left to right, we see that the amplification process is activated by the occurrence of a physical event or the recognition of a potential hazard, which is interpreted by individuals or groups through their mental schemes and perceptions and then transmitted to others via communication channels (Renn, 2011). Each recipient engages in a series of amplification (or attenuation) steps, such as filtering and decoding of signals, applying intuitive heuristics, attaching social values, interacting with other individuals and groups, thus acting as an amplification (or attenuation) station for risk-related information. This will generate first-order behavioural and communicative responses affecting direct victims, which will later evoke secondary impacts extending beyond the narrow group initially interested by the original event.

30 Secondary effects include:

- Enduring mental perceptions, images, and attitudes;
- Local impacts on business sales, residential property values, and economic activity;
- Political and social pressure;
- Changes in the physical nature of the risk (for example, feedback mechanisms that enlarge or lower the risk) and in risk monitoring and regulation;
- Changes in training, education, or professional requirements;
- Social disorder;
- Increased liability and insurance costs;
- Repercussions on social institutions and other technologies.

31 Secondary impacts are, in turn, perceived by groups and individuals so that another stage of amplification may occur to produce third-order effects. The impacts thereby may spread, or "ripple" to other parties, distant locations, or future generations. Each order of impact will not only disseminate social and political effects, but may also trigger (in risk amplification) or hinder (in risk attenuation) positive changes for risk reduction (Kasperson et al., 1988). This process is better illustrated by the analogy of dropping a stone into a pond: the ripples spread outward, first encompassing the directly affected victims, then touching the next higher institutional level (a company or an agency), and, in more extreme cases, reaching other parts of the industry or other social arenas with similar problems. The rippling of effects suggests that amplification can introduce substantial temporal, sectoral and geographical variations in the scales of impacts (Slovic, 2000).

2.1.3 What is the role of media in this general framework?

32 Within SARF, media are presented as potential social amplification stations that influence the flow of information by acting on some of its specific attributes. The first of these characteristics is volume: large quantities of information may serve as risk amplifiers, as they direct public attention towards particular risk problems and away from competing sources of interest on the one hand, and mobilize latent fears about certain hazards experienced in the past on the other. In second place, the degree to which information that is regarded as credible by the population is disputed can increase public concern, since it can heighten public uncertainty, augment doubts about the competence of experts and erode the credibility of official spokespersons. Dramatization, a third attribute, is a powerful cause of risk amplification, in the sense that it can increase public worries towards a certain hazard and, in the worst of scenarios, unleash scaremongering. The fourth and final element is the symbolic connotation of the information: specific terms or concepts may have different meanings for varying social and cultural groups, triggering associations (and, therefore, reactions) independent of those intended (Kasperson et al., 1988).

33 Nonetheless, some recent studies have brought to light that media could be less important in the amplification process than SARF might suggest. According to some research, public responses to risk are not driven by media coverage per se, but are more influenced by other factors, among which trust in institutions, grounded experience and knowledge, apparent linkages between risk and non-risk issues and events, and the like. Furthermore, relationships between media coverage, public perceptions, and ripple effects are complex and highly interactive with other components, so that, as a single station, media may not be sufficient to ensure "take-off" of the whole amplification process (Slovic, 2000).

34 In conclusion, if initially SARF seems to suggest that the easiest way to comprehend risk perceptions and manage public reactions is to intervene at the point of the amplification chain represented by the media, latest developments suggest that an understanding of existing lay knowledge and beliefs could be more helpful in handling risk communication. A design-based and user-centred approach to communication built on detailed analysis of what different publics know and want to know (rather than what the sender wants to tell them), of how they talk about and respond to specific risk issues and their media preferences would be a much more useful tool, because it would provide a coherent and full understanding of the impacts and operations of the plural and symbolic information systems that media constitute (Slovic, 2000).

2.2 Flood risk perception

35 Flood risk perception constitutes one of the pillars of social resilience, as it determines responses to flood warnings and to efforts to increase community preparedness both at individual and public levels. Past experience has shown that lack of understanding of how the population discerns risk by the authorities causes failures in flood risk management policies. For this reason, flood management plans should include risk perception as a key social component, thus adopting a multifaceted approach that takes into consideration the close relationship among awareness, worry and preparedness in the construction of people's reaction. To do so, flood managers should firstly understand what are the drivers of flood risk perception and, subsequently, develop strategies to act at their roots, starting from more effective communication strategies.

2.2.1 Factors influencing the perception of flood risk

36 The way flood risk is perceived by the public is highly influenced by three orders of factors: risk features, situational factors and personal characteristics.

37 Risk features relate to the physical characteristics of flooding, such as the severity of the threat, the time available between a flood warning being received and the onset of flooding, the kind of flood, and the like *(Parker et al., 2008)*. On the other hand, situational factors reflect the peculiarities of the geographical and social context in which individuals live and their position in relation to them, and are, therefore, subject to the attributes of the hazard. Among these, we can mention previous flood experience, degree of control over flood, level of exposure, availability of resources and media attention. Besides these, personal characteristics include not only the physical attributes of an individual (such as gender, age, education and income), but also his/her particular psychological composition, such as cognitive, affective and behavioural elements that account for particular reactions to floods and dispositions to act *(Brilly and Polic, 2005; Bradford et al., 2012)*.

38 Research has produced very conflicting results concerning personal characteristics, making generalizations about relationships between risk perceptions and physical attributes very difficult; additionally, the assessment of the individual psychological features of a whole population is unfeasible (and useless, due to their continuous transformation) from a flood management point of view *(Baan and Klijn, 2004)*. In view of both these considerations, most of the studies on flood risk perception have focused on the second category of influencing elements, that is, situational factors.

39 Among these, people's experience with past flooding and flood warnings appears to be the most relevant factor in determining how inhabitants perceive the risk of further inundations. It has frequently been observed that the perceived likelihood of a risk increases if it has already been experienced or can be readily imagined, as the experience serves as a filter used to evaluate and prioritize the multitude of risks involved in daily life. This phenomenon is described as "availability heuristic" and is often deemed to induce errors of judgment, as it leads people to believe that recent or well-publicized events are more probable than they actually are (Whitmarsch, 2008). In the case of floods, environmental psychologists have defined this mental shortcut as the "crisis effect", which indicates that disaster awareness peaks during and immediately after its occurrence, but rapidly dissipates between disasters (Stefanovic, 2003). In other words,

immediately after a (near) flood people overestimate flood risk, but after some time has lapsed, worries decrease and over the course of few years flood risk is grossly underestimated *(Penning-Rowsell, 2003)*. This behavioural pattern has two implications: firstly, it means that inhabitants of areas that are often flooded are more risk aware, in the sense that, being more familiar with flooding, they perceive risk as looming and are better psychologically (and often materially) prepared. Secondly, the fact of being used to the dynamics of the river and having experienced the consequences of floods lets them feel less frightened than residents of less flood-prone territories.

40 Closely related to previous experience is the degree of preparedness and of control of the consequences of flooding. It has frequently been demonstrated that people who are well prepared and who know how to act adequately during and after a flood perceive the risk of flooding as less threatening. In their eyes the situation remains manageable to some degree, thus inducing them to take a proactive attitude that contributes to the reduction of the vulnerability of their communities. In this context, the certainty of being compensated for damages plays an essential part: people who are well insured or have confidence in a quick financial assistance by the Government feel less stressed, dependent and inferior, consequently seeing flood risk as not so intimidating *(Baan and Klijn, 2004)*.

41 Another situational factor that has a great influence on risk perceptions is that which experts call the "levee effect". This refers to the tendency to place unrestrained and often inappropriate faith in the power of protection works, so that, once levees, dykes or reservoirs are built, people get lulled into thinking the constructions will protect them against all future floods. On the contrary, the possibility that a flood occurs that is larger in scale than the defences were designed for, and that protection measures fail is always latent. By giving a false sense of security, these infrastructures distort risk perception and prevent local communities from undertaking initiatives to reduce their exposure *(Baan and Klijn, 2004)*.

2.2.2 Human response to flood warnings

42 The field where flood risk perception is deemed to have the most immediate and evident consequences is human response to flood warnings. Although numerous technical and practical elements intervene in the alerts reception process (for example, patchiness in the coverage of the warning system, failures in flood forecasting, short warning lead times, inefficiencies in the dissemination procedure, unavailability or inability of people to receive alerts, and the like), socio-psychological factors also have a significant impact on the reception, understanding and reaction to flood warnings *(Parker et al., 2008)*. In this section we will first outline some common behaviour among citizens receiving an alert and, second, we will investigate the causes explaining these responses.

2.2.3 Commonalities

43 Different studies reveal important commonalities in how populations respond to flood warnings. In the first place, as soon as an alert is received, people seek further information through different means, such as government agency hotlines; radio; family, friends and neighbours; local authorities and/or emergency services; and websites. The second reaction usually corresponds to the tendency to pass the flood information they have collected to others, generally household members and neighbours, personally or by telephone. A subsequent

widespread action is saving property: most people immediately move valuables and cars to safer places; then, they try to prevent floodwaters entering buildings by erecting flood boards or gates across doorways; finally, they take a number of safety measures, such as switching off gas and electricity supplies, finding warm clothes and securing pets.

44 In rarer cases when a severe flood is expected, pre-flood evacuation is another relatively common response to warnings. Even if it usually occurs where an official flood warning system is in place, it can be enacted even in the absence or inefficiency of dissemination procedures by the authorities, which are substituted by high local vigilance, efficient resident networks and effective informal alerts mechanisms (Parker et al., 2008).

2.2.4 Factors affecting response to flood warnings

45 A number of correlates have been observed between certain social factors and flood warning response. Although generalizations can be dangerous because minor differences in the specific circumstances or in the focus of the relationship can negate or reverse a connection, studying and classifying these correlations could provide important starting points for the improvement of flood warning systems.

46 To simplify the complex landscape of this field of research, we can divide factors affecting response into two broader categories: socio-economic and, more relevant to the purpose of this publication, socio-psychological factors.

Socio-economic factors:

- **Tenure or ownership:** Usually householders and business owners take more actions to avoid flood damage than renting occupiers (Parker et al., 2008);
- **Age:** The elderly generally respond less adaptively to warnings, even though they tend to stipulate more flood insurances (Steinführer and Kuhlicke, 2007);
- **Gender:** Research results are conflicting, sometimes showing that females respond more readily than males, other times revealing the exact opposite (Drabek, 1994);
- **Social grade:** Lower social grades are less likely to be reached by a flood warning, to respond to flood risk by purchasing insurance cover and to save high-value goods from flood damages (partly because they have less assets to rescue);
- **Usability of technologies available:** Some flood warning technologies have been found to be little user-friendly, especially for some social categories, such as the elderly or people with disabilities (Tapsell et al., 2004).

Socio-psychological factors:

- **Social context:** When receiving a warning, people discuss it with their family, friends and neighbours before deciding how to respond, especially in those environments where unofficial warning systems are well established. Interactions between members of the same social context may cause the alert to be alternatively downplayed, ignored or confirmed (Drabek, 2000);
- **Experience:** Inhabitants having previous flood-warning or flood experience will more probably respond to an alert than those who have not. In addition, the more recent the experience, the more likely and fast is an active reaction. This is explained by a cognitive process called "availability heuristics", according to which the human brain uses mental

shortcuts to process complex information, for instance drawing upon other past images or experiences that appear to be similar to the expected flood (Tversky and Kahneman, 1973). The choice of available figures can be highly influenced by external factors, such as media, thus distorting risk judgment and, consequently, response to warning;

- **Emotion:** Narrowly linked to past experience, since deriving mainly from it, emotions, such as fear, dread or worry, affect decision-making about warnings, upsetting any rational probabilistic attempt of risk assessment (Slovic et al., 2002);
- **Optimism:** Even if conditioned by contextual circumstances, such as previous flood experience and emotions, optimism as a character attitude induces people to underestimate the chances of adverse consequences in relation to their own situation, thus obstructing response to warning (Weinstein and Klein, 1995).

2.2.5 Causes of inappropriate reactions

47 Beside factors influencing response to flood warnings in general, some specific elements clarify ineffective reactions to alerts.

48 The most obvious explanation is misinformation or lack of clearness about the flood risk or flood warnings. This is constituted by various components that individuals need not only to perceive, but also to understand to respond successfully. Components include the risk of flooding, the meaning of flood warnings, how to access and confirm flood warnings, the most appropriate and effective range of responses to a flood warning, and how to respond actively. Lack of information about, or comprehension of, any of these factors may lead to wrong responses (Parker et al., 2008).

49 The existence of compensation schemes and favourable insurances (such as new-for-old contracts) represent a second explanatory element of inapt response to flood warnings. The security of receiving a reimbursement for flood damages could serve as a disincentive to react effectively, discouraging self-responsibility and personal undertaking of loss-reduction measures. Cases of passive responses to warnings for this reason were registered in Germany and France, where government flood-damage compensation schemes are a long-standing practice (Parker et al., 2008).

50 Finally, scepticism about official sources of warnings or their accuracy and reliability may easily induce ineffective responses. Whatever the motive of such disbelief, flood alerts originating from institutions in which citizens have low confidence will probably be treated with perplexity and insouciance. Loss of credibility of issuing agencies may have multiple origins, but one of the most important seems to be the public exposure to too many false alarms, which desensitizes citizens to warnings (Parker and Budgen, 1998).

3 MEDIA AND FLOODS

3.1 Current relationship between media and floods

3.1.1 Disaster information

> A **disaster** is defined by UNISDR as "A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources" (UNISDR, 2007)

51 Disaster information includes all news, facts and knowledge provided to the public concerning a natural or human-induced disaster before, during and after its occurrence. Although media and the audience tend to identify disaster information only with news relating to the emergency phase, the dissemination of knowledge during all stages plays a vital role in supporting the management of the calamity, by raising awareness, reducing vulnerability and improving preparedness, especially when conducted through mass media.

52 Floods are one of the most common disasters, affecting different regions all around the world. Nevertheless, their nature, impacts and consequences may vary from place to place due to morphological, meteorological and anthropological factors. The global and, at the same time, local bearing of this phenomenon has increased the importance of a good management of the communication of disaster information on floods at all levels.

