DV 7.6.5 - Guidelines for Effective and Inclusive Risk Communication

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Table of Contents

1. Executive Summary

This deliverable presents the main research activities undertaken in Work Package 6, "New Models of Education and Communication for Resilience to Risks", as part of the RETURN project. The work supports the development of guidelines for inclusive and innovative risk communication. For this reason, the research focused on how risk communication can effectively integrate relational and trust-building dimensions, innovation in design tools, and the management of complex issues such as uncertainty. These dimensions are essential for sustaining institutional credibility and citizens' preparedness in multi-risk contexts.

We live in a complex era, in which climate change, the intensification of natural hazards, and the pervasiveness of their consequences must be communicated within media ecosystems characterized by the proliferation of sources and increasingly advanced digitalization. In this context, it is no longer sufficient to communicate risks and preventive strategies: it is necessary to build a capital of trust between institutions and citizens. This deliverable contributes to this goal by presenting a research model for risk communication that integrates theoretical reflection and documentary analysis with empirical investigation and structured citizen listening. This replicable process provides a framework for research, action, and evaluation to advance evidence-based, inclusive risk communication across different risks and contexts.

Methodological approach

Throughout the RETURN project, a multi-method approach was adopted to integrate different knowledge and operational needs.

1. **Documentary analysis**, helpful in understanding the international and national landscape—for example, through the study of international guidelines promoted by major risk management agencies, and of national Civil Protection plans.
2. **Scoping and systematic literature review** of international studies, conducted both at the beginning of the project to build a database of tools, practices, and conceptual challenges in risk communication, and at a later stage to explore a crucial issue: uncertainty in defining and communicating natural, environmental, and climate-related risks.
3. **Qualitative interviews with institutional stakeholders** (representatives of the Civil Protection and local authorities, researchers in public research bodies, freelance professionals, and communication experts), aimed at exploring, among other aspects, conceptions of risk communication and how participation (and consequently trust) are operationalized in practice.
4. **Qualitative research with university students**, designed to test AI-generated risk communication materials varying by *source* (Mayor vs. Civil Protection) and *framing* (gain vs. loss), to explore preferences, credibility, trust, and ethical implications regarding the use of AI in risk communication.

5. **Quantitative research with a survey** administered to a representative sample of the Italian population. The survey explores risk perception and familiarity, informative patterns and media habits, trust in sources and AI, and framing preferences.

Together, these methods enable exploration of how institutions, experts, and citizens construct meanings around risk and how they integrate complex issues, such as uncertainty or ethical reflections on technological tools, into their practices and knowledge.

Main findings

Building trust and credibility through participation
- Trust is a powerful relational asset, built through continuous, inclusive, and transparent communication during non-emergency periods.
- Participation expands collective knowledge and strengthens institutional legitimacy.
- Institutional credibility also depends on how organizations design and stabilize participatory practices.
- Although communication professionals are aware of organizational, bureaucratic, and cultural constraints, their suggestions point toward a model of risk communication that includes risk education from school age, a widespread presence in everyday public spaces, and structured listening through codified practices.
- Professionals feel the need to create "communities of practice" for the sharing of communication strategies that concern a specific field, such as natural hazards.

Innovation and AI-assisted communication
- Experimenting with generative artificial intelligence enables systematic testing of communication formats, but human supervision and contextual adaptation to local needs remain essential.
- In the study with university students, messages with gain and loss frames were perceived differently: *gain-framed* messages emphasized cooperation and solidarity, while *loss-framed* ones were more explicit in linking causes and consequences and in prompting action.
- Messages from mayors were associated with empathy and hyper-local identity, while Civil Protection messages were perceived as competent and oriented toward collective safety.
- The ethical and transparent use of AI (including, when necessary, disclosure practices) is essential to avoid undermining trust in institutions.

Complex issues: communicating uncertainty
- Almost all stakeholders agreed that uncertainty is a structural and unavoidable component of risk communication and should be communicated to increase trust and transparency.
- Visual or verbal representations that make uncertainty understandable even to audiences unfamiliar with scientific language can enhance trust in science, communicators, and decision-makers.
- Communicating uncertainty must be accompanied by interpretive guidance and be formulated in clear, accessible language.

- Simplifying or minimizing uncertainty may improve media visibility but can prove counterproductive in the long term.
- Effective messages balance scientific transparency with clarity for non-expert audiences.

Diversity matters: integrating inclusion in risk communication
- Integrate audience profiling into all campaign phases, using demographic and social data (e.g., gender, age, cultural background, disabilities, vulnerabilities) to tailor messages to specific community needs.
- Design differentiated and accessible communication materials, ensuring usability for older adults, parents, people with disabilities, and linguistically diverse groups (e.g., simplified texts, audio versions, subtitles, alt-text).
- Apply cultural and linguistic adaptation rather than simple translation, involving cultural mediators or community stakeholders to verify clarity and contextual relevance.
- Adopt a multichannel approach that combines digital platforms, traditional media, and proximity channels to reach groups with diverse media literacy and access patterns.
- Use clear, non-technical language that takes into account the different sensitivities, cultural predispositions, and levels of understanding of audiences.
- Establish routine checks to prevent stereotyping and ensure equitable representation, and validate messages and visuals with representatives of vulnerable or marginalized communities.

Navigating citizens' risk perceptions
- Citizens tend to recognise risks and their potential future impacts, particularly when these are framed in relation to everyday life. However, concern does not automatically translate into preparedness. Communication strategies should move beyond awareness-raising alone.
- Risk communication should strengthen awareness through locally grounded, place-based narratives while adopting future-oriented, personally relevant framings.
- Emotions play an important role in shaping risk perception, but should be carefully managed to avoid anxiety and disengagement. Instead, concern can be leveraged through empathetic, action-oriented narratives that support individual agency.
- Communication efforts should prioritise practical guidance. Translating long-term environmental risks into concrete, everyday actions, supported by clear *how-to* content and actionable examples, can help bridge the gap between risk perception and preparedness, fostering more informed and resilient communities.

Source and frames: testing effective risk communication
- **Who speaks matters.** The source of risk communication messages is more influential than framing. Credibility, trust, reliability, perceived competence, and motivation to act are more strongly activated by technical sources (such as Civil Protection) than by political actors. Perceived competence is a key driver of effective risk communication, shaping trust, credibility, and willingness to act.
- **Framing must align with the source.** Framing is effective only when it aligns with the source. While framing effects may be limited, they must remain consistent with the speaker's role and

legitimacy. Gain framing can reinforce competence and trust when used by technical sources, whereas it may weaken evaluations when adopted by political actors. Loss framing can increase concern and motivation to act, but only when conveyed by technical sources and accompanied by controlled emotional activation.