A | Public expectations and the media's mission

53 When dealing with disasters, the public has precise expectations about the kind of information that should be made available by media, particularly during emergency. People generally look for news that is:

- Timely and constantly updated, especially during or immediately after the occurrence of a catastrophe;
- Clear and unambiguous – even if it could convey inaccurate content, a definite and even absolute language is often preferred by the audience, since it is easier to understand and sets some benchmarks in dealing with unknown and complex issues;
- Relevant to their needs and tastes – in the course of an emergency, for instance, people want to have news about if, when and where they have to evacuate, if their relatives and acquaintances are among the dispersed people, when the flood will end, and the like;
- Detailed – for example names of flooded roads and locations, precise number of victims, the exact date when return to their houses will be possible;
- Correct and reliable – over the years, media have received hard criticism, since they have been accused of distorting information or of favouritism in support of certain thesis or parties in the public debate. These polemics emerged because people expect media to describe facts and figures in a neutral fashion, leaving judgments to recipients; if opinions are expressed; they should be attributed to their authors and reported literally (Van Hook, 1986).

54 Consistent with these requirements, members of the public usually choose media on the basis of the quality of information, the manner it is presented and its prompt availability. These selection criteria pressurize media to collect as much news and as punctually as possible, constrained as they are by the necessity to sell their products in a highly competitive and crowded market. According to commercial rules, the only special obligation attributed to journalists is to satisfy customers in the most effective way, from which wider benefits to society will flow, guided by the "hidden hand" of the media market.

55 However, newspeople often perceive themselves as having a social role, a moral obligation to "serve the public good", as population informants, advocates for minorities, critical watchdogs or open forums for the expression and exchange of opinions. This self-perceived mission questions the idea that relations between media and their audiences are self-adjusting, due to the fact that the demands of the public provide the ultimate performance yardstick. On the contrary, for communicators this may represent a potential threat to their autonomy and professional standards, especially when pleasing the audience may, in their opinion, conflict with their integrity and code of conduct (McQuail, 1992).

56 These reflections should convince flood managers not to underestimate the work and capabilities of media, taking for granted that they are always moved by materialistic economic purposes. Irritation and impatience towards journalists' questions should, instead, give way to availability to cooperate, in view of the shared interest of the commonweal.

B | How media work

57 By nature, media work mainly on current events. However, a good portion of their contents relate to themes and stories which are neither topical nor central in public concerns, but still of potential interest to the audience. This applies also in the case of floods: most of media attention focuses on happenings during the emergency phase, but some journalists may decide to concentrate on other less impelling aspects of the issue, examining in-depth side topics, such as the scientific knowledge relating to floods, public policies, the level of population awareness, and the like.

58 In general, media houses all over the world have similar working formats and methods, but priorities, contents and internal operation systems may differ within each individual company. Usually, journalists are assigned to work on various themes as needed (including subjects not always related to their field of expertise) and are responsible for reporting to their editors. Even though the choice of how to write a story (how to select information, how to present it, what aspects to highlight) is up to the reporter, news, irrespective of the format (article, radio news or newscast) undergoes various levels of editing before being published. Hence, we could consider news to be the result of the combined work of reporters and editors.

59 For example, after being asked to report about a flooding event causing several victims, a journalist could take an interest in the necessity of establishing an early warning system in that specific place. He/she may start investigating what has been done in that vulnerable area to date for flood prevention, why it has not been effective, what could be possible future scenarios if heavy rainfall occurs in the region again, and the like. After finding such information, the reporter will define the core and direction of the story (that is, what is the most significant information to be delivered), prepare a first draft and share it with the editor, who will redact the text. Only after all these passages the article will be published.

60 Besides media houses' internal procedures, it could be useful to consider other features of their working methods that could have certain relevance in their relationship with flood managers. First, journalists have tight deadlines, meaning that they look for fresh news but do not always have the time to verify the reliability of information and sources in detail. For this reason, they tend to primarily rely on an accustomed network of verified informants, thus suggesting that entering this circle could ensure better control on the information flow by decision-makers.

61 Second, most of the time reporters are employed by media houses and, consequently, cannot be truly independent from their company's interests. In addition to the intent of the individual journalist, the general orientation of the press body to which he/she pertains should be explored and allowed for when presenting the journalist with facts and data. More infrequently, reporters are forced to work under conditions of lack of freedom of expression. Censorship may also influence the content of their articles, but as long as information is provided in a neutral way with the clear aim of saving lives, such restraints can normally be overcome.

62 In third place, news must have a selling value; if it does not, it will hardly be taken into consideration or will easily be bypassed by more sellable information. Satisfying the curiosity and needs of reporters is probably advisable to dissuade them from complementing what they know with additional imprecise (or even creative) facts.

63 Finally, journalists have a code of ethics and standards. Although some basic principles could belong to simple good sense, other rules of practice may not be immediately understood by those from different professions. Through seeking to comprehend and respect the persons and institutions we come into contact with, the foundation of a relation of mutual regard can be established.

3.1.2 Relationship between flood managers and media

64 For the sake of the flood management process, decision-makers and media should ideally try to build a clear and cooperative relationship. Unfortunately, this is not always the case: both

categories often see each other as a hindrance and are very critical towards the other's work. Most of the time, the root of these tensions is a mutual lack of understanding of the nature and working methods of the other profession, which contributes to the strengthening of reciprocal prejudices and close-mindedness.

A | Reciprocal opinions

65 Flood managers often decry mass media, maintaining that they obstruct the management process (especially immediately after a disaster during rescue and relief operations) and add stress to the already hard work of decision-makers. They think that a more relaxed working atmosphere could be possible if reporters were not there to record their actions, question their decisions, and air the remarks of the critics. They also believe that journalists by nature look for news that may arouse some controversy, since they operate in a very competitive market, driven by the tastes of a public not interested in general, easily available information, but seeking something uncommon and cutting. As a consequence, managers are often of the opinion that media are not keen on investigating long-term policy aspects, mitigation and preparedness issues, but prefer concentrating on immediate questions that can capture the audience's attention. Furthermore, a quite popular opinion among decision-makers argues that most journalists are incompetent in scientific and technical subjects, which is at the origin of numerous misunderstandings and inaccuracies in their services.

66 If, on the one hand, it is true that reporters search for frequent, timely and complete information that may not be available (particularly during disasters, as they are not scheduled events), on the other hand, flood managers frequently fail to understand that journalists work on very narrow deadlines and have to produce news at any cost by the time that bulletins are to be printed or broadcasted.

67 Similarly, media sometimes underestimate the seriousness of certain situations and the pressure undergone by decision-makers, as they are responsible for the safety and well-being of the population. From journalists' point of view, the frequent tendency shown by authorities to put media in very low priority and deny sharing information represents an attempt to hide errors and weaknesses from the public and policymakers at central level. In many cases, media are highly critical towards government efforts to regain control of the situation and may blame flood managers for the crunch of resources provoking and/or occurring during disasters.

68 Whereas decision-makers' reluctance to talk to the media may be understood in the light of some distortions and unfairness by journalists, accusing reporters of always acting in bad faith would be equally unjust. On many occasions, journalists are motivated by the desire to provide useful information to the people when floods wreak havoc, as well as to raise awareness on secondary or little-known topics. Frequently, the information provided through the media would help authorities to manage their work in a better way, but insufficient communication between the two sectors results in both losing good opportunities which could have benefited the population.

B | How to relate to each other and build an effective relationship

69 Not only during, but also before and after floods, a lot of work requires close cooperation between flood managers and media. As previously mentioned, it is a common belief that

journalists chase decision-makers to obtain news for articles; in reality, collaboration between the two is also in the interest of flood managers, in view of the fact that media are the main vehicle to disseminate information (above all the perishable information contained in warnings and forecasts) to the public. Establishing and maintaining a good working relationship with representatives of the media helps to get the message out to the target audience and on time (Public Weather Services Programme (PWSP) of WMO, 2010). Moreover, a positive and active cooperation with (especially local) media presents two additional advantages for flood managers: firstly, they can encourage journalists to write articles on certain subjects and guide them on the content and style of the publication; secondly, by meeting reporters' needs, they become the source of expert opinions and the contact person for specialist interviews (Bieniek, 2011).

70 There are no silver bullets to build good relationships between flood managers and media, since much depends on the institutions' organizational capabilities, adopted information policies, personal attitudes, and the quality of previous rapports. Cooperation can have both direct (conferences, briefings, seminars, workshops) and indirect (press releases, video messages, websites, social media) forms, but the most desirable way to keep relations is through the former. Direct and regular contacts, in fact, allow interaction, which is key for decision-makers and journalists to become acquainted with each other and ask questions, clarify doubts, and understand reciprocal necessities. For instance, it would be wise for flood managers to create a media database and systematically gather and update the contacts held in it on recent developments (Bieniek, 2011), or conduct capacity-building activities for journalists on a periodical basis to share any kind of information, from usual news to recent technologies being used to research findings that could be useful to inform the public about.

71 For these meetings to be effective, some basic rules should be observed from the side of decision-makers:

- Concentrate on only a few topics at a time (maximum three), thus avoiding the risk of overwhelming reporters with too much overlapping information and confusing them about the priority of issues to be delivered to the public;
- Be accurate on those subjects communicated, providing credible and authoritative data and facts and correcting misinformation. Although supposed to be well prepared, it could happen that decision-makers do not know how to answer a question. In that case, it is wise for them to simply admit that they are not able to respond and refer the inquiry to the appropriate person. Besides avoiding giving an erroneous reply, such action will ensure journalists that the decision-maker is competent and professional;
- Remembering that the final recipients are not media themselves, but rather the target audience, communicators should craft their communication in a comprehensible and attractive fashion. This means avoiding jargon while explaining technical terminology, speaking slowly and succinctly, providing examples and titbits, complementing information with additional materials (tables, pictures, leaflets, and the like) that the reporters can use;
- Distinguish between facts and opinions and, if a question is too sensitive, stick to the objective data (unless the decision-maker is prepared and authorized to answer);
- Most importantly, maintain a friendly attitude. If the questioning becomes antagonistic or if the situation becomes hostile in nature, the communicator should try to recreate a relaxed atmosphere. If this is not possible, it is better to take a break or postpone the meeting to a better moment.

3.1.3 Dealing with crisis situations

72 Dealing with crisis situations is never a simple task, especially when huge disasters have to be faced with very limited human and financial resources. During emergencies, communication is also often wrecked, systems may not be functioning, networks may be disrupted and chaos may rule in the affected area. Nevertheless, even under hard conditions (technical problems, bad weather or inaccessibility of some areas), effective communication can often ease flood managers' tasks. For this reason, one of the first priorities immediately following a disaster should be the reinstatement of communication lines and cooperation with the media, from the perspective that they are not an obstacle to rescue operations, but a resource to capitalize on to speed up operations and raise efficiency.

73 Before considering practical steps to handle relations with reporters during a crisis, it is necessary to clarify the distinction between the two different kinds of media that act in the field during emergencies. On the one hand, there are international journalists from large foreign companies, who arrive at the disaster scene with the duty to tell the story of the catastrophe to their audience back home, following instructions and working methods prescribed by the corporation to which they belong. On the other hand, local media, who know the territory, its history and its population, have the objective to collect information not only to report happenings to the wider national public, but also to support both authorities and inhabitants to overcome difficulties, reduce losses and restore normality.

74 If, for flood managers, it is easier to relate to local media, showing these a more open, collaborative and proactive attitude, international journalists should not be disregarded as a burden, but be acknowledged for their contribution to fundraising from foreign countries, people and organizations. Even though priority should be given to communication with local media for the concrete benefits they are able to bring to the management of the situation, ignoring or marginalizing international journalists could present some drawbacks in the short and long term. Firstly, this could favour the spread of false or inaccurate information and, secondly, global attention and all the advantages that it could produce (for example, crowdfunding) might be deflected. The suggestion is, therefore, to cultivate a closer relationship with local reporters, but, at the same time, to maintain regular contacts with foreign media.

75 Coming to pragmatic advice on how to cooperate with journalists during emergencies, here we propose some measures that could provide guidance in this direction:

A | Establish a strategy to deal with media during crisis

76 To prevent the situation getting out of control and, consequently, the image of the authority becoming degraded (thus eroding the confidence of the public), try to be as prepared as possible by arranging tools in advance so that they are ready to be used in the time of need:

- Designate a spokesperson, supported by a communication board, including communication specialists and anti-crisis staff. The role of the team should be to collect information and prepare the messages that the spokesperson will transmit to the public through different means (radio, television, newspapers, and the like), as well as to keep contacts with local media. It is essential that all the personnel in the communication board are trained before the occurrence of disasters, to be ready to act quickly when floods arrive;

- Determine a procedure to work effectively and rapidly even under stressful conditions, when fast decision-making is necessary, due to actual danger and/or media deadlines. This system should indicate guidelines, instruments and responsibilities to receive/gather information, to quickly agree on issues and finalize messages, and to review and evaluate the work done;
- Set a calendar of regular appointments with the media and the public, such as daily radio or television shows at a fixed time. Whereas the goal of meeting with journalists is to brief them on latest developments and rectify possible misunderstandings, addressing the audience directly through routine broadcasts is intended to create a point of reference for the population and increase trust in the authorities;
- Besides regular programmes, other occasions and instruments to communicate both with reporters (such as extra interviews) and the public (such as 24-hour phone lines) should be envisaged, with the aim to issue news, but also to receive information from the ground, feedbacks and corrections;
- Take a cooperative attitude towards journalists. As previously mentioned, reporters are not foes, but allies in the battle against floods. Therefore, to have them fighting at your side, an effort to be empathic towards their point of view is the bare minimum. This does not simply mean being available and providing them with timely and transparent information, but also enabling them to understand your message and transmit it to the population. In practice, supporting their job entails utilizing a comprehensible language, explaining difficult concepts and, in the poorest contexts, supplying working material such as antennas, fuel and connections. Do not forget that journalists are often affected by floods in exactly the same way as inhabitants.

B | Select attentively the content of your communication

77 Although all information has an effect on people's psychology, during crises some kinds of data and facts are needed by the population to survive and recover, while others specifically aim to influence its mood by tranquilizing and instilling hope. Since both are indispensable to alleviate physical and moral suffering, the core of all emergency communications should comprise (as soon as information is available):

- Details about the actual situation: flooded areas, number of victims, dispersed people, and the like;
- Warnings for the immediate future: flood alerts, regions at risk, potential threats;
- What the authorities are doing: relief measures, refugee camps, field hospitals, and the like;
- What the authorities will do the following day/s (specifying as much as possible estimated time): including planned rescue operations, aerial surveys, distribution of provisions and survival goods, and evacuations;
- What people should/should not do for their safety and subsistence: where to go/not to go to be safe, where to get support, not to drink unsafe water, not to go back home unless authorized to do so, and the like;
- What is expected in the medium and long term: including if and when people will be able to reoccupy their homes, when reconstruction will start, who will carry it out, who will bear those costs;
- Information about other actors active in the field that could be addressed by the population: including local civil protection and government authorities, the Red Cross, the United Nations Office for the Coordination of Humanitarian Affairs, and non-governmental organizations.

78 Naturally, all these facts should be as detailed as possible; in particular, the sources of information should always be quoted, so as to reduce confusion and sound reliable to the people. Moreover, the order in which news is transmitted is a powerful signal to convey urgency and priority: primary information comes first, to catch the public attention and be sure that the message reaches its target, including those who access media only for short periods. A simple and efficient way to be sure to quickly deliver complete, accurate and relevant information is to develop templates to prepare messages to be broadcasted; this helps not to skip essential information that could be forgotten in the rush, at the same time granting a good degree of flexibility. It should be remembered that formats are support guidelines, not rigid constraints.

C | Put great care into shaping the tone of communication.

79 In crisis situations, the goal of communication is to be visible and show the population that authorities are present and operative and, consequently, to build confidence that they will be able to manage the situation. Hence, when crafting a message for the media, we must always bear in mind that our final target audience is the affected population and not journalists per se. This implies that, while remaining sincere and not concealing the worst news, it is fundamental to employ a language that does not create panic and conveys a positive message, as the combination of frankness, calmness and optimism is the best possible receipt to help people calm down and believe in officials.

3.2 Potential role of the media in Integrated Flood Management

80 Media occupy a delicate position in society, being located between flood managers and the population. From a certain point of view, this is a privileged situation, since they could act as intermediaries between the two, transmitting, filtering and improving communication in both directions. From another point of view, being the middleperson is a great responsibility, requiring good knowledge of the other parties, the questions at stake and the general context, as well personal skills, such as diplomacy, intuition and dynamism.

81 In the tension between these two extremes, media could play an important role in flood management, not only during floods, but also before and after their occurrence. Since they can constitute a bridge between decision-makers and local inhabitants, in this section some of their potential functions are suggested according to the different flood management phases and to the subjects they are addressed to. Certainly the list is not exhaustive, but is presented as a starting point to be developed by interested parties depending on the actual conditions.

3.2.1 Before a flood

82 Activities undertaken before floods are deemed to be very important as they help to significantly reduce loss of lives and property. However, for media, reporting during and after disasters has top priority compared to pre-flood coverage, which rarely presents a matter of urgency or is of high interest to the public. In particular, considering that every news channel has programme packages that include every issue of society, ranging from politics to crimes, educative outlets about floods in times when danger seems far away may not be overriding in the media agenda. Even though this does not mean that this subject is totally excluded from the reporting schedule, flood managers should try to sensitize journalists to dedicate more attention to it. However,

in many cases, media have played a significant role in awareness-raising activities, informing decision-makers and advocating for institutional action for flood management.

A | Possible roles for the media towards decision-makers

– **Provide information about vulnerabilities of communities:**

  Better decisions are only possible through better information. Sometimes official information channels are biased and decision-makers may not be aware of every issue, activity or small accident at field level. That is exactly the domain where media could be very helpful: since they bring questions to the attention of flood managers before disasters risk to devastate some areas, media reports could be crossed with official news to form more effective decisions. In particular, journalists may accidentally discover some information while investigating other news or have more widespread local contact networks and better opportunities to talk freely with laypeople.

  The fact that the population could feel more comfortable speaking openly to reporters than to representatives of authorities offers media the occasion to find out and collect minor information, specific needs and common concerns that could be useful for decision-makers.

– **Advocate for institutional action for flood management:**

  Journalists can also put pressure on flood managers to take decisions and move faster and more efficiently in two ways: by directly addressing authorities or sensitizing the public, so that it urges them to act. Whereas the first option is feasible in the short term, with constant and biting reports appearing in different kinds of media, the second one is applicable only in a longer time frame, due to the time-consuming effort to educate the population.

  In their advocational activity, media could strive to point out expressed requests of the population to decision-makers, aiming to give voice to or reinforce unheeded pleas and worries; on the other hand, they could try to push actions and discussions on their own initiative, according to the findings of their research and sensitivity to the matter.

B | Possible roles for the media towards populations

– **Raise awareness:**

  Specularly to the role performed towards decision-makers, media could play an essential part in raising awareness on flood-related issues within the population, an activity that has the potential to significantly reduce loss of lives and property. In this sense, some kinds of mass media (television, radio, newspapers, and Internet) are highly accessible to the public, a characteristic which places them among the most powerful tools to enlighten people.

– **Translate technical knowledge into readily understandable language:**

  Various aspects of flood issues are very technical in their content and terminology and frequently wordings used by experts are hard to understand for the general public. Nevertheless, some advanced scientific knowledge (for example, methods used to generate data or conduct research) would be very beneficial to know for the public.

  In this context, media could vulgarize information and disseminate it to the audience, so that it appears comprehensible and appealing at the same time.

– **Increase public interest/participation:**

  Media have the ability and means to shape information in a more interesting way than flood managers or researchers. In the vast pool of news in everyday outlets, flood-related

information should emerge from the mass due to catchy presentations and in order to attract people and induce them to listen, watch or read carefully.

Once public interest is raised, communities could then be motivated to become involved in preventive activities, such as initiatives to make their homes safer, children's education, drills, and the like.

3.2.2 During flooding

A | Possible roles for the media towards decision-makers

– **Provide timely information about conditions and needs of affected people:**

In many cases, even decision-makers get to know about floods from media outlets. During disasters journalists report on numerous aspects, ranging from technical through to social issues, thus providing valuable information to flood managers that enables them to adapt decisions to the actual situation.

Besides contributing to the planning process, news received from various media could also be used to cross check facts and data obtained from official sources or to complement them with information about public perceptions and concerns that are not always caught by authorities.

In this sense, a supplementary function that reporters could perform would be to act as a communication channel from communities to decision-makers, especially for those kinds of messages that hardly filter through the chain of command.

B | Possible roles for the media towards the population

– **Disseminate warnings and information about the actual situation:**

Media are the first-hand information providers at the explosion of the crisis, especially when floods occur in remote areas where the presence of the State is weak. Whereas the official flow of messages goes through many formal procedures that slow it down, journalists are on the spot, ready to immediately catch news and disseminate it to the masses. Furthermore, when State machinery becomes defunct, reporters may be the only point of contact with the outside world in the field; hence, their outlets often serve as the exclusive on-site means of communication for affected people during disasters.

– **Inform about actions undertaken by authorities:**

The delivery of messages about actions realized by the authorities has both a practical and a psychological goal: on the one hand, it aims to let people know concrete useful information (for example, where to find aid); on the other hand, the awareness that the institutions in charge are acting is reassuring and lifts the population's mood.

– **Suggest what to do/not to do:**

Spreading dispositions and advice through mass media multiplies the possibilities that inhabitants act and react in an appropriate manner, avoiding the most common mistakes and reckless behaviour. Instructing the population and, consequently, preventing further accidents helps flood managers to keep control of the situation and manage the crisis, while at the same time providing helpful and comforting guidance to people.

– **Facilitate communication between affected people:**

As mentioned before, when floods occur, journalists may be the first and only people arriving on the site of disasters. Very often, roads and communication lines are disrupted

or, in the most remote areas, they have never been in place. In these circumstances, the only available communication devices are those owned by reporters (when not affected themselves), who should not refuse to share them with inhabitants to enable them to contact relatives and friends until the authorities can re-establish basic infrastructures.

3.2.3 After flooding

A | Possible roles for the media towards decision-makers

– **Continue to provide information about the conditions and needs of affected people:**

Even after disasters, decision-makers can take advantage of the media as a precious source of ground information that helps them keep up-to-date on humanitarian, social, economic, and environmental aspects that could elude their attention, eclipsed by other priorities.

– **Forward the population's requests and complaints:**

In the aftermath of disasters, authorities may overlook requests and complaints by the population, due both to the fact that they perceive them as secondary compared to other problems or that traditional communication channels (apart from those intended for emergencies) are temporarily suspended to tackle more compelling necessities.

As loss of lives and property upsets the life of locals for a long time, their needs may be higher than usual and, simultaneously, underestimated by flood managers. In this situation, media could raise the visibility to decision-makers of victims' issues and help them to obtain logistic support, facilities, and refunds in a briefer time.

Moreover, people's expectations could be drawn from media reports and follow-up could be planned accordingly.

– **Keep the attention high:**

Complete recovery of flooded areas may take years, while, progressively, priority by the Government and foreign donors may decline.

The role of media in this waning landscape could be to keep track of what is going on at the field level, report to those who could practically solve problems and advocate for immediate action.

Speaking about the living conditions of affected people and the risks they are subject to represents the main instrument to avoid these topics being forgotten at the national and international levels.

B | Possible roles for the media towards the population

– **Inform on current and future strategies by the authorities:**

Information on relief measures and compensation such as it is conveyed by the communication channels used by authorities is often difficult to find, understand and apply by the population.

Media could contribute not only to delivering advice and news to people, but also to craft this information in a more comprehensible fashion.

Additionally, communicating through mass media the strategy planned by decision-makers to deal with floods in the long term is as necessary as it is beneficial: transmitting self-confidence through the impression of having clear ideas on solutions for the future fosters

trust and hope in the inhabitants and is one of the key factors for the success of the strategy itself.

- Help in directing donations:

  After flooding, communities have to struggle hard for survival. In these kinds of crises, news agencies can work jointly to collect donations (monetary or goods) as their involvement can help to generate considerable donor response.

  Taking advantage of the popularity of certain media and their powers of persuasion, flood managers could cooperate with them on fundraising for relief and rehabilitation, not only immediately after disasters, but also in the middle and long term.

  After some months or years, public interest declines; hence, keeping donations alive and directing them towards areas identified by authorities as the most needy is a difficult and vital task to prevent dispersion or loss of aid.

- Improve preparedness:

  Media can also play a significant role in the preparedness of communities, with immediate effects on the reduction of deaths and damages.

  Regular broadcasting of information about how to be ready for the worst, that is, how to make one's house safer, how to reach safe places and how to prepare an emergency bag to pick up during escape (containing basic indispensable goods that would help to survive for a certain time before relief packages are delivered) could be more effective than yearly evacuation drills, because of the effect of its repetition and regularity.

- Guide people's reaction:

  Dealing with the opinion-shaping power of media is a question as delicate as it is imperative. Journalists have links to the sentiment of the population from two standpoints – according to their personal opinions and interests, but also due to their relationship with flood managers.

  If a constructive rapport exists between the two parties, media can greatly contribute to flood management by directing people towards a reaction supportive of the measures put in place by the authorities.

  News agencies could also decide to promote population opposition to government plans for numerous reasons (they do not agree with them, do not trust decision-makers, and the like), but this may be very counterproductive, it usually being the authorities that possess the main powers and resources to act.

	Towards decision-makers	Towards populations
Before a flood	– Provide information about vulnerabilities of communities – Advocate for institutional action for flood management	– Raise awareness – Translate technical knowledge into readily understandable language – Increase public interest/ participation
During flooding	– Provide timely information about conditions and needs of affected people	– Disseminate warnings and information about the actual situation – Inform about actions undertaken by authorities – Suggest what to do/not to do – Facilitate communication between affected people
After flooding	– Continue to provide information about the conditions and needs of affected people – Forward the population's requests and complaints – Keep the attention high	– Inform on current and future strategies by the authorities – Help in directing donations – Improve preparedness – Guide people's reaction

Table 1 — Possible roles of the media in Integrated Flood Management

4 COMMUNICATION STRATEGY

4.1 Effective communication in flood management

84 Media influence perceptions and acceptance of risks, either negatively or positively. They play a significant role in the social amplification of risk, due to negativity, distortion, sensationalism, dramatization or exaggeration in the management of information (Farre, 2005). Nevertheless, a well-directed communication process can help people to be prepared, know how to act before, during and after a flood and feel less threatened (Baan and Klijn, 2004), as well as foster a more effective public response (Villalobos, 1998).

85 In the management of flood risk, communicating through mass media presents some limitations. Generally, media inform about what occurs, but they could do much more: they could explain the meaning of events, serve as guides during moments of uncertainty and as educators. Besides information media, some other communication approaches seek to generate processes for participation, reflection, dialogue and action during all stages of a policy, including the definition of the problem(s) to be addressed and the selection, implementation and evaluation of alternative solutions.

86 In other words, while information media focus on the message, other communication methods concentrate on the relationships among the actors and try to strengthen bottom-up policies. Communication that promotes people's participation in the process of risk analysis and decision-making has a much greater potential, since it contributes to the building of a solid social base for the proposed actions (Baan and Klijn, 2004).

87 Regardless of their frequency and impact, floods usually favour the production and circulation of information arising from different sources and representing various points of view and interests (Organización Panamericana de la Salud (OPS), 2009). This makes planned, intense and assertive communication essential in flood management. People normally select information that is significant to them, reflects their reality, responds to their needs (Baan and Klijn, 2004) and comes

from a reliable source. Thus, a communication strategy using a comprehensible language and reflecting the feelings, experiences and knowledge of the population to which it is targeted is fundamental.

88 The population's response to a flood alert constitutes a particular situation. The alert in itself does not guarantee that people will react, because they go through a multi-step process that involves (a) listening, (b) understanding, (c) evaluating the level of risk conveyed, (d) taking the risk as their own or others', (e) confirming the alert and (f) responding to it (Mileti, 1996; Parker et al., 2008).

89 For a reaction to an alert to take place, it has to come from a credible and reliable source, be coherent and consistent, provide complete information and be issued on time. It also needs to convey a given level of certainty as well as contain a guide about what people should to do if they find themselves in a risk situation. The frequency with which an alert is issued is an important factor to determine how people will listen, analyse and decide to act.

90 Knowing about these and other processes involved in the comprehensive management of floods is necessary for planning and better preparedness. As a measure of prevention and knowledge, it is important that communication campaigns are conducted on site and directed towards the population that may be affected by the hazards. This will make people aware that they live in a risk area and will push them to take precautionary measures over the medium and long term.