- **Activate without alarming.** Effective risk communication combines credible sources, clear messages, and regulated emotional activation. This combination can foster motivation to act without generating excessive anxiety. Rather than relying on overly alarmist messages, risk communication should prioritize sustained engagement that highlights expertise and clearly defines institutional roles.

Key operational insights and recommendations
- Build institutional trust through continuous and transparent communication during non-crisis periods.
- Coordinate institutional voices (Mayor, Civil Protection, experts) to combine local proximity with perceived competence.
- Use artificial intelligence as a supportive tool, always ensuring human supervision and a relational tone.
- Employ positive, community-oriented gain frames to enhance engagement and trust.
- Use visual cues typical of loss framing (e.g., emoticons, red tones, warning icons) to capture attention, particularly in digital communication.
- Accompany messages with practical guidance and simple calls to action that encourage low-effort, high-impact behaviours.
- Avoid sensationalism; prefer realistic, verifiable, and evidence-based scenarios.
- Communicate uncertainty transparently, clarifying what is known and what remains under review.
- Explain how science works (and the limits of predictive models) in clear, accessible, non-technical language.

Practical implications and applications

The results of the research activities presented in this deliverable served as the basis for the guidelines on effective and inclusive risk communication developed by WP6 within the RETURN project.
In addition, several practical applications can be derived from the project outcomes, including:
- Collection of testimonies and good practices currently implemented within the Italian context.
- Design and testing of risk communication prototypes developed with the support of generative artificial intelligence tools.
- Development of a toolkit for analysing complex communication processes, such as the representation and communication of uncertainty.
- Creation of training materials for institutional and Civil Protection operators (some of the results have already been integrated into the MOOCs coordinated by TS3).

2. Introduction

This deliverable summarises the results achieved by the communication research team (UNIROMA1, UNICA) within WP6, *New Models of Education and Communication for Resilience to Risks*, of the RETURN project. Within the communication area, WP6 aims to develop guidelines for risk communication that are effective, innovative, and inclusive. In addition, WP6 has proposed a research model for risk communication campaigns, designed to ensure they are tailored to local communities' needs and aligned with the organisational capacities of institutions, local administrations, and Civil Protection operators.

This model integrates desk and documentary research, qualitative inquiry, active engagement, and quantitative survey design. It can be applied across all phases of a communication campaign: ex ante, to understand communicative needs and the perceived suitability of materials; in itinere, to explore the campaign's reach and the associated public sentiment; and ex post, to critically assess content and reflect on potential effects. These methodological components have already been outlined in previous deliverables. In this report, we present a synthesis of the empirical efforts undertaken over the project's different years.

The purpose of this deliverable is therefore to explore innovative approaches to risk communication (across tools, target groups, and thematic areas) within an evolving media environment, shaped by profound technological transformations that affect both production routines and audiences' reception practices. These audiences must now navigate new intermediaries and actors who contribute to trust-building processes. This occurs in a context in which risks are increasingly extreme and disruptive to everyday life. In addition to long-term climate change, Italy has been repeatedly exposed in recent years to severe and impactful natural hazards.

For these reasons, the deliverable examines how trust-building processes (such as incentives for participation), innovations in communication infrastructure and technologies, and the management of complex issues, such as diversity and scientific uncertainty, shape risk communication practices. This contribution examines how stakeholders, practitioners, citizens, and experts interpret risks, what is considered "reliable" in institutional communication, and how emerging tools, such as artificial intelligence, can be ethically and responsibly integrated into risk communication.

These research questions are addressed through a multidimensional approach to risk communication. Transparency and trust are conceptualised as relational resources that institutions must cultivate during periods of normality, and are analysed through stakeholder testimonies. Transformations in the communication environment are examined through the case of AI, which is considered an opportunity to design prototypes and test communication actions. Uncertainty, in turn, is conceptualised as an unavoidable component of risk communication and as an intersection between trust, science, and complexity.

The report is organised into several sections. First, we reconstruct the research pathway that led to the activities presented here. We then discuss the relevance of risk communication and the centrality of

participatory practices, drawing on the perspectives of stakeholders involved in risk communication. Next, we present a research activity conducted with university students that examines how AI can be integrated into risk communication and how different sources and framings are perceived. We then explore key issues for risk communication: uncertainty, analysed through a systematic literature review and combined with stakeholders' views; and diversity, examined through an in-depth analysis of international guidelines. Finally, we integrate these elements with evidence from a survey conducted on a representative sample of the Italian population. The deliverable concludes with guidelines and operational recommendations.

3. Project Overview

This report presents the main empirical findings that informed the drafting of guidelines for inclusive, innovative, and effective risk communication. The work summarizes the main activities carried out by WP6 – *New Models of Communication and Education to Risks* – between November 2022 and November 2025. The main stages of this process are represented in Figure 1 (*WP6 – Communication – Key Steps*) and described below.

Figure 1. *WP6 – Communication – Key Steps*

3.1. Desk Research

The international context

This phase involved a structured reflection on the tools and practices of risk communication. During the initial months of the project, the research team engaged in an in-depth exploration of the theoretical and practical aspects of risk communication, examining its conceptual foundations and the operational routines currently in place.

A ***scoping review*** of the international literature was conducted to identify and classify the main tools and practices of risk communication analyzed by scholarly research. The results of this review are presented in *Deliverable 6.1.1, Identifying Best Practices in Risk Communication: A State-of-the-Art Review of International Literature*, and discussed in related research papers (Massa & Comunello, 2024a,b). The analysis revealed that risk communication develops within complex systems, influenced by organizational, cultural, and technological dimensions. While generalizations are not possible, the literature identifies several recurring principles that can inform the design of effective communication strategies.

A first key aspect concerns **intentionality** in the production and dissemination of content: risk communication takes shape within specific organizational settings, and its effectiveness depends on how manageable and adaptable the communication tools are for the personnel involved. Communication must also be embedded within a broader ecosystem involving multiple actors, relying on shared language and strategies that are centralized yet flexible enough to accommodate local contexts.

The **characteristics of target audiences** are equally crucial. They need to be constantly monitored, and the design of communication tools should be supported by ongoing audience research, while

acknowledging that individual psychological and sociocultural factors fall outside the scope of this analysis.

The **media environment** also conditions the effectiveness of strategies. Social media platforms, for instance, allow rapid and widespread dissemination, but their impact depends on users' digital literacy and the accessibility of digital infrastructure. To reach rural or mountain communities or vulnerable population segments, additional tools are often required, such as traditional media, printed materials, or direct interactions.

Messages should be clear, credible, and concise, and use recognizable, trustworthy sources. The integration of participatory strategies alongside centralized communication can foster proactive behaviors, provided that the cultural and political dimensions of target groups are adequately accounted for.

From this analysis, several **operational guidelines** emerge:

- promote cooperation among organizations involved in risk management;
- include social science experts in the design of communication tools;
- provide flexible personnel and dedicated financial resources for communication activities;
- integrate communication from the earliest stages of risk management;
- continuously monitor audiences and their needs;
- assess the pros and cons of each communication channel and adapt messages accordingly;
- avoid overlapping voices among experts and authorities;
- consider the degree of politicization of the context before associating messages with governmental institutions;
- provide clear data and accessible explanations, even for numeric or visual content;
- employ locally grounded narratives where appropriate;
- develop participatory strategies capable of overcoming cultural and political resistance;
- consider the resilience of infrastructures and the timing of campaigns in relation to the different risk phases.

In parallel, a **comparative analysis of international guidelines** was conducted (*Deliverable 6.2a, Identifying Best Practices in Risk Communication: Guidelines Benchmarking*). This analysis confirmed that unidirectional and persuasive communication models, associated with the so-called *deficit model*, are now considered outdated and potentially counterproductive. Effective risk communication today recognizes communities and individuals as its primary interlocutors, engaging them with respect, empathy, and attention to their real needs and capabilities. Assuming automatic understanding or top-down acceptance of decisions can compromise the credibility and trust that environmental agencies have built over time.

In this perspective, a **bidirectional model of communication** implies listening, dialogue, and mutual learning. Agencies must establish channels and allocate resources to collect and analyze stakeholder and

citizen feedback. Public trust, understood as relational capital, is built over time through coherence and transparency, but can be quickly undermined by communication failures.

Risk communication is a **highly specialized activity** that requires technical skills and continuous training. Guidelines are only practical if grounded in sound, up-to-date scientific principles and complemented by operational tools (maps, digital products, training platforms, and best practices). There are no universal recipes: strategies and tools must be adapted to the specific types of risk and to the social, cultural, and institutional contexts in which they are applied. Stable cooperation between agencies and academia is therefore essential to sustain a virtuous cycle of knowledge production, sharing, and continuous improvement.

Analysis of the Italian context

The international evidence and theoretical insights guided the analysis of the Italian context, conducted through documentary and desk research activities.

A first area of investigation concerned the role of communication within **Civil Protection Plans** at the regional and municipal levels (*Deliverable 7.6.2b, Communication plans for multi-hazard risks: An analysis of Civil Protection plans*). The study showed that communication plays a marginal role compared to technical and organizational aspects. It primarily serves an informative and instructional function, aiming to guide citizens toward appropriate behavior, but it rarely translates into structured or operational communication strategies. These plans generally lack replicable guidelines, practical tools, or a precise segmentation of target publics. Indications regarding channels, messages, and targets are often generic, with few references to vulnerable groups or temporary communities. Even when a primary communication source is identified (usually the mayor), no detailed instructions are provided concerning timing, coordination, or collaboration with media and external actors.

Civil Protection Plans are thus predominantly **technical and bureaucratic documents**, oriented toward internal management rather than public outreach. Awareness-raising or risk-socialization activities are typically presented in separate materials (brochures, information sheets). Differences between regional capitals and smaller municipalities are minimal despite disparities in resources. References to digital or social media are rare, reflecting communication models that remain largely predigital.

Furthermore, there is a lack of training and coordination among communication officers, an absence of partnership strategies, and limited attention to preventive and relational aspects such as **trust-building and citizen engagement** in local risk management.

Subsequently, desk research extended to the **analysis of institutional risk-communication campaigns** produced in Italy (*Deliverable 7.6.3, Communication campaigns to be tested in T.6.3. A qualitative study on risk communication campaigns in Italy*).

The resulting picture is highly heterogeneous and fragmented, reflecting the country's morphological and socioeconomic diversity. Regional and municipal strategies primarily focus on awareness-raising and

information dissemination about locally relevant hazards, rather than on developing integrated, continuous communication practices. Most campaigns adopt **didactic, top-down approaches,** centered on transmitting technical knowledge and behavioral norms rather than on participatory or dialogic communication.

This configuration reflects a still **hierarchical conception** of risk communication, in which prevention and mitigation prevail over engagement and the co-production of knowledge. Territorial fragmentation generates a plurality of formats, channels, and languages that mirror the uneven institutional capacities and communication skills of local administrations. The result is a lack of homogeneity and continuity: initiatives are often confined to emergency periods or short-term projects, and scientific data are rarely translated into formats that are accessible and understandable. Many visual and informational tools, although analytically accurate, remain difficult for non-expert audiences to interpret, highlighting the need for better mediation among the scientific community, institutions, and citizens to strengthen mutual trust and understanding.

Within this context, the national campaign *Io non rischio* ("I do not take risks") represents a critical attempt to standardize and coordinate communication practices. Nevertheless, the overall landscape remains heterogeneous. Even when facing similar risks, regions adopt different communication approaches, shaped by local contexts, institutional cultures, and varying degrees of coordination across governance levels. These findings provided the **conceptual and operational foundation** for the design of subsequent empirical tools, conceived as flexible, replicable instruments to strengthen dialogue between institutions and citizens and to promote participatory processes in risk communication.

Key Insights - *Desk Research*
From information to interaction International literature and guidelines highlight that effective risk communication must move beyond one-way, top-down approaches and adopt dialogic and participatory models. Communities should be recognized as active interlocutors rather than passive recipients. **Context matters** Trust and credibility are built through negotiation among citizens, institutions, and qualified stakeholders. Risk communication must take into account institutional behavior, local cultures, and the existing levels of public trust in each territory. **A tailored strategy** Risk communication cannot rely on universal models. Effective strategies must adapt to the socio-cultural, institutional, and infrastructural conditions of each context, integrating tools and languages coherent with local specificities. **Citizens at the center** Understanding citizens' needs and expectations is crucial. Communication tools should be continuously tested and refined through iterative, participatory processes that assess audiences' ability to understand, respond, and engage proactively.

The Italian landscape: a promising mosaic
The analysis of the Italian context reveals a fragmented yet fertile landscape. Regional campaigns display diverse and experimental approaches; the national *Io non rischio* campaign provides a shared framework, but there is room for greater integration and dialogue to ensure coherent, inclusive communication nationwide.

3.2 Designing flexible and replicable tools

Developing flexible and replicable tools for risk communication requires an iterative and multi-layered process that translates theoretical evidence into practical applications. Building on the findings of the desk research phase, this stage aimed to develop adaptable instruments to support inclusive, data-informed, and context-sensitive communication strategies.