91 During the disaster caused by Hurricane Katrina in New Orleans in 2005, losses of life could have been avoided if people had been well instructed and informed of the fact that they resided in an endangered zone (Committee on New Orleans Regional Hurricane Protection Projects, 2009) (in addition to this, the lack of communication during the hurricane made it difficult to conduct evacuation and to coordinate among governmental agencies (Piper and Ramos, 2006)).

4.1.1 Communicating uncertainty

92 Flood forecasting and flood risk estimates rely on a combination of meteorology, hydrology, climatology, statistics, hydraulic engineering, and geography, altogether carrying along numerous sources of uncertainty (limited hydrometeorological observation records, spatio-temporal variability in precipitation and flood potential, changeability of climate, and the like).

93 While scientists can easily conceive and conceptualize uncertainty, the general population could have some difficulties in properly comprehending probabilities and terminology, leading to a misalignment between what the experts intend to convey and what the users understand (Morss et al., 2005; Morss et al., 2008; Gill, 2008; Ramos et al., 2010).

94 In addition to this, human perceptions can considerably affect the interpretation of contingencies and risk. For instance, studies indicate that people tend to overestimate the risk of flood immediately after a disaster and to underestimate it as time passes, conferring to uncertain data a more serious and pessimistic meaning in certain periods than others (Baan and Klijn, 2004).

95 Despite the challenges incidental to the task of communicating uncertainty, several reasons explain why the provision of this information is so necessary.

- First, it may assist people to make more effective decisions, especially when many options are available and need to be weighed up. Consider, for example, the situation of a civil protection local office deciding whether to evacuate a community ahead of a potential flood: knowing that the chance of heavy rainfall being experienced is 10 per cent allows the agency to immediately decide to begin evacuations.
- Second, if the population has an insight of the confidence of the flood forecast, its expectations about the accuracy and reliability of the message are modified and the possibility of frustration if the forecast is incorrect is reduced. As a consequence, users are more likely to retain trust in the source, being reassured of the honesty and objectivity of the communication providers. This is particularly true in the case of "false alarm", when making sure that people understand that decision-making in the presence of uncertainty may entail an incorrect warning could avoid the spreading of "crying wolf" syndrome (Gill et al., 2008).

96 Our communication strategy must, therefore, incorporate the management of uncertainty as a fundamental part of our messages. To have greater control on the complex interaction between this kind of information and the final reaction of people, some authors recommend the need for cooperation between the scientific community and decision-makers. Such partnership would favour an integrated bidirectional approach, where continuous feedback from the final user helps to incorporate decision-making necessities into the research and development process (Morss et al., 2005).

97 Hereinafter, different devices to communicate uncertainty are presented. Whatever tool is chosen, it is important to take language and cultural differences as well as the level of sophistication of users into account (Gill et al., 2008):

- Terminology: Agree on clear definitions of terms describing probabilities (for example, assigning them precise numbers) and explain the established scale to the public;
- **Colours:** Create a colour scale in which each hue corresponds to a certain probability. Attention must be paid to the fact that the "emotional" tints (for example, red) are assigned to extreme values;
- **Graphs, maps and charts:** These devices let the users concretize abstract figures and visualize complex information at a single glance.

4.1.2 Collaboration with experts in social and behavioural fields

98 As previously mentioned, the way people select and interpret information is highly influenced by their perception of risk and needs. Hence, to ensure that messages are received and understood as expected, an investigation of the mechanisms guiding public acceptance of flood communication is recommended during all stages of the management process. The involvement of experts in social and human behaviour could be the most suitable method to deal with this task, requiring specific psychological and sociological background.

99 In this collaborative relationship, both flood managers and social experts should try to fathom the other party's perspective, objectives and requirements, while, at the same time making their expertise available to contribute to a more effective and timely response. If, on the one hand,

behavioural science specialists should make the effort to understand the technical aspects of the disaster process, on the other hand flood managers should give adequate importance and allocate the necessary resources for the engagement of these subsidiary disciplines.

100 In disaster management, the communication dimension among professionals contributes to achieving common objectives and engaging in joint action in what has often been described as a multidisciplinary approach.

4.1.3 Coordination between flood managers and media

101 Since a disaster is a high-profile event, having good contacts with the media can guarantee that information will be sent to the population, as well as promote participation and guide collaboration among emergency response teams (Reynolds, date uncertain). Thus, it is important to establish and strengthen positive relationships with diverse media outlets – press, radio, television – not only during an emergency, but also before and after the event (OPS, 2009).

102 Once contacts are created, they need to be maintained and improved until a good level of coordination, an indispensable factor, particularly during crisis, has been achieved. Mechanisms to harmonize activities (for example, regular interviews or press releases) should be put in place and practiced continuously to reach a high quality communication output.

4.1.4 Communication for flood management in transboundary river basins

103 Communication for flood management in transboundary river basins is a very important and also sensitive issue, because it involves a range of scales (local, regional, national and international) (Brachet and Valensuela, 2012) and factors increasing complexity, such as different languages, cultures, laws, interests and resources. In this context, a lack of planning or poor coordination between the countries concerned will more likely generate contradictory, false or imprecise information, leading to negative reactions, situations of panic, and lack of trust in authorities that hinder rather than ease the management process.

104 Therefore, it is fundamentally important, first, to reconcile interests within countries and then among countries, and, second, to develop a common strategy to exchange knowledge and information and strengthen the communication capacities of all parties.

105 Such a plan should not disregard the following cardinal points:

- Create a coordination mechanism to assure that the information provided is not conflicting, late, or overlapping. In this regard, it is recommended that all senders share common and verified sources of information and that a priority order is established for receivers so that upstream and most vulnerable countries get news first. Establish a system of sequential transmission points avoids inundating recipients with doubled messages.
- Clearly define roles and responsibilities to guarantee a faster and better response to emergency and to prevent problems related to bad coordination and border limits. A disaster occurring in a transboundary basin is a disaster common to all the neighbouring countries, not a single party's problem in which responsibilities, actions, responses and reconstruction processes fall on one State.

– Establish a standard format to exchange information to facilitate dissemination, understanding and response. The use of settled graphic forms, for instance, is preferable to coded messages (unless the code is agreed and comprehensible by all parties). To avoid mistakes in translation, a language common to all the riparian countries should be chosen. Likewise, location references should be reported using arranged denominations or geographical coordinates. The creation of a shared glossary could also be desirable (Davidson et al., 2003).

4.1.5 Avoid misinformation

106 One of the most delicate aspects of flood management concerns the adequate handling of communication to avoid misinformation. When the lives of human beings are at stake, imprecise information or a sensationalist style can trigger a greater disaster than the hazard itself.

107 In the situation of a poorly managed communication strategy, three different phenomena are likely to occur (Vasterman et al., 2005):

– Framing:

  The setting of a broader narrative structure defining the event/subject through the propagation of a specific problem definition, causal interpretation, moral evaluation, and solution recommendations. Enriched with metaphors and images, in some cases the frame helps the public to better understand the issue, but the risk of dramatized, simplified, one-sided framing unleashing unexpected reactions is always latent.

– Media hypes:

  News waves triggered by a key event and fostered through intensive media coverage of correlated information (such as social actors' response, comparable incidents, moral and ideological evaluation of performances), attracting more and more attention. Media hypes are generally enclosed in a specific frame, since reporters look for confirmation of their scoops and select only the information reinforcing them, thus proving the tenability of the original narrative structure.

– False information spreading:

  Once false rumours are injected into the media world, they often gain traction and become widely held beliefs. Three mechanisms generally lead this process (Lux, 2008):

  - Biased assimilation, that is, when an individual is presented with a statement of unknown accuracy, he/she will accept or reject its validity according to his/her preconceived notions of what is correct. Once a false rumour becomes well established, a correction may become difficult to accept;
  - Information cascades, which materialize when awareness of the aggregate opinions of others influences an individual's taste and belief formation. Through this process, early news can have an undue leverage over the public's general acceptance of a statement of fact;
  - Group polarization, happening when individuals tend to assume more extreme positions towards a given subject if they discuss it in like-minded groups.

108 The circulation of misinformation hinders flood management from different points of view. First, it can provoke scaremongering and hardly controllable reactions in the population, which may later refuse to believe rectified communication and follow instructions by the authorities. Second, the public attention focuses on minor aspects while it is diverted from more central

questions that would give a stronger contribution to the management process. Third, incorrect messages are closely connected to false alarms, which reduce the credibility of alerts and their sources and, as a consequence, undermine the capacities of the population to respond to warnings (OPS, 2009).

109 The development of accurate communication and dissemination plans can be a valid support in the prevention of informational shortcomings.

4.2 Establishing a communication plan

110 Planning allows a course to be charted for the communication process as well as to identify the media that are going to be used and the actors who will be involved, depending on the human and material resources available. In addition, it is fundamental to set goals and objectives, define functions, establish responsibilities, allocate budgets and fix deadlines. In brief, it is a dynamic and ongoing process that requires continuous readjustment among resources, activities, aims and strategies (OPS, 2009).

111 Maintaining consistency with the flood management plans and programmes established by national or local authorities, the communication plan can be set up by responding to the questions detailed in **Table 2**:

What is our starting point?	Diagnostics
What do we want to achieve?	Objectives
With whom do we want to communicate?	Public goal
How are we going to communicate?	Strategies, programmes and media
When?	Frequency of the strategy
Who is going to participate?	Responsible parties
What are we going to use to implement it?	Resources
Does our communication plan work?	Follow-up and evaluation

Table 2 — Guiding questions to develop a communication plan
Adapted from (OPS, 2009)

In the following paragraphs we will briefly describe each of these stages.

4.2.1 Communication diagnostics

113 Diagnostics is the initial process through which information concerning the actual state of communication is gathered and systematized, showing the characteristics of the population, its perceptions of flood risks, the media used to get information, as well as the human and technical resources that the designated authority in each country has at its disposal to address disaster-related emergencies.

114 The picture resulting from the diagnostics helps to define the communication plan and its objectives, providing a baseline to evaluate achievements once the process is concluded. To develop a diagnostics, we firstly need to define what information we want to obtain and how we are going to get it, that is to say, the instruments we are going to use. Second, fieldwork is performed, and finally, the information collected is systematized.

115 Some of the tools most commonly used to carry out diagnostics are:

- **Survey:** providing quantitative results that allow making inferences about a population set without consulting all of its members;
- **Interview:** giving qualitative information from key informants (leaders, teachers, priests, and the like);
- **Participatory workshop:** a group exercise that enables some community members to reflect about and analyse a certain subject while at the same time providing the researcher qualitative information.

116 The choice of instruments depends, among other factors, on the objectives, resources and time available to conduct the diagnostics.

4.2.2 Definition of the objectives

117 Objectives should be established according to the communication priorities identified in the diagnostics. It should be remembered that not everything can be solved through communication – problems requiring structural solutions have to be clearly distinguished from those for which better communication management should suffice. The objectives need to express what we intend to achieve with our communication strategy and take into account the different phases characterizing a crisis or emergency. In other words, they define the proposed actions in relation to the various stages of flood management: prevention, emergency and recovery.

118 Using the Johari Window **(Table 3)**, one can determine communication needs on the basis of the differences in perception, knowledge and information about risk and weather among different actors. In this regard, it is crucial to keep in mind that perceptions are more important than reality (OPS, 2009). For example, a structural proposal to reduce exposure to floods can be perceived by the vulnerable population as a risk-increasing factor, while the technicians may present it as the best option. In this case, the communication initiatives could be directed towards unifying knowledge and bringing perceptions closer to actual risk through dialogue among actors, for example, providing the concerned people with the information they need to understand the functioning of the structural proposal. In this case, but also generally speaking, the aim is to broaden what in the Johari Window corresponds to "open knowledge" and reduce "blindness".

The **Johari Window model** was developed by American psychologists Joseph Luft and Harry Ingham in the 1950s to study group dynamics. It is widely used to understand self-awareness, interpersonal and inter-group relationships and to improve communication.

The scheme is composed of four "regions", "areas" or "quadrants" containing information about a certain participating subject, according to whether the information is known or unknown by the subjects themselves, and whether the information is known or unknown by others (Chapman, 2001).

Open knowledge: What we know and what they know	**Their hidden knowledge:** What they know and what we do not know
Our hidden knowledge: What we know and what they do not know	**Blindness:** What we do not know and what they do not know

Table 3 — The Johari Window
(Food and Agriculture Organization of the United Nations (FAO), 2008)

4.2.3 Definition of the target audience

119 The target audience refers to the specific actors that we are going to address through our communication strategy. Communication in the management of flood risk shall focus on:

- The affected or (potentially affected) communities. In this broad category, more specific groups should be distinguished according to various criteria, such as age, gender, area of residence, and the like. Particular attention should be paid to the most vulnerable segments of the population, such as children and elders, people with disabilities, prisoners, and the like;
- Civil society, which could give an extremely important contribution to the dissemination of our message, especially before floods to raise awareness and after floods to improve preparedness;
- Local authorities of regions neighbouring areas at risk, so that they can prepare to welcome refugees, help bordering villages during flooding events and sensitize their population;
- The general public, for which an informative approach aiming at providing a generic education on the topic is advisable.

120 Different strategies should be crafted according to the target audiences identified. In each case, it is essential to have a clear idea of the message we want to communicate before, during and after a flooding event.

4.2.4 Definition of short- and medium-term plans

121 If, on the one hand, a communication strategy represents a long-term plan to run the exchange of messages and information with all stakeholders, on the other hand, to work efficiently it requires the development of structured short- and medium-term schemes and programmes (FAO, 2008). Those include an accurate definition of the media and tools to be used, time and frequency of dissemination and tailoring of the message. Although this will be better described in a later section, what is fundamental to highlight here is the added value in terms of efficacy and supervision generated by the downscaling of the planning of communicational actions: briefer time frames allow precise and detailed choices for each phase, location and recipient, as well as an overall view and a full control over the entire process.

4.2.5 Identification of responsible parties and resources

122 A communication plan can be developed only according to available resources both material and human. An initial assessment of staff, funds and other means available enables flood managers to foresee a realistic series of communicational activities, proportionate to the actual

assets in their possession allocated to carry them out. For every scheduled action, human, financial and material resources should be individuated and set aside from the beginning of the planning process (OPS, 2009).