Understanding the context
Gaining an in-depth understanding of the communication environment is a prerequisite for identifying suitable formats, contents, and delivery channels. Mapping the characteristics of the application domain enables the anticipation of barriers, the highlighting of opportunities for innovation, and the outlining of operational priorities. This stage includes a systematic review of the literature to collect insights from risk communication experiences across different contexts and hazards. It also involves analyzing international guidelines issued by organizations specializing in risk prevention and crisis management. At the national level, it is essential to examine existing campaigns with respect to content, tone, and implementation models. This analytical work can be further enriched through consultations with key stakeholders—such as public officials, professional communicators, and risk management experts—whose contributions help align the design process with institutional practices and local governance structures.

Conceptualizing the content
The second phase focuses on shaping the campaign's conceptual and creative architecture. The objective is to design innovative communication approaches that move beyond conventional formats or to rework existing models through cross-media combinations and new engagement opportunities. This stage may involve experimental techniques such as *A/B testing* (Gaysynsky et al., 2022), the inclusion of unconventional or underrepresented elements drawn from the literature, and the exploration of emerging formats. These can range from visual materials (maps, infographics, short videos) to narrative structures (storytelling, framing techniques) or hybrid outputs generated with the support of AI systems. Collaborating with external experts—including designers, media professionals, and risk communication practitioners—can provide complementary perspectives and strengthen the project's methodological robustness. Throughout the creative process, the goal remains to enhance community resilience and inclusivity, ensuring that principles of diversity and intersectionality (Giritly et al., 2024) inform every stage of the design.

Testing and refinement
After defining the campaign's core components, an experimental phase follows, dedicated to validation and fine-tuning. The choice of research methods depends on the specific questions and elements to be

tested. Mixed-method approaches (Plowright, 2010) are particularly suitable because they combine the statistical rigor of quantitative analysis with the interpretive depth of qualitative insights. Research instruments should enable systematic engagement with audiences and collect data on citizens' perceptions, expectations, and preferred communication channels. Continuous testing of hypotheses and messages creates a feedback loop that improves both the design process and the campaign's adaptability. The results of this phase inform the drafting of operational guidelines, thereby supporting future applications and scalability in other contexts.

Logics and strategic value
Actively involving citizens and stakeholders from the earliest stages of design strengthens both the scientific and social impact of risk communication initiatives. Participation fosters shared understanding and cross-sector collaboration, improving the capacity to interpret and manage complex systems. Methodological triangulation — the integration of multiple perspectives and techniques — remains essential for capturing the dynamics and meanings of communication processes. Keeping users at the center, whether intermediaries (institutions, experts) or final recipients (citizens), ensures that design and evaluation proceed through cycles of listening, feedback, and co-creation. This participatory and evidence-based approach contributes to the development of tools that are not only scientifically sound but also operationally flexible, replicable, and sustainable across different territories and risk scenarios.

Project application
Within the RETURN project, these operational principles were applied to design research tools that capture the complexity of risk communication. Specifically, these instruments were used to elicit perspectives from diverse audiences and key stakeholders involved in risk communication.

- **Dialogue with communication professionals.** An interview guide was designed to explore practices, opinions, and preferences among risk communication professionals. The guide was administered to 32 experts engaged in various aspects of risk communication, working within governmental agencies, public research centres, universities, the Civil Protection system, or as consultants for public and private organizations (see APPENDIX A). The interview explored participants' normative orientations toward risk communication, their views on engagement and participation, their preferences in campaign design, and their perceived organizational constraints and opportunities. Additional topics included integrating social media into risk communication practices and developing strategies to address complex issues, such as uncertainty.

- **Audiences and the tools of tomorrow.** A complementary research protocol was tested to assess the potential role of artificial intelligence in the design of risk communication messages - *Deliverable 7.6.4., Research report on communication tools and strategies' effectiveness (among different target groups, and considering different risks)*. After reflecting on *prompt design* strategies, we generated communication products using generative AI (See APPENDIX B) and presented these materials to university students in communication studies (See APPENDIX C). This activity enabled us to record audience preferences and dissonances (later integrated into the

design of survey instruments) and to reflect on the applicability of AI-assisted content creation in risk communication.

All these tools, along with the main findings emerging from their application, are described in greater detail in the following sections of this report. Figure 2 summarizes the main stages of the research process for developing a dialogic, feedback-based, and collaborative risk communication campaign.

Figure 2. *A research model for risk communication campaigns*
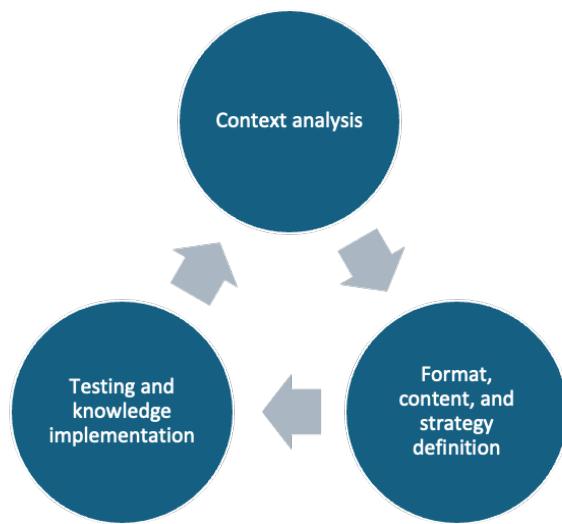
Replicability and future integrations

This framework provides a replicable methodological agenda for testing risk communication strategies across different local contexts and sectors. Its design has already been tested in diverse territorial settings, both in a large metropolitan area (Rome) and in an insular context (Cagliari), demonstrating the approach's flexibility and adaptability across different social, institutional, and communication environments. The research protocol (prompt design, expert validation, and audience testing) can be adapted to various types of institutional communication — from environmental and health risks to emergency management and civic engagement. The modular structure enables local authorities, agencies, and research centres to test risk communication messages tailored to their specific needs.

3.3. The Choice of Qualitative Methods: Understanding Risk Communication in Depth

When we talk about risk communication, we refer to complex communicative processes that involve a vast network of meanings, practices, and perceptions. For this reason, part of our research relied on empirical explorations employing qualitative methods. This choice is situated in a complementary perspective: on the one hand, in relation to quantitative approaches (which will be further explored

through the survey), and on the other, with respect to normative or prescriptive tendencies that often promote risk communication models that are not fully grounded in evidence.