123 Similarly, identifying a person or team responsible for each activity favours effectiveness and coordination in group work, provides points of reference to internal and external partners and helps clarify statutory liability if a lawsuit is brought against the flood management authority.

124 If properly executed, this step of the communication planning ensures a balanced and efficient distribution of the available resources.

4.2.6 Planning of follow-up and evaluation

125 Follow-up and evaluation have the function to provide feedback about the reception, comprehension and impacts of the messages and to determine the effectiveness of the communication plan. Mechanisms for the appraisal of intermediate and final outcomes need to be determined before the implementation of the foreseen initiatives in order to adjust, adapt or redirect actions throughout the process.

This will be explained in detail in the section dedicated to the evaluation phase.

4.3 Establishing a dissemination plan

126 A dissemination plan is composed of three basic stages – selection of media and technology, creation of the message and choice of frequency of communication actions – whose goal is to define the practical aspects of the delivery of the message to the target audience. Based on the consideration of the media as a social good (Warnock, 2007), the dissemination plan relies both on international and local mass media, which are deemed to be particularly effective in communication for development and social change (Gumucio, 2001). Needless to say, a clear distinction between communication during emergencies and in normal situations is one of the basics of a valuable dissemination strategy.

127 Complementarity with the communication plan is indispensable to safeguard the consistency of the whole communication strategy.

4.3.1 Choice of media and technology

128 When selecting the most appropriate media to disseminate a certain message, different factors may be critical to determine the final choice, depending not only on the objectives and requirements set by the sender, but also on some conditions beyond his/her control, such as the literacy rate of the population or the state and extension of communication infrastructures. This paragraph outlines the characteristics of the main international and local mass media which make them better suited to certain situations or types of public than others.

129 Before entering the description of each tool, a general remark about the distinction between international and local mass media needs to be pointed out: Whereas the former grants a homogeneous reach to the general public (which, from some points of view, represents

an advantage, but also a serious limitation), the latter enables achieving greater impact and interaction with specific recipients.

130 Despite their limited territorial coverage, media operating locally usually reflect the distinct conditions of the zones in which they work and this closeness makes it possible to catch the population's attention and, more than that, to let it identify with the message. In so doing, these media have the capability to encourage collective action and social change, and for this reason their employment in projects related to development, risk management and food security is highly recommended by experts (Acunzo, 2009). Hence, while international media focus on the right combination of technology and information, local media center on sociocultural processes, stimulating reflection, dialogue and action.

131 In this context, a joining link between the two types of media can be identified in the Internet, which, by suiting multiple scopes and allowing interaction, brings global and local audiences closer (Medellín, 2006). Certainly, besides the opportunities offered by the Internet, a complementary utilization of both types of media would be ideal. A summary of media types and characteristics is as follows (see also **Table 4**):

- Radio:

  As one of the most accessible tools, the use of radio is especially dominant in those countries where more modern communication infrastructures (telephone cables, Internet connection, and the like) are lacking, not widespread or in poor condition. Additionally, it does not require any specific level of education of the recipients, provided that the information is delivered in a language understandable to them.

  Local radios in particular are known to have a strong impact on the population, because they allow a more direct identification with the message. This can occur, for instance, when hearing a known tone of voice, mention of recognizable places, and contents referring to familiar situations (Girard, 2003). Therefore, the adoption of radio is advisable for dissemination of warnings as well as of educational broadcast.

- Television:

  Like radio, television presents the advantage of being far reaching, both in a geographical and in a social sense, as it gets through to millions of viewers all over the world and comprehension is not precluded to illiterate people.

  Although suitable to both crisis and normal situations, one possible limit of the employment of television for didactic and informative purposes concerns the interest and level of attention of the audience: as television is generally associated with entertainment and offering a wide range of alternatives, educational programmes usually do not rank very high in ratings and shares, because viewers tend to get quickly bored and switch to other channels.

  Nevertheless, television remains one of the strongest opinion shapers, thanks to the power of images to construct values and arouse emotions.

- Fixed telephone and mobile:

  Even if communication by way of these tools relies on a network of telephone lines and radio links, thus being influenced by the conditions of infrastructures, it proves to be very useful to send alerts and to offer assistance to citizens through the establishment of hotlines.

  These can be available even outside emergencies to get information about preparedness measures, seasonal forecasts, legal assistance for damages, and the like, and are particularly helpful for certain categories of farmers, fishermen or rural residents (Panos, 2008).

The main advantage of phone calls consists in the possibility of receiving an immediate confirmation of the reception of the message and a direct feedback from the recipient.

Moreover, oral conversations bypass the issue of literacy, while a major downside of short-message service (SMS) texts is that they suppose that addressees are able to read the text.

Over the last few years, the commercialization of smartphones has made available another interesting instrument – applications. The great variety of functions they can perform (such as warning, education, crisis and everyday information) mixing graphic, audio and video devices, is, however, counterbalanced by the high costs of the sophisticated support technology needed.

– **Printed media, including the press (newspapers and magazines) and outreach material (flyers, brochures, books):**

The oldest and most well-established means of communication, printed media are probably the most effective way to inform and educate populations, due to the important role they still play in shaping opinions in many societies (Bieniek, 2011).

Although the forcefulness of explanatory texts may be hampered by low rates of literacy in certain regions, the use of figures and pictures allows any kind of public to be reached. The circulation of information by way of printed media is not strictly linked to infrastructural conditions, their dissemination being realized through the physical distribution of newspapers and leaflets place by place.

Apart from difficulties in reaching remote areas, the delivery of the message still depends on people's willingness to engage in reading and, for against-payment materials, to buy them.

– **Internet, including websites, social media and blogs:**

By reason of the fact that it combines text with images, sounds and videos, Internet allows total freedom of expression, thus enabling not only the tailoring of the message to the characteristics of the addressees (age, literacy, cultural and linguistic background), but also to craft it in such an attractive fashion as to capture their interest.

Above all, Internet matches the sender's need to verify reception and comprehension of communication with the internauts' desire for interaction by offering the possibility to leave feedbacks, start discussions, signal one's appreciation, choose personal settings, and so on. While undoubtedly representing a powerful means of communication, it suffers from two major shortcomings: the quantity (and quality) of information available, and the limited accessibility in some parts of the world (International Institute for Communication and Development (IICD), 2005, 2006).

If the main difficulty for users concerning the former is to select the most reliable and up-to-date news, when referring to the latter, we face the opposite problem, that is to say the exclusion from information of millions of people due to the limited availability and expensive price of information and communications technologies.

Media	Requiring a good level of infrastructures	Requiring literacy skills	Impact (general/ local)	Recommended kind of information
Radio	No	No	General and local	Warnings and educational
TV	No	No	General and local	Warnings and educational

Media	Requiring a good level of infrastructures	Requiring literacy skills	Impact (general/ local)	Recommended kind of information
Fixed phone	Yes	No	Local	Warnings and assistance
Mobile	Yes	Yes	Local	Warnings and assistance
Printed media	No	Yes	General and local	Warnings and educational
Internet	Yes	Yes	General and local	Warnings, educational and assistance

Table 4 — Media types and characteristics

4.3.2 Creation of the message

A | Selection of information and tone of communication

132 In our current society information is what we least lack; media such as the Internet open the door to huge amounts of news, data and facts, and the main difficulty lies in selecting the most reliable and appropriate information. Thus, considering that a population usually looks for concise but relevant information, it is recommendable to pick only a few targeted facts; submerging the public with large quantities of dispersed data only contributes to create confusion in people's mind.

133 To do this, we need to answer the following question: what do we want to communicate? The query relates, first of all, to what kind of information we want to deliver (warning, general education on the topic, preparedness tips) and, second, to what impact we aim for our communication (do we want to arouse certain feelings, raise interest, start a reflection?).

134 Defining these two issues allows not only to cherry-pick the most appropriate information, but also to choose the tone of communication, For instance, if we are instructing the population about what to do/not to do in case of flooding, we will use an assertive, plain and sharp language; if, however, the objective is to offer some food for thought to the audience, it is advisable to express ourselves through questions, metaphors and a soft persuasive wording.

135 Finally, a basic principle valid for any type of information and mode of expression is to try to inspire trust and credibility in the recipients by respecting conditions such as clarity, transparency and sincerity (Walaski, 2011).

B | Adaptation of information to the chosen media/technology

136 Every media uses a particular language. Some take advantage of images more than texts, others only of oral communication or sounds, still others combine all these forms together. To exploit the whole potential of each kind of media, the message should be "translated" into the "code" of the chosen means. For example, for communication by radio, it is preferable to avoid long elaborated concepts and to privilege brief trenchant sentences getting straight to the point, otherwise the risk is to lose the listener's attention. However, in printed media

one can produce more complex and in-depth texts, which could be supported by figures and tables. In the case of videos, the message breaks down into various languages that interact simultaneously, so that, to capture the surplus produced by the peculiarities of every code, great care has to be put into the balance, amalgamation and rhythm of images, wording and soundtrack.

137 When the dissemination plan foresees the transmission of the same information through different technologies, diversification and tailoring become extremely necessary. Copying and pasting the same message or picture from one tool to another may not only be misleading, but may also make our communication monotonous. The subsequent lack of interest by the public represents a missed occasion for the spreading and effectiveness of our communication strategy, since it annuls the ripple effect of recipients suggesting the product to friends.

C | Adaptation of information to the target audience

138 When drafting a message, one should look at it from the point of view of the recipient rather from that of the sender. Neglecting this step in social communication weakens the efficacy of the whole strategy, since information will not be received as expected. We cannot think of the recipient as an empty box in which we deposit our message; on the contrary, he/she is a complex subject imbued with knowledge, beliefs and opinions that filter and shape the interpretation of facts (Morss et al., 2008).

139 Therefore, the adaptation of the information to the target audience should set three priorities: Make the message...

- **Intelligible:** that is to say, forge language, select content and support it with the appropriate media according to the understanding capacities and needs of the public. Explaining what floods are to a group of children is totally different from illustrating the probabilities of flooding of a certain area to local adult residents.
- **Interesting:** As explained above, if you do not catch the attention of the audience, you will not accomplish your mission and, additionally, will lose the opportunity to use the receiver as a sounding board to multiply your outreach. To this end, it is desirable to identify the preferences of the public – for example, what type of media it consults more frequently.
- **Suitable** to the actual living conditions of the population you are targeting. A communication aimed at an urban public will not be the same as one aimed at a rural population; addressing vulnerable communities in a region at risk entails distinct content, wording and tools.

D | Timing of dissemination actions

140 The timing of dissemination actions is to be planned in the long, medium and short term. Whereas the long term coincides with the duration of the whole communication strategy, which could last several years, we can estimate as medium term the few months corresponding to the period of highest probability of flood, such as the hurricane season in some regions of the world. The short term is equivalent to the emergency phase, starting when flooding begins to materialize and ending when the greater danger has passed and reconstruction measures can be implemented.

141 As obvious as it may seem, the frequency of communication and dissemination initiatives is inversely proportional to the wideness of the time frame considered. If during emergencies the delivery of messages to the affected population and relevant stakeholders should be as intensive and recurrent as possible, in the medium and long term, especially in those phases when watchfulness decreases, regular and periodical activities can be scheduled at a lower pace to rekindle attention and monitor the level of reception by the public.

142 The creation of a timeline that indicates the amount of time estimated for each action is a helpful tool to allocate the appropriate human and material resources to every initiative. If correctly developed, it should reflect the order of priorities of the entire communication strategy, or it could represent an easy way to start establishing it.

4.4 Evaluation

143 Evaluation should not be seen as a simple score on a numerical scale to judge the goodness of a communication strategy; rather, it should be considered a learning process for all the parties involved, from decision-makers, to project implementers, to the target audience. This can be possible only if evaluation is conducted through a participatory approach, including all stakeholders, and is developed throughout the total duration of the strategy.

144 Here we suggest an evaluation procedure comprising three dimensions corresponding to the different stages of the management process: decision-making, implementation, and impact evaluation (Uphoff, 1985). Each of these components should respond to some key questions at the foundation of the evaluation process itself (Riddaway, 2006):

- What will be evaluated, when and how?
- Who will have the overall responsibility for the evaluation process? Who will do it practically?
- What will be done with the results of the evaluation and how will they be disseminated?

4.4.1 Decision-making evaluation

145 This type of evaluation is carried out during the definition of the project, in direct consultation with the officers who will put the strategy in place in the field and with potential recipients, and with the support of advisors and experts (Friedland, 2001). This initial appraisal (or consultation, as some authors name it) represents the first approach in the planning process to the material, perceptional and contextual conditions of implementation of the strategy. As such, it can be part of the communication diagnostics previously mentioned.

146 Generally, projects that do not have an evaluation mechanism at this stage tend to experience enforcement problems that could be easily predicted and prevented (United Nations Educational, Scientific and Cultural Organization (UNESCO) – United Nations Development Programme (UNDP) – World Bank, 2009).

147 Open consultations, an active listening attitude towards participants, and willingness to incorporate observations in the decision-making process usually result in a better-oriented communication strategy.

4.4.2 Implementation evaluation

148 Also called "process evaluation", this type of evaluation focuses on the implementation activities (Riddaway, 2006). It allows actions to be redirected towards achieving greater efficiency, according to contextual conditions not foreseen in the strategy's original plan. Some authors have also defined this kind of evaluation as "formative" or "corrective" (Contreras, 1985), since it permits adjustments during the development of a project, with the aim of refining goals, impacts and results.

149 The implementation evaluation relies on the collection of opinions (criticisms or recommendations for improvements) of potential or actual recipients about already performed initiatives and their effectiveness. Some of these elements emerge spontaneously, while others require ongoing observation and dialogue by way of instruments such as surveys, interviews and focus groups to surface.

150 Nevertheless, the flexibility of the strategy (and, implicitly, of the decision-makers setting it) reveals itself equally crucial for the incorporation of new and unforeseen factors in view of the optimization of the use of resources, the active involvement of the target audience and the maximization of expected effects. It is therefore recommended to ensure feasible participation mechanisms for recipients, as well as to link them to the evaluation efforts through adjustment devices, thereby improving the use of the research outcomes.

151 The implementation evaluation offers the opportunity to precisely outline initiatives, keep an up-to-date situational diagnostics, define and adapt solutions to and for recipients, and take into account areas and subjects needing specific actions; in other words, it serves the purpose of bringing about changes in the ongoing process according to partial results (Figueroa et al., 2002).