The use of the qualitative method enabled the pursuit of several objectives. First, it allowed us to investigate how different actors (institutional representatives, citizens, and professionals) construct, interpret, and convey risk communication. This made it possible to identify broader, transversal dimensions, such as the symbolic value attributed to risk communication, its emotional component, its impact on preferences, and feedback effects on message design strategies. Ultimately, it enabled us to approach risk communication as a relational practice in which expectations, texts, and contexts meet.

The qualitative method thus shaped two interrelated and dialogic phases of research. The first phase involved semi-structured interviews with stakeholders and risk communication professionals to explore integrative strategies between the ideal of risk communication and the resources — sometimes scarce or perceived as insufficient — available to practitioners. Dissonances and integrations emerged from both spontaneous and guided narratives, leading to a deeper understanding of contemporary risk communication and its possible future directions.

The second phase focused on the analytical curiosity directed toward young university students (conveniently grouped under the evocative label *Gen Z*) who were involved in testing AI-generated messages. This phase enabled examination of preferences and the perceived relevance of risk communication among a particular audience, suspended between information overload and trust in algorithmic selection and new production tools.

The researchers' interpretative analysis followed the collection of relevant data. Through constant comparison, the testimonies were examined transversally using thematic analysis and document triangulation.

In summary, the research followed the following operational steps:

1. Design of interview guidelines and validation of research protocols.
2. Collection and transcription of interviews.
3. Coding and identification of emerging categories.
4. Discussion and triangulation of results with other sources of evidence (desk research and survey).

The use of qualitative methods yielded contextual insights to inform the development of communication tools and campaigns. Listening to both professionals and target audiences allowed the identification of recurring patterns, communication barriers, and trust levers. These opinions, gathered with replicable tools and analyzed through dialogic, iterative processes, contribute to the definition of adaptable, inclusive guidelines.

The empirical protocol described here is consistent with the objectives of WP6 and aligned with the project's multidisciplinary approach. The design and testing of risk communication tools constitute a

promising *Proof of Concept*, and the results serve as a basis for developing guidelines for effective risk communication.

3.4. The Survey as a Key Tool

The qualitative research described in the previous section was complemented by a survey conducted on a representative sample of the Italian population. The survey was designed to verify and expand the evidence emerging from the qualitative phases, translating exploratory insights into generalizable results. It aimed to assess perceptions, practices, and preferences regarding risk communication.

A structured approach, such as a survey, enables the identification of recurring trends and differences across demographic or territorial groups, thereby validating and comparing the interpretive hypotheses derived from the interviews — for instance, regarding trust in information sources, communication practices, or the perceived effectiveness of messages.

The nationally representative sample ensures comparability and paves the way for future longitudinal studies. The questionnaire focuses on multiple dimensions, including risk perception, trust in sources, communication preferences and habits, trust in AI-based systems used for risk communication, and reactions to gain/loss framing and explicit source indication.

This research action contributes to the objectives of WP6 by producing data that are both comparable to and complementary to the qualitative evidence, thereby informing the development of risk communication guidelines grounded in robust, representative empirical evidence. The integration of qualitative and quantitative approaches ultimately enables the identification of differentiated targets and strategies for risk communication campaigns.

4. The Stakeholders' Perspective: Exploring Risk Communication as a Strategic Asset in Risk Management

A fundamental component of the research was 32 semi-structured interviews with professionals operating in the Italian risk communication ecosystem, aimed at examining how socio-natural risks are conceptualized, framed, and addressed within institutional communication practices. The interviewees were identified through their documented professional experience in the domain of risk communication and reflect a diversified set of institutional and operational contexts: 14 men and 18 women; 12 employed in public research bodies, 8 working within local authorities, 5 operating in structures of the National Civil Protection System, and 7 affiliated with organisations and roles categorized as "other" (including freelance consultants, representatives of communication associations, and private sector contractors).

The interviews were conducted between October 2024 and September 2025 and guided by a protocol comprising 59 stimulus questions organized into 9 thematic areas. The duration of the interviews ranged from 40 minutes to slightly over 2 hours, with an average of approximately 1 hour and 15 minutes. This configuration enabled the collection of in-depth narratives concerning professional practices, interpretive frameworks, and institutional constraints shaping risk communication in Italy.

This section summarizes testimonies regarding stakeholders' conceptions of risk communication and their opinions on participation, which are intended as effective tools for designing communication strategies.

4.1. Defining Risk Communication

In this section, we will examine stakeholders' views on the definition of the subject of risk communication, as expressed in our interviews. However, such communication faces challenges related to risk perception, the plurality of audiences, the scientific and technical complexity of the content, institutional fragmentation, and the increasing digitalisation of communication in today's society. A structural criticality that crosses narratives concerns the leap from knowledge to behavior and requires more mature socio-cultural and participatory approaches than traditional technical-information communication.

Risk communication vs emergency communication

Risk communication is considered an essential component of contemporary civil protection systems, aiming to reduce exposure to natural hazards, raise citizens' awareness, and promote appropriate behaviour before, during, and after a calamitous event (Paton, 2008; Leiss, 1996). In line with this definition of the literature, the majority of the interviewees delimit the field of action of risk communication, highlighting a **differentiation between preventive communication and emergency communication** (Coombs, 2015; Sellnow and Seeger, 2013; Comunello, 2014), as can be seen from the excerpts below:

> *"So, in my opinion, the distinction between risk communication and emergency communication is fundamental to understanding risk communication. Risk communication is a communication that, in*

my opinion, takes place and develops in peacetime, so it is a communication that we can structure in an organic way with campaigns, for example (...). Emergency communication is a communication that requires a very short breath. It is a communication that is done in extreme timeliness and therefore also has totally different criteria, a probably different language and also a different psychological asset " (Interviewee #27, F, Public Research body).

"Er... then, I would describe it [risk communication] as that activity that is done to help inform citizens about what are risks, to become more aware and also to understand how one can, let's say, behave to reduce the probability of these risks occurring" (Interviewee #15, F, Freelance/ Private Sector Communicator/Communication Expert).

"(…) The idea is not to alarm, the idea is to raise awareness. Raise awareness and consequently provide resilience tools. What do you need to do if [the risk occurs]? What do we suggest you do if [the risk occurs]? How do you prepare for that type of event that is relevant to your territory? (…) (Interviewee #24, M, Freelance Private Sector Communicator/Communication Expert).

While acknowledging the heterogeneity of the service organizations in which the expert figures interviewed operate (Civil Protection, research institutions, etc.) as well as the type of natural risk faced in work practice (e.g.: volcanic risk) when it is not multi-hazard, the snapshot offered by the narratives is that of a risk communication capable of informing without alarming, while having as its objective that of empowering local communities.