A | Monitoring

152 Along with qualitative assessment methods, the evaluation of implementation can also be realized using quantitative indicators, deemed to be particularly advisable for a temporal comparison of the state and impacts of our actions. To this end, communication plans need to define baseline indicators from the beginning of the project.

153 These will firstly show a particular snapshot and statistics of the initial conditions of the project and, as the information and data underlying the indicators are updated, will then portray its progress (UNESCO-UNDP-World Bank, 2009).

154 Experience has shown that these quantitative methodologies are not sufficient and need to be complemented by qualitative counterparts in order to fully understand how the communication process is progressing. Keeping the two approaches separate may cause confusion and, in the worst case, immobility and contradictions in the functioning of the strategy.

155 Thus, it is desirable to cross analyse data and information from both implementation evaluation and monitoring by means of a "mapping exercise" of the development stages of the plan that can be overlaid, exactly in the same manner as Geographic Information Systems function.

4.4.3 Impact evaluation

156 The impact evaluation, which some authors denominate *"ex post",* is undertaken at the end of the project to analyse if and to what extent the original objectives have been met. The overall purpose of this appraisal is not limited to a generic scoring of the strategy, but extends to the identification of the most effective elements on the one hand, and of the main hindrances on the other. In this sense, a successful project is one that brings about a reflection on the goals, conditions and methods through which it was carried out and that provides lessons learned for similar schemes. This perception of success broadens the classical definition, which only takes into account the achievement of planned goals.

157 Being based on the assessment of results, this type of evaluation gives a limpid picture of the usefulness of the communication strategy after it has ended and can, therefore, be used to open a new phase of the same project or become part of a feasibility study for new initiatives under similar conditions and objectives.

158 What the impact evaluation can add to the other two steps of the monitoring phase is a global vision of the long term processes taking place during implementation. These are defined by the general contextual framework and can be extracted only from the whole set of information available once the project is concluded. The results of the evaluation are expressed in an explicative and descriptive manner for the purpose of being useful and supportive to other initiatives.

4.4.4 What is to be expected from evaluation?

159 From a classical perspective, the impacts of a communication strategy are usually conceived in terms of behavioural change, variations in knowledge and attitudes, empowerment, capacity-building, coalition-building, partnership and resource development (Inagaki, 2007). When approached from a non-classical point of view, that is, considering the recipient as an acting and active subject and not only as a passive receiver of information, different outcomes are usually evaluated: a stronger body of knowledge, a greater ease in managing problems, the levels of organization in a community, solidarity and social cohesion, and common action (Communications Initiative, 2007). Although more difficult to measure, these factors give a more realistic portrait of the plan effectiveness and reinforce the participatory approach that informs the concept of Integrated Flood Management.

160 Likewise, sharing results with all stakeholders and disseminating them outside the circle of flood managers can bring back unexpected feedbacks that may prove to be more constructive and valuable than confrontational among known experts.

161 Finally, lessons need to be learned not only with regard to strong points and good practices, but also by recognizing weaknesses and failures. Learning from what is positive as well as negative improves our planning ability, thus benefiting future projects (Inagaki, 2007).

5 EXAMPLES OF GOOD PRACTICE

5.1 “Породични приручник за понашање у ванредним ситуацијама” A family guide by the Serbian Ministry of the Interior

Figure 4 — Serbian family guide cover

5.1.1 The initiative

162 The Department for Emergency Situations of the Ministry of Internal Affairs of Serbia, in cooperation with the Office for Democratic Institutions and Human Rights of the Organization for Security and Cooperation in Europe (OSCE) Mission to Serbia, published a manual for families about the best behaviour to be kept in emergency situations. Intended for the entire

population, the brochure represents the first initiative in the field of education and responds to the aim of providing civilians direct access to essential information during crisis. The rationale behind this lies in the idea that the citizen is the main actor in the emergency system because when a disaster occurs – often suddenly and without warning – people have to face alone various difficulties until rescuers arrive on the scene.

163 In addition to floods, the guide considers other hazards (fires, earthquakes, heat waves), not only describing the danger itself, but also providing answers to the most common questions and giving suggestions on how to act. This is achieved through coloured and friendly graphics, combined with a few bullet points and texts clarifying the pictures **(Figures 4 and 5)**.

164 To reach the widest possible population, the manual has been translated into minority languages (Albanian, Hungarian, Romany and Slovak), as well as English and Russian.

5.1.2 Positive aspects

165 Compared to other instruments and initiatives in the area of disaster preparedness, the Serbian family guide stands out in several positive aspects. First, it presents useful information in a synthetic but clear way, taking advantage of the communicative power of images and limiting texts to few sentences that support pictures. Second, advice is illustrated in the form of both positive and negative instructions (what to do/not to do), an easy technique to avoid confusing the reader with long, complex (and boring) explanations. Finally, the use of images allows various kinds of audience to be reached, including children and illiterates. This is clearly demonstrated by the fact that, although possibly not being able to read Cyrillic script, the reader can easily grasp the message conveyed by the pictures and understand how to behave.

Figure 5 — Manual pages about floods

The manual can be downloaded at www.osce.org/serbia/118655.

5.2 "Vigicrues: Information sur la vigilance crues" French Ministry of Ecology, Sustainable Development and Energy's website on floods

5.2.1 Overview

166 As part of the initiative Vigilance crues (flood surveillance) undertaken by the French Government in 2006, the website www.vigicrues.gouv.fr has the objective of informing the general public and flood managers of the conditions of rivers falling under the State's responsibility for flood surveillance, forecast and information transmission **(Figure 6)**.

167 Targeting a varied audience, including all stakeholders from inhabitants to professionals to local authorities in charge of warnings, alerts and emergency services, the website is built around the basic principles of simplicity and clarity. Through the use of visual elements, such as maps and colours, and limited recourse to text, it offers an overview of the actual state of national and local hydrological networks and the estimated level of vigilance to face potential dangers arousing in the next 24 hours.

5.2.2 The website

168 The website essentially displays a map showing the French rivers belonging to the Vigilance crues initiative divided into segments. Each piece has a different colour (green, yellow, orange and red), according to the assigned level of surveillance. Next to the map, a legend explains the level of risk associated with every colour, while the maximum level of vigilance in the country and the time and date of the latest update are shown on top of the page. A link to vigilance.meteofrance.com allows access to the map of meteorological surveillance by Météo-France.

169 By clicking on the river segments, users can visualize local maps supplemented by news bulletins reporting the chronology, evolution and intensity of floods and (whenever possible) forecasts. They also include a description of possible consequences, as well as advice on behaviour by relevant authorities. Additionally, local maps display hydrological stations, clicking on which one can find a graphic or table concerning the last measurements of the water level or flow.

170 All data and information are permanently available and constantly updated. Although maps are refreshed twice a day (at 10 a.m. and 4 p.m.), in case of sudden change or during flooding they can be revised at any moment and more frequently. Generally, the level of vigilance shown (that is, the colour assigned to rivers) is valid for a period of 24 hours; nevertheless, when hydrological conditions allow longer forecasts, these are published through bulletins.

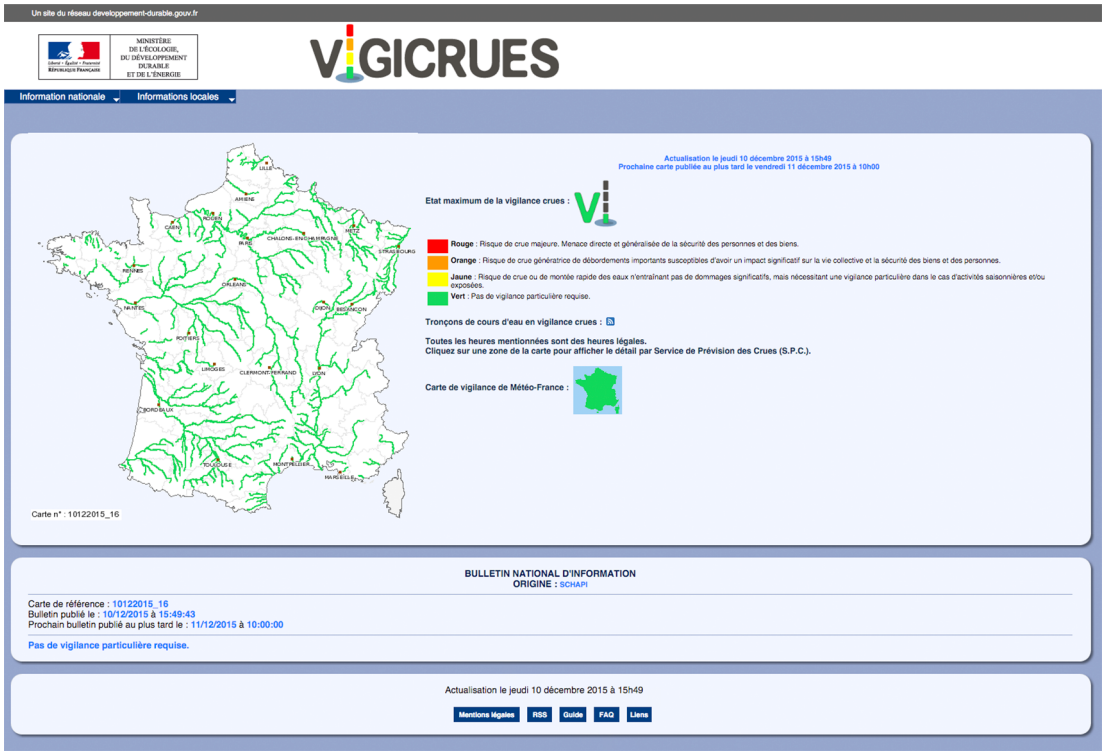

Figure 6 — Vigicrues.gouv.fr homepage

5.2.3 Positive aspects

171 vigicrues.gouv.fr can be regarded as a good-practice example of an institutional website providing flood information to the public for various reasons. On the one hand, information is offered in a very clear and impacting way, resorting to visual devices such as maps, colours and graphics. On the other hand, great attention is given to the completeness of content, for instance through the provision of both national and local facts, the display of the maximum level of vigilance in the country on the homepage, and a link to the Carte de vigilance de Météo-France.

172 Furthermore, the understanding by the audience of the information provided is not taken for granted: a detailed legend, interactive maps and explicit advice on how to act are simple but effective instruments to involve and engage users.

5.3 The Green Ninja Project: Using social media for public education and engagement

5.3.1 Introduction

173 Social media offer science communicators the opportunity to engage with a large fraction of their target audience at relatively low costs compared to traditional media. While potential viewers can number in the millions, it can also be challenging to break through the static of today's information-dense world. The Green Ninja Project **(GNP)** is described here as a best-practice example of the use of social media to communicate scientific and often complex climate-related knowledge to the general public. Examples of the Project's graphics are

shown in **Figures 7–9**. This tool provides guidance on the effective use of social media for public education and engagement.

Figure 7 — Green Ninja logo

5.3.2 The challenge

174 As knowledge about the climate crisis grows, so does the challenge of communicating complex climate scientific information in a way that is accessible, relevant and useful to the general public. In their germinal article on climate change communication, *"Making Climate Hot"*, published in Environment Magazine in 2004, Susan Moser and Lisa Dilling (Moser and Dilling, 2004) note several reasons for a lack of public attention to climate change. Among these is the uncertainty of climate research that influences models and predictions. The complexity of climate science is compounded by perception lags – the impacts of climate change caused by current behaviour can't be seen immediately. Successful communication about climate change therefore needs to address the complexity of climate science and establish relevance for individuals and communities.

175 One crucial target audience is children because of the influence they have on parents' attitudes and behaviour, the pedagogical opportunities available through K-12[1] educational systems, and because as future leaders of the world, they will inherit the climate problem, and in particular will deal with the impacts of today's response to climate change. The GNP aims to empower the next generation to be part of the public response to climate change by addressing the particular challenge of making scientifically accurate climate information accessible to youth.

5.3.3 Introducing the Green Ninja Project

176 The GNP started in the autumn of 2010 with funding from the National Science Foundation (United States) to improve climate change education. The initial project goal was to produce youth-oriented short films that featured stories about climate science to help students see the connections between their lives and our changing climate. The films were designed to tell stories about action on climate change through the humorous adventures of the Green Ninja, a climate-action superhero. Although the initial funding supported a set of live action and animated films, later funding enabled the GNP to support teachers through the development of curriculum associated with Green Ninja films. Today, the GNP strives to transform youth culture in ways that promote informed action on climate change. Efforts focus on social media communication platforms because of the ease of distribution, low cost, and the potential to connect with individuals in ways that promote real engagement. The aim is to engage a group of students who (a) see the world through a climate-change lens and (b) regularly make decisions informed by their understanding of our climate system.

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1 K-12 is a designation used in the United States for the sum of primary and secondary education (from kindergarten to twelfth grade, that is, from 4 years to 12 years of age).

177 During the three years of activity of the GNP, one of the primary successes has been the development of a strong team of committed and creative professionals and students working primarily within a university environment. This team has assembled a string of accomplishments such as producing award-winning short films, developing a loyal following on YouTube and Facebook, and building partnerships with business and local government. Additionally, through a series of teacher professional-development workshops, over 100 teachers use Green Ninja materials in their classrooms. The challenge, as with many small non-profit projects, is how to secure adequate funding to grow in a sustainable manner, and how to communicate the message through the static of an already information-crowded world.

5.3.4 Best practices

178 A key barrier to climate communication is the lack of coherence in the climate story. Climate science is extremely complex, so people receive information in bits and pieces. News stories on drought and its effect on agriculture remain separate from consumer experience of increased food costs and municipal water restrictions. Climate science is often disconnected from public experience of climate change.

Figure 8 — Green Ninja banner

179 The GNP utilizes principles of digital storytelling to make climate science accessible, interesting and relevant for young audiences. Humans, particularly children, learn through story. Human beings are storytellers, making decisions not solely through reasoning but also through values. Narrative lends coherence to complex lines of information, establishing stories that are relevant for individuals in their daily lives. For climate communication, simply declaring the importance of scientific findings is not enough. Audiences respond better to stories that demonstrate why certain subjects are important.