Although it rarely occurs in narratives, it should be noted that the distinctions between the two areas of communication mentioned above can be systematized in a conceptual fluidity that nevertheless reflects the consequentiality of the communication actions of risk and emergency communication, as can be seen from the excerpt below:

"(…) when we talk about risk communication, which in a certain sense overlaps with emergency communication, when the risk becomes full-blown, so the event occurs. Therefore, we can at that point talk about emergency communication, before we have to talk about preparedness, so how we prepare populations for risks". (Interviewee #24, M, Freelance/Private Sector Communicator/Communication Expert).

Nevertheless, the specific purpose of risk communication, aimed at improving stakeholders' perceptions of natural risks who may not be experts in the field (Babič et al., 2023), such as citizens, emerges with clear differentiation. The latter, if involved in civic engagement practices, can, however, also become privileged interlocutors for the institutions responsible for planning risk communication in peacetime, as they know the territories in which they live.

Risk communication is fundamental to defining responses to natural disasters within the risk management system, enabling long-term responses when framed within a planning process that develops in peacetime, not only during emergencies (Khan et al., 2017).

Communicating to the public between awareness and perception of risks

Risk communication is a central dimension for understanding not only the contextualization of natural hazards in territories (La Rocca & Lovari, 2024) but also the impact of climate change in communities (Diers-Lawson & Meißner, 2021). An emerging concept in the narratives is awareness as a prerequisite for encouraging self-protective actions in citizenship, enabling each individual to act during the preparedness phase. This is stated by 37% of the people interviewed, of whom we report some significant extracts:

"(…) I would start with the awareness that risk in the end is immanent, that is, there is no zero risk, just to say a phrase that we always hear, but it is just that, that is, the awareness of this and at the same time the awareness that there are tools to prevent or deal with the damage when the risk materializes" (Interviewee #9, M, Freelance/Private Sector Communicator/Communication Expert).

"Communicating risk to citizens is an extremely complex thing because first of all it starts from the assumption that the general public is not well aware of what risk is precisely as a concept and here it is bad to say, but it is something that we have verified in the field, among other things also recently in 2023 and 2024, when meetings with the citizens were organized following the events of the Campi Flegrei, numerous meetings with the citizens of the Campi Flegrei, then the area of Naples, (...)" (Interviewee #31, F, Public Research body).

"(…) A risk communication that seeks to increase the perception of risk, but also the more operational part, therefore the willingness to take actions, for example, mitigation, as well as to be ready, no, the preparation part, to put it in English, in short, for which it is preventive in some way, therefore to be equipped on a series of knowledge to be able to act in critical situations effectively. Then there is also the part that is certainly just as important, in short, linked precisely to the knowledge of the territory, of the risks associated with the territory in which one lives (...)". (Interviewee #8, F, Public Research body)

Some experts emphasize the relational dimension of this communication process, underscoring the need to develop clear, structured messages that inform citizens about the specific type of natural risk at hand. At the same time, there is a need to go beyond one-way communication that makes the system of public institutions responsible for the transmission of information fragile (Canel & Luoma-aho, 2019), so that the responsibility of the recipient of the communication itself is triggered, as can be seen from the following excerpts:

"(…) In general, risk communication, for me, if I had to give a definition, is sharing. It is a sharing that aims to make those who listen to you aware, not only by sharing information, but to activate that cognitive process whereby the person who listens to you becomes aware of dangerousness, because then we mainly deal with danger rather than risk, therefore with that important component of the risk equation that fundamentally depends on the nature of the volcano in particular that we are dealing with and that we can check for a zero amount". (Interviewee #10, F, Public Research body)

(…) So a more informative part related to the type of risks, to how much I am connected and exposed to this type of risk and then the other part linked more to the change in behaviors which is much more complex, this second part, compared to the first, from my point of view, because the first part ... how to say... very often this part of communication is delegated to researchers and scientists who deal with

natural risks, if we want to talk about those, and very little recourse is made, instead, to those who deal with risk from a point of view, let's say of the more social, psychological sciences (...) because first of all, in fact, our behaviors have a basis that is not only rational, but a very subjective basis and also cultural, emotional, value etcetera etcetera and then because changing behaviors is not something that is done overnight and therefore I would say that we should work more on understanding, in the meantime, people what perception they have of these risks." (Interviewee #30,F, Public Research body)

"(…) We say this to communicate uncertainty but also to involve citizens in all research activity and also, let's say, in this way to understand what their perception of risk is and involve them in the questions, in the methodologies, in the discussion of scenarios before the research and then, let's say, on the communication of the results (...)". (Interviewee #4, F, Public Research body)

This conception goes beyond the traditional deficit model (Sturloni, 2018; Cerase, 2017) to promote a more dialogic and participatory approach to the construction of risk communication content between institutions responsible for its development and recipients. In this sense, the narratives appear to be in line with the principles of public risk communication as a transactional process (Palenchar, 2005) and sector studies (Haer et al., 2016) that highlight the need to design communication campaigns through which citizens are made aware not only of the risks that may characterize the territory in which they live but also of climate change. The aim is to provide citizens with practical information on the actions to take, so as not to leave room for information gaps that could be filled by disinformation. The need to communicate uncertainty, a dimension inherent in natural risks due to the complexity of environmental data, also emerges as relevant (Covello & Sandaman, 2001) and cannot be scientifically aligned with the meaning of everyday language, which is, in fact, incorrect or unpredictable (Cerase, 2016). Technological advances in recent decades have helped reduce scientific uncertainty in risk assessments and weather forecasts, but the information provided to citizens is not always accessible to the public. The most complex challenge facing risk communication is the **change in citizens' behaviour,** which should be more oriented towards prevention, as can be seen from the following quotes:

"So, from what is my experience at the Civil Protection Department, which is therefore a structure that communicates to citizens at a national level, for us all this has translated into trying to increase knowledge of the risks and spread correct behavior. So for us as an administration, all our activities from the campaigns to the website, everything that is aimed at citizens is aimed at increasing awareness of the risks, communicating both the risks themselves and above all the correct behaviors to be adopted in emergencies ". (Interviewee #7, F, National System of Civil Protection)

"There is absolutely no perception on the part of citizens of the need to know how dangerous the place where they live can be. Dangerousness that is linked to the knowledge of the territory, the inhabited place, the place lived, the place frequented (...). In practice we find a tendency to vain and absolutely devoid of any purpose human action of self-exposure to risk for the most trivial needs of media representation, we know and see daily people who, for example during a storm surge, have the wicked tendency to arrive on a pier just to take a selfie, with the risk of being dragged into the sea". (Interviewee #13, M, Local Authorities)

"Risk communication is something that goes beyond simple risk information, because it includes not only data, notions, and the basic elements of management with respect to the risk we are talking

about, as it requires to be conveyed with the right tone and with the right narrative style. I would like to say this so that it is understandable and clear to the citizen, that is, it does not give rise to misunderstandings but is not such as to alarm the citizen either. Therefore, a communication that makes the citizen aware and aware of the risk, so as to make him able to act when the risk should lead to the real danger". (Interviewee #28, F, Freelance/Private Sector Communicator/Communication Expert)

In ordinary time or "peacetime", attention must therefore be focused on awareness, preparation, and involvement of the population. This perspective aligns with the literature (Covello et al., 1986) on the objectives of risk communication: to inform and educate, to stimulate behavioural change, and to experiment with collaborative strategies in risk management.