180 The goal of the GNP is to create kid-friendly educational content that accurately communicates climate science in an accessible, entertaining and action-oriented manner. The creative vision and action plan of the GNP focuses on effective communication strategies implemented through various social media tools. Much of the original content emerged somewhat organically, the

result of a creative process that eludes description. As further materials were developed, it was recognized that establishing a common communication framework ensured that all content reinforced a coherent story about climate change using effective practices.

181 Five principles were adapted based on Moser and Dilling's recommendations for improving climate change communication as a guide for robust social media practices about climate change:

A | Abide by basic communication rules

182 A primary principle for any communication endeavour is to know one's audience and keep the communication relevant to that audience. The primary public of the GNP was identified with young people aged between 10 and 18 years, with little or no knowledge about climate change and why they should care about this topic. Since it was recognized that the audience is immersed within social media technologies such as YouTube and Facebook, the content and engagement strategies were designed with these tools in mind, since that is where this public spends time.

183 A suite of good practices is common in many popular YouTube videos and the GNP has adopted a number of these to help boost engagement. First, films are relatively short (2–3 minutes), and fast moving to help maintain audience attention. Humour was used both to make the films fun and engaging, and also to soften the stream of negative news that is often surrounding our environmental system. The goal here is not to hide the reality of the situation, but rather to empower the audience to focus their attention on how to improve the state of the planet and not get trapped in all the negative indicators. Finally, each film is focused on a single message that is reinforced through the film and the associated educational materials. These basic communication rules were applied to our YouTube films to improve their effectiveness and interest.

B | Use opportunities well

184 A key component of effective communication is regular content. YouTube is a popular video platform with over 3 billion views a day. Although videos that go viral get a lot of press, it is actually a fairly rare event. More common are popular YouTube channels that are built up from regular content (for example, weekly) using a strong social media platform for engaging users. Since people are watching YouTube instead of television, the idea of regular weekly programmes can encourage viewers to subscribe to a channel. For the GNP, engagement with users is an important goal, so producing regular content becomes a priority.

185 Effective climate communication provides a call to action. One of the primary differences between watching television and watching a video on YouTube is the potential social interaction. Television is primarily one way – people watch and listen. Social media platforms, including YouTube, are two-way and allow the user to react and interact in some way. Each video on the Green Ninja Show aims to include a call to action, a way for people to get involved and participate. Calls to action could range from sharing a video on Facebook or Twitter, to uploading photos of themselves taking a particular related action on Instagram. The development of regular content and establishment of effective calls to action both serve to better engage the audience.

C | Deploy persuasive techniques effectively

186 A challenge of climate change communication is to make science communication persuasive. One of the keys to persuasiveness is the idea of "show don't tell". The GNP uses this strategy to access its brand and products. The aim is to be youthful, fun and quirky: instead of saying this, these characteristics were created throughout the project. In developing animated characters and logos, student focus groups gave their feedback on the look and feel and these ideas were applied to the website and other promotional designs. And because humour is somehow subjective, small focus groups or surveys were used to get feedback and make revisions where necessary.

187 Effective climate communication must transmit impacts of climate change that may be geographically or temporally remote. Social media offers a way to deploy persuasive techniques to maintain audience awareness of climate news, including recent scientific research. For example, Twitter offers a way to create a media stream of current news and the opportunity for action. At present, the website offers news and Twitter updates about current climate science topics that are particularly relevant to young people. Although media (films, graphics) produced by the Project focus more on climate solutions, the website conveys the urgency of taking action through recent news.

D | Use trusted messengers to communicate

188 A key component to effective climate communication is building a base audience of interested, engaged people that can leverage information into action. This requires broadening the circle of stakeholders and communicators who can be trusted to spread the message.

189 The GNP has two trusted messengers. First, the Green Ninja character around which the story revolves. The Green Ninja was designed to be fun, friendly and smart, characteristics that allow him to become a trusted messenger. Second, the GNP relies on educational partnerships with teachers to get content to their students. Thanks to teacher professional-development workshops and other informal connections, various science and mathematics teachers have started using Green Ninja films and curriculum in their classroom. Since teachers are again trusted messengers for their students, these collaborations have been very effective in sharing climate science topics with students.

E | Engage audiences

190 As mentioned above, the goal of social media and what distinguishes them from more traditional media is their ability to engage with the audience. A popular image shows that people who watch television sit back in their chair while people on computers sit forward on their chairs. The idea here is that computer users are more committed and if they do not like what they see, they move on quickly. Engaging your audience is central to the social media experience, and designing a communication experience around connecting with the audience offers a more lasting and potentially more effective way to get a message across.

191 The design of the Green Ninja Show employs many of these best practices in an attempt to engage a larger audience in ways that will promote informed action. The first season of the Green Ninja Show will have weekly episodes for 16 weeks. Each episode will have a simple call

to action and a special teacher web portal will be available to help teachers use each episode as an engagement point for their classes. The social media plan builds on past successes and reaches out to new bloggers and influencers in the content area. The framework for the Green Ninja Show allows a variety of presentation formats (live action, animation, puppetry, interviews) and was produced and reviewed by various faculty/student teams both for educational content and also for popular appeal.

5.3.5 Conclusion

192 The framework described here offers communication strategies designed to tap into individual and cultural strengths and values and thus appeal to local and global audiences. In this way, one follows what Moser and Dilling call a "unite-and-conquer" approach – to build coalitions of informed youth who are empowered to engage the climate problem in their families, schools, neighbourhoods and cities to effect change on a national and global scale. These communication strategies were mapped onto a social media structure in order to attract young people in an engaging manner. Although the use of social media tools can be demanding, they also offer promise for real engagement in ways that differ from traditional media. The GNP has found these tools helpful in reaching a diverse audience about the challenges and opportunities associated with our changing climate. We would expect that communicators in other fields would also benefit from employing some of these strategies.

Figure 9 — Green Ninja banner

5.4 Crisis mapping

5.4.1 Introduction

193 Crisis mapping is the real-time gathering, display and analysis of data during a crisis. The data sources used include social media (Twitter, Facebook, Flicker, among others), direct messages from observers using either SMS or a website form, and news reports. Different kinds of crises can be covered, from natural disasters, to social/political conflicts, such as elections. The

outputs from crisis mapping usually consist of situation reports and maps, most of which are shared openly online.

194 This process involves a wide range of parties: crisis mappers, responders, the public and other information providers. Crisis mappers represent a bridge between the large amount of data now available in every crisis, and the responders who need information from that data but would be quickly overwhelmed if they tried to process it in real time whilst managing a crisis response. Most crisis mapping groups include highly-skilled individuals and subject matter experts belonging to disparate fields (for example, in information technology, engineering, geography, political science and media), and train their members on both data-handling techniques and issues (for instance privacy, security and verification) and on the processes that they have set up to reliably manage that data.

195 Since its first utilization in 2010 during the Haiti earthquake, crisis mapping has been employed on various occasions, for example during the 2010 Pakistan floods, the 2011 Japanese tsunami, the 2011 Libyan and 2013 Kenyan elections, and many other smaller events worldwide. Among these, several major and minor flood events have confirmed crisis mapping's applicability to community-based flood reporting and management **(Figure 10)**.

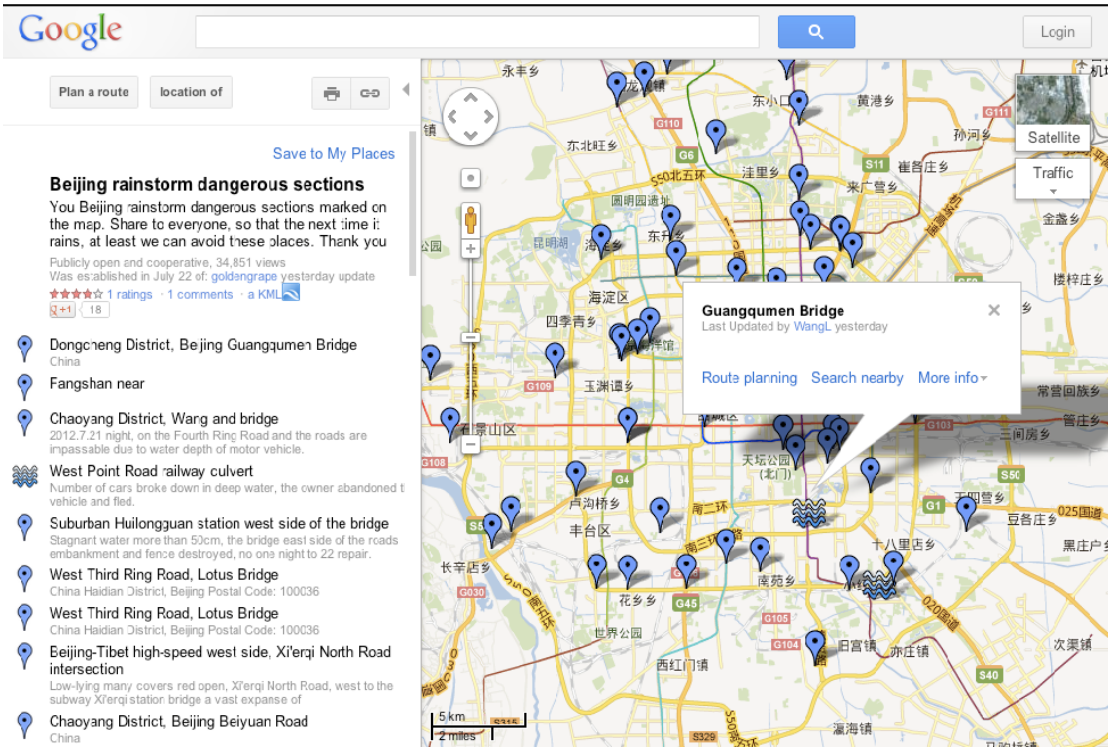

Figure 10 — Example of Crisis Mapping for the 2013 Beijing floods

5.4.2 Process and tools

196 Few crises are predictable, so most crisis-mapping groups have now developed processes that they can either use directly or modify slightly to fit a new event, allowing them to act quickly. Shown in **Figure 11** is an example process containing elements common to many crisis-mapping deployments. The large numbers of volunteers on each deployment are split into smaller teams, each with a specialist task. Media monitors check social media feeds for information about

the event, and compile lists of useful sources on it, including news sources, official sources, private individuals producing quality data, and keywords (for example, Twitter hashtags) being used to mark facts about it. The team converts each actionable piece of information found into a "report" (summary of one piece of input information), that they categorize and then pass to other teams to refine (for example, by translating into a common language, such as English or Spanish, or transforming geographical references into latitudinal/longitudinal locations) and verify. SMS monitors follow a similar process for information received directly from mobile phones. Once verified, the facts are shown on a situation map, generally publically available, and an analysis team (not present in this diagram) uses data-science techniques to convert the information in the reports into a regular situation report, usually available only to responders.

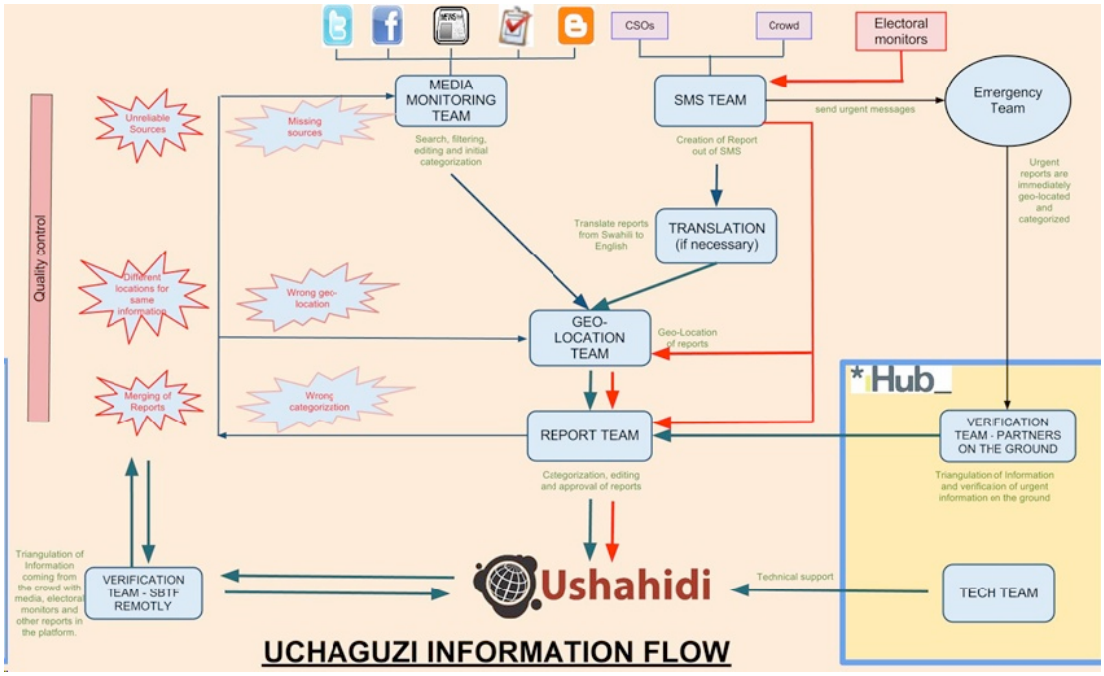

Figure 11 — Standby Task Force's process for election monitoring in Kenya, 2013

197 Another important work carried out by crisis mappers during critical events is the conversion of aerial imagery into online maps (usually with the program Open Street Map), and the search for aerial imagery for objects of interest to responders, including informal refugee camps, changes in structures (for example, from hurricane damage) and flood outlines. Much of this work can be "turksourced", that is, an algorithm is used that allocates small pieces of work (for example, map tiles) to each volunteer, and combines and compares their results (typically each tile is given to at least three separate volunteers) to form a large-scale picture.

198 Numerous tools have evolved with crisis mapping, and many of them are open source, that is to say freely available for anyone to use or adapt as needed. Open Street Map and Google Maps are often used as base maps for deployments; reports are added to those maps through systems like Ushahidi and Taarifa, while response coordination is carried out by way of tools such as Sahana, and deployment coordination by existing technologies like Skype, Googledocs and Ning. More specialist tools include Crowd Flower for turksourcing and various data-science and Geographical Information System **(GIS)** tools, comprising Open Source GIS **(QGIS)** and R, for analysis. Crisis mappers have developed guidelines and processes for working with each of these programs.