Effective processes and communication strategies

Risk communication is a continuous process aimed at building awareness in citizens who must take into account the evolution of the society itself in which natural disasters can occur (Steelman & McCaffrey, 2013), as well as the peculiarities of territories, including island territories (La Rocca & Lovari, 2024). In view of this, it is defined as a process of building awareness rather than mere transmission of data and information, as follows:

> *"Risk communication is nothing more than a process. A communication that is given and that must be a certain communication where you must clearly find empathy in risk communication and where you must try to understand rather than satisfy, understand what the needs of the citizen are".* (Interviewee #26, F, Local Authorities)

> *"It is a sharing that aims to make those who listen to you aware, not only by sharing information, but to activate that cognitive process whereby the person who listens to you becomes aware of dangerousness, because then we mainly deal with danger rather than risk, therefore with that important component of the risk equation that fundamentally depends on the nature of the volcano in particular that we are dealing with and that we can control for a quantity equal to zero".* (Interviewee #10, F, Public Research body).

> *"We live in a country where the amount of risks is very extensive, the difference from one territory to another even very close, the same phenomenon really sometimes a building goes down and a building remains standing in the same street for an earthquake eh, a, a place goes completely under due to a flood and two streets away barely a little water enters. It is a very varied territory, the risks are very different; therefore, giving the same behavior for everyone is clearly something useful, but sometimes it is not enough, because clearly to give equal behavior to everyone you have to oversimplify ".* (Interviewee #14, F, National System of Civil Protection)

The objectives of risk communication are often described as a sequence of three phases that can be guaranteed if supported by the continuity of communication strategies for the prevention of natural risks:

- To correctly inform citizens;
- To create awareness in the population;

- Promote self-protection behaviors in citizenship.

The recurrence of these themes is expressed by the people interviewed as follows:

"Risk communication is something that goes beyond simple risk information, because it includes not only data, notions, and the basic elements of management with respect to the risk we are talking about, as it requires being conveyed with the right tone and with the right narrative style. I would like to say this so that it is understandable and clear to the citizen, that is, it does not give rise to misunderstandings but is not such as to alarm the citizen either. Therefore, a communication that makes the citizen aware and aware of the risk, so as to make him able to act when the risk should lead to the real danger". (Interviewee #28, F, Freelance/Private Sector Communicator/Communication Expert).

"It must be an informative communication, so it must give information and also know how to dilute it, it must also collect concerns, questions, it must also provide tools because it is not only necessary to inform about the risks, but also to provide practical tools on how to deal with this risk, to prevent it, etc...". (Interviewee #15, F, Freelance Private Sector Communicator/Communication)

"Then, logically, there is a further element which is the continuity of the business. The fact that I have done an activity once does not lead to any kind of result, while it is the reiteration of the activity in new ways, in different ways, that allows us to penetrate both the resistance that each of us has to communication, and the curtain of the infodemic that surrounds us today". (Interviewee #24, M, Freelance Private Sector Communicator/Communication Expert)

The interviewees converge on the importance of constructing simple, repeated messages that clearly convey the content, having subjected the content to a process of decoding technical language. The recurring strategies are expressed through the clarity of the message, the decoding of technical language, and the visual impact of the content. This is stated by 50% of the people interviewed, of which we report the most exemplary quotations:

"There are elements that, in my opinion, must be the basis of the effectiveness of communication, regardless of whether this is risk communication or other communication, and which are clarity, and I said it before, now it escapes me. I meant that in any case the messages must be clear and must be complete". (Interviewee #27, F, Public Research body)

"So, certainly (the objectives are) transparency, as I said before, clarity and then the objectives can also be to raise awareness in the community to responsible behavior when the risk arises" (Interviewee #16, F, Public Research body)

"I think that doing risk communication is complicated, doing seismic risk communication is even more complicated. As they say, I often compare myself to my colleagues in volcanoes who certainly have the possibility in communicating volcanic risk in some way to attract people precisely from images, videos, from the fact that we have the most beautiful active volcanoes in Europe and perhaps in some cases even in the world and instead we have difficulty in making visual communication, which is the one that is most attractive today and the one that works the most today (...)" (Interviewee #20, M, Public Research body)

The question of translating scientific language emerges as a crucial challenge. Risk communication in Italy often casts scientists as the primary communicators (Massa & Comunello, 2024), but they do not always have the necessary skills to translate a technical message into one that is understandable and therefore accessible to citizens. This criticality recalls reflections on the need for mediation between expert knowledge and non-specialist public (Davies, 2008) and on the communication of science in contexts of uncertainty (Friedman et al., 2012). Risk communication must be simple, iterative, and multichannel to remain in the memory of the audiences to which it refers, as can be seen from the excerpt below:

> *"Yes, then I imagine the communication of citizen risk to be very concise, clear and accompanied by images and sounds rather than written texts and that it is of immediate visual impact because we often say the citizen does not stop to read, let's say the contents of weather forecasts when they are too long, imagine it, if I had to describe a risk situation in detail".* (Interviewee #12, M, Local Authorities).

Ensuring Inclusiveness: communicating to a plurality of audiences

A recurring theme in the narratives is the **plurality of audiences** in this communication. The audience is heterogeneous; therefore, the message is effective only when it is calibrated. Risk communication, especially when produced by public institutions, thus requires adaptation to the public, taking into account differences in age, roles, context, and perceptions. Hence, there is no "citizen," but messages are needed that can ensure inclusive communication, while also taking into account generational differences that can affect the quality and type of sources relied upon to inform oneself about natural risks. This communication strategy is highlighted by 32% of the people interviewed, as can be seen from the following quotations:

> *"There is no citizen. There are many citizens in many different age groups, with many different schoolings and therefore the issue is already a complex issue for this, because when we think about risk communication which in a certain sense overlaps with emergency communication when the risk becomes full-blown, so the event occurs and therefore we can at that point talk about emergency communication before we have to talk about preparation, So how do we prepare populations for risks? First of all, in my opinion, we must start from the school environment, that is, we must start from the first piece which is the school, at all its levels, where we must build an awareness of the risk and we must provide a toolbox for each type of risk, to allow us to understand the risk and to understand how we behave when that risk turns into an emergency event".* (Interviewee #24, M, Freelance/Private Sector Communicator/Communication Expert)

> *"(…) So, in my opinion, communication must first of all be done starting from schools, because in my opinion if we want citizens, precisely, to create an active citizenship, it is important to start training the individual from an early age on how to do it, such as the fact of having taught that... I am from L'Aquila, so we have lived through the earthquake, the new generation, the new children know that in the event of an earthquake they know very well how to behave, they know that they have to get under the desks. In that case you are teaching him self-protection, that is fundamental".* (Interviewee #3, F, Freelance/Private Sector Communicator/Communication Expert).