199 Nevertheless, during an event the most beneficial resource available to crisis mappers is not processes or tools, but connections. Over time, crisis mappers have either built relationships with, or become part of, formal response agencies and local communities, without which their ability to produce the information needed by them would be diminished. These relationships come either through direct contact during events, or connections made through related conferences, communities and event simulations.

5.4.3 Issues

200 Crisis-mapping deployments present some major issues. First, privacy (the protection of individuals' data, including data that could be used to identify them); second, security (the reduction of risk from deliberate harm to volunteers and reporters); third, veracity (the verification of information received, and the minimization of attempts to 'spoof' the system with incorrect news); fourth, legal protection (the mitigation of potential legal suits arising from mapped data).

201 As crisis mapping becomes increasingly popular, a new issue is emerging – timeliness, the ability to produce reports based on current inputs the volumes for which might be very large. The response to the problem of overwhelming amounts of information has been to both streamline the tools and processes used by the teams, and to investigate the use of robotics (that is, autonomy) and data-science techniques to separate work into tasks and inputs that can easily be handled by computers on the one hand, and those that should continue to be processed by people on the other.

5.4.4 Global flood news

202 globalfloodnews.com is a website monitoring mainstream and social media reports of floods on a global scale. Making use of the Ushaidi platform, it displays on a map the information about flooding events collected all over the world. Reports can be selected according to their source (trusted reports, Google, Twitter, Flickr, and the like) and time frame, and a red label indicates if they are unverified.

203 **Figure 12** illustrates an example of reports concerning floods in the North Indian state of Uttarakhand in June 2013.

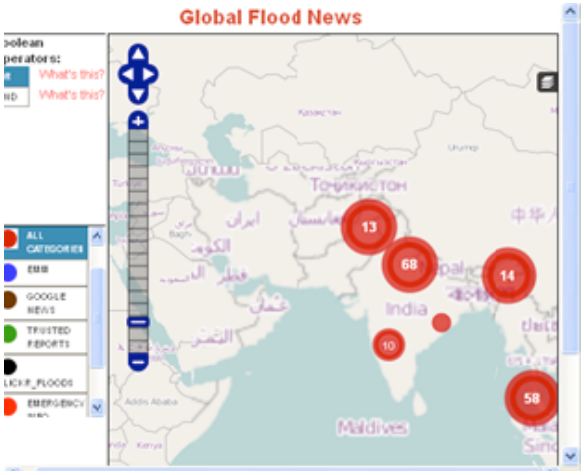

Figure 12 — Example of crisis mapping for the 2013 floods in Uttarakhand, India

5.5 American Red Cross Flood App

5.5.1 Overview

204 Floods are the most common natural disaster in the United States. In early 2014 the American Red Cross developed its new Flood App to help save lives and reduce losses from floods and flash floods (the Flood App icon, **Figure 13**).

Figure 13 — The Flood App icon

205 This free app gives iPhone, iPad and Android smart phone users instant access to local and real-time information, so they know what to do before, during and after a flood. The content is available in English and Spanish based on the user's language settings on their mobile device.

5.5.2 App features

206 Flood App includes location-based, audible National Oceanic and Atmospheric Administration flood and flash flood watches and warnings covering the United States territory, which reach the user even when the app is closed (**Figure 14** illustrates screenshots from the app).

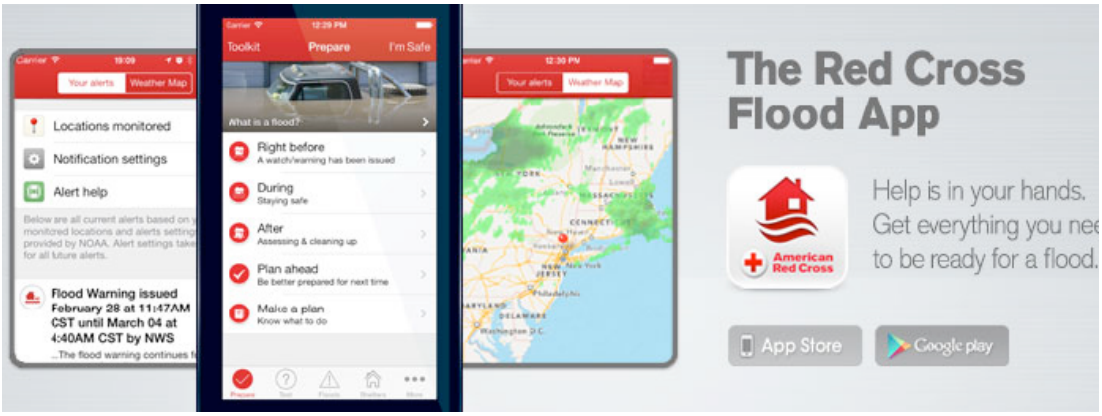

Figure 14 — Flood App screenshots

Other features include:

– One-touch "I'm safe" messaging that allows users to send a message letting family and friends know that they are out of harm's way;

- Preloaded content that gives users instant access to critical action steps to be undertaken during, but also before and after flooding, even without mobile connectivity;
- Emergency toolkit with flashlight, strobe light and audible alarm to let others know where you are;
- Locations of open Red Cross shelters;
- Real-time recovery resources for returning home and cleaning up;
- Badges that users can earn through interactive quizzes and share on social networks.

5.5.3 Background

207 The Flood App is the latest in the series of Red Cross emergency preparedness apps that put lifesaving information right in the hands of people whenever and wherever they need it. The expert advice in Red Cross apps, which also include apps for first aid, tornadoes, hurricanes, wildfires, earthquakes and other services, has been used to help save lives during disasters and medical emergencies. Red Cross apps have been downloaded on more than 4 million mobile devices.

208 Flood App, along with the other apps, can be found in the Apple App Store and the Google Play Store for Android by searching for American Red Cross or by accessing www.redcross.org/mobileapps.

5.6 Farmageddon: A virtual drought to raise awareness among online farmers on World Water Day, 22 March 2013

5.6.1 Overview

209 *"Farmageddon"* stands for the initiative undertaken on 22 March 2013 when online farmers on Farmerama (see description at the end of the chapter) were hit by a virtual drought for a whole day and had to face its consequences: their fields were dry, their crops burnt and their animals thirsty. The first online drought on World Water Day 2013 aimed to raise awareness among the 45 million Farmerama players of the reality of water issues, especially of the consequences of drought on small farmers worldwide.

210 Indeed, most small farmers in developing countries depend on rainfall to grow food and droughts can have terrible consequences for them, their livelihoods, their health and, more generally, on global food security. Water harvesting and storage, as well as irrigation technology can therefore make a big difference for farmers.

5.6.2 The initiative

211 The initiative was organized by the FAO and UN-Water through the FAO EndingHunger campaign and the World Water Day campaign on the occasion of World Water Day on 22 March 2013. The idea behind "Farmageddon" was developed by Saatchi and Saatchi (Frankfurt office), which involved Bigpoint (a game development company) in the design of the virtual drought **(Figure 15)**.

Figure 15 — Farmageddon presentation picture

212 On 22 March 2013, the players who logged in to their online farm on Farmerama found everything dry and no water available **(Figures 16 and 17)**. They were then given the choice to carry on playing – without water for the day – or to end the virtual drought by spreading the word or making a donation for low-cost pumps, water tanks, tubing and other supplies for small farmers around the world through the FAO EndingHunger campaign.

213 The virtual drought on Farmerama intended to get in touch with a kind of public – online players – that is not necessarily easily reached by the World Water Day initiative and other awareness and fund-raising campaigns of the United Nations. By simulating a drought on online farms, Saatchi and Saatchi and involved partners managed to enter the world of this new audience and show it very concretely – players realized that without water their homesteads were in trouble – and in an original way how drought can affect the life of real farmers, their production, their livelihoods, their health and that of their family.

Figure 16 — A virtual farm on Farmerama

Figure 17 — The same farm on 22 March 2013: the virtual drought hits Farmerama

5.6.3 Outreach efforts

214 The drought on Farmerama materialized through specially made graphics of a dry and damaged environment, and the impossibility for online farmers to water their fields: no water was available. Players were offered the possibility of visiting a microsite (http://farmageddon.eu/) specially created by Saatchi and Saatchi under the visual identity of the World Water Day 2013, to find out more on the campaign itself and on drought and water issues in general. They could also donate to water equipment for small farmers through the FAO EndingHunger campaign.

215 The initiative was featured on the EndingHunger website as well as on the homepage of the World Water Day website on 22 March, with a special announcement and a page dedicated to it. Farmageddon was also publicized through the social media channels of the World Water Day, the EndingHunger and Saatchi and Saatchi networks, including Facebook and Twitter. Saatchi and Saatchi also issued a press release on 22 March to announce Farmageddon and the objectives behind the initiative.

5.6.4 Results

216 The initiative created an interesting online buzz, especially on Facebook and Twitter. The post on the World Water Day Facebook page was viewed by almost 5000 people and was shared 60 times. Farmageddon tweets were retweeted by many United Nations agencies including the United Nations Office for the Coordination of Humanitarian Affairs, the United Nations in Brussels, the United Nations Children's Fund, United Nations Women, and the Zero Hunger Challenge, as well as other individuals and non-governmental organizations.

217 Farmageddon was also featured by Mashable as one of the nine efforts described in *"World Water Day Campaigns Making a Splash on the Web"*.[2]

2 See http://mashable.com/2013/03/22/world-water-day-social-media

218 Beside the successful word of mouth on social networks, Farmerama players also talked about the virtual drought within their community, although less than expected. Reaching this new audience revealed itself not to be as easy as predicted, but on the whole Farmageddon was appreciated as a very original starting point in this direction.

5.6.5 Background

– World Water Day

  The International World Water Day has been held every year on 22 March since 1993. Its aim is to raise awareness of water-related issues and promote the sustainable use and management of the world's water resources. In 2013, World Water Day addressed "Water Cooperation" as a reflection of the 2013 International Year of Water Cooperation and was coordinated by UNESCO on behalf of UN-Water (www.unwater.org/water-cooperation-2013).

– The FAO and the EndingHunger movement

  Founded in 1944 with headquarters in Rome, FAO is a specialized agency of the United Nations system, leading worldwide efforts to end chronic hunger and build a food-secure world. It works with its 191 member countries to make sure that people everywhere have regular access to enough high-quality food for an active, healthy life. The EndingHunger movement, the FAO educational outreach programme for young people, gives youth and non-specialists a way of getting involved in the drive to end hunger (www.EndingHunger.org).

– Farmerama

  Farmerama is a farming simulator by Bigpoint where players can grow and harvest crops and raise animals. Farmerama is available in 22 languages and has a total of 45 million users (us.farmerama.com/).

– Saatchi and Saatchi

  Saatchi & Saatchi is a global advertising agency network with 140 offices in 76 countries and over 6,500 staff. It was founded in London in 1970, but is now headquartered in New York (saatchi.com/en-us/).

219 More information on Farmageddon is available at www.unwater.org/water-cooperation-2013/media-corner/news/farmageddon/en/.

5.7 Emergenza alluvione: An educational commercial by the Italian Civil Protection

5.7.1 Overview

220 Emergenza alluvione (that is, *"flood emergency"*) is the title of a commercial developed by the Italian Civil Protection in 2007 to educate the population on how to behave in case of flooding. In the video the two main characters, Protezio and Disgrazio show the most common actions undertaken by ordinary people when they are reached by a flood: while Protezio, the clever one, performs best practices, Disgrazio, the dumb counterpart, accomplishes only wrong and dangerous deeds **(Figure 18)**. Comics are accompanied by a soundtrack explaining the images and giving hints and tips about what to do/not to do in a very clear and plain language.

5.7.2 The initiative

221 The commercial is part of a wider multipronged campaign about risks realized in cooperation with **Fondazione Pubblicità Progresso**, a foundation promoting social communication. It aims to sensitize public opinion on certain seasonal risks (brush fires, floods and heat waves) at the centre of public attention through short (around 30 seconds) funny cartoons built around two opposite testimonials, the above-mentioned characters Protezio and Disgrazio (two fictitious names recalling the Italian words *protezione*, that is *"protection"*, and *disgrazia*, that is, *"adversity, disaster"*).

222 Created and first broadcast on national public television channels in 2007, the commercials were transmitted again several times during the following years, being coupled since 2010 with a radio message. Whereas the media planning and buying was run by the Editorial Department of the Presidency of the Council of Ministers for the Italian Civil Protection, the conception and realization of the drawings were assigned to Leo Ortolani and Flavio Campagna Kampah, respectively well-known Italian cartoonist and graphic designer under the creative direction of the Communication Office of the Civil Protection.

5.7.3 Positive aspects

223 As a component of a preventive strategy by a government agency in charge of flood management at the national level, this commercial presents various positive aspects: First, it gives very simple and synthetic information in the form of "what to do/not to do" suggestions. Second, it combines an easy vocabulary with coloured images, thus making the transmission of the message immediate and, at the same time, reaching different kinds of audience (for example, children, illiterates, non-Italian speakers). Finally, it tries to attract and keep the watchers' attention high through an amusing style, both in the aspect and actions of the characters.

224 The commercial can be viewed at www.protezionecivile.gov.it/jcms/it/view_gal.wp?facetNode_1=f4_5_3&prevPage=multimedia&numelem=4&contentId=GAL21041#top-media.

Figure 18 — Screenshot of *Emergenza Alluvione*

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(Unless otherwise noted, all online references have been last accessed in July 2014.)

ANNEX I - ACRONYMS

APFM	Associated Programme on Flood Management
CELSA	Centre d'Etudes Littéraires et Scientifiques Appliquées
CIESPAL	Centro Internacional de Estudios Superiores de Comunicación para América Latina
FAO	Food and Agriculture Organization of the United Nations
GIS	Geographical Information System
GNP	Green Ninja Project
GWP	Global Water Partnership
IICD	International Institute for Communication and Development
IPCC	Intergovernmental Panel on Climate Change
ISCRAM	Information Systems for Crisis Response and Management
IWRM	Integrated Water Resources Management
OPS	Organización Panamericana de la Salud
OSCE	Organization for Security and Cooperation in Europe
PWSP	Public Weather Services Programme
SARF	Social Amplification of Risk Framework
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNISDR	United Nations Office for Disaster Risk Reduction
USAID	United States Agency for International Development
WMO	World Meteorological Organization

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