> *"So, from the communication courses I took in Civil Protection and I learned that it is important first of all from those in front of me. So for the "I don't risk school" campaign, I will have children from the age*

of 10, indeed up to 10 years old and I will have to try to communicate the risk, perhaps telling the story of the lion inside the cage or outside of anger, so the difference between risk and danger. If I do the school camps "I am the Civil Protection too" and therefore I will have children from 10 to 14 years old, there too there will be good civil protection practices and I will raise the bar a little more, as we did this year, I will communicate the risks through games, also there showing the difference between risk and danger" (Interviewee #5, F, Local Authorities).

Knowing the recipients' information needs and perceptions, therefore, appears necessary for effective risk communication. In this sense, it is also essential to evaluate the population's prior experience (Cisternas et al., 2024), as individuals who have experienced natural-disaster-related emergencies may have a different perception of risk than those who have never experienced similar situations. Risk perception varies significantly across groups, influenced by values, personal experiences, and exposure to danger. Effective communication must be tailored to the recipients, the target of the message. This multi-target view is reflected in research on risk education (Cole & Murphy, 2014) and community resilience (Buzzanell, 2010). The need to expand the audience for risk communication also emerges from recent studies (Massa & Comunello, 2024), which suggest the need to consider migrant, non-Italian-speaking communities, tourists, and individuals with particular characteristics. This approach also aligns with the principles of intersectionality in risk communication (Giritly et al., 2024), which recognize how factors such as gender, age, cultural origin, and disability intersect in the construction of vulnerability as a condition warranting greater attention to ensure the inclusiveness of communicative action.

The privileged contexts for building a culture of risk are educational and work settings. Education during the school years is crucial for the formation of values, behaviors, and orientations that will characterize tomorrow's adults, transforming perceptions of risk from mere fear to awareness and active resilience. Risk education must help students understand the complexity of environmental and social systems and global problems, such as climate change, and develop *problem-solving* skills. Creating a culture of environmental risk within the school institution, therefore, means transforming awareness of dangers into a life skill that equips future generations to be more attentive, prepared, and resilient in the face of natural disasters.

The role of institutions and citizens' trust

The main responsibility for communication lies with the institutions. The issue of public institutions (e.g., Civil Protection) and research institutes (e.g., INGV; ISPRA) as the primary source called upon to construct and disseminate risk communication content is stated by 35% of the people interviewed, as better explained by some significant excerpts:

"Risk communication is what impacts the community in terms of environmental risks and we always talk about the environment and health together and should clearly involve the institutions in carrying out their role towards the whole community that we mean institutions and citizens, increase general awareness, but also give solutions or in any case put into practice actions to mitigate the risk itself". (Interviewee #6, F, Public Research body)

"In the meantime, communication must be planned. You have to plan it because you have to know who the actors are who also have to release the communication, so in a communication plan, in my opinion, I think this is the valid one, you have to know which is the actor who has to communicate and with whom you have to communicate ". (Interviewee #26, F, Local Authorities).

"The bulk of the responsibility for this activity, indeed almost exclusively the weight of this activity, lies with the institutions, where, for institutions, as before, let's say, the responsibilities lie with the organizations that deal with the public sphere. Because as the saying goes, "if the arrow doesn't hit the target, we can't blame the target." Therefore, the governance of the explanation that public and institutional communication must take on is also about preventing what is one of the greatest dangers in the event of risk. That is to say, in the event of a crisis, risk or emergency" (Interviewee #17, M, Freelance/Private Sector Communicator/Communication Expert)

The testimonies are therefore consistent with the literature (Cerase, 2015; Massa & Comunello, 2024), which holds that risk communication is closely linked to organized activities aimed at effectively and responsibly reducing hazards to health, the environment, and individual and collective well-being. The main function of institutions is to transform technical information on risk into effective, credible, and usable messages that motivate citizens' action and self-protection (Han et al., 2022; Seebauer & Babcicky, 2018). Institutional timeliness avoids misinformation and undue substitution of experts. Institutional content must respect ethical and communicative principles that are fundamental to building trust (Peters et al., 1997; Renn & Levin, 1991). Some respondents, therefore, argue that **trust** in the institution is a prerequisite for effective risk communication (Paton, 2007), as can be seen from the following excerpts:

"we are a municipality that has already been doing communication in a risk by the department for 4-5 years; So, we do our days on our waterfront, we train and inform citizens on how to behave, so the citizen initially saw us a little skeptical (...)Here, I repeat to you with the adoption of the Civil Protection plan, we have begun to inform the citizens with the use of volunteering and also with public meetings that we have begun to organize, precisely indicated fraction by fraction so that we can speak directly with the citizens ". (Interviewee #21, M, Local Authorities)

"We as an administration, all our activities, from the campaigns to the website, everything that is aimed at citizens is aimed at increasing awareness of the risks, communicating both the risks themselves and above all the correct behaviors to be adopted in emergencies." (Interviewee #7, F, National System of Civil Protection)

"This brings me to a point that I wanted to deal with later, linked to the voice that must be distinguishable and this is also important in terms of recognition and therefore branding in this case of institutions which in times of crisis becomes fundamental, because when this has to do with the psychological aspects of communication, not only theoretical in a condition of emergency, for a citizen to have immediately clear in mind who the institution is becomes fundamental, it is an important thing that fortunately we have seen in the field, but not in a negative sense is that if the reference institution does not immediately show itself in the famous golden hour is present in the field, in case of emergency someone else will inevitably do it". (Interviewee #27, F, Public Research body)

The theme of trust, central to the interviews, recalls the role of social capital in facilitating collaborative behavior (Putnam, 1994), particularly when risk communication becomes a shared process through public

dialogic spaces. The community, in fact, identifies the phenomena worthy of attention and ensures that some risks are highlighted and recognized as such while others, equally dangerous, are ignored. It is precisely these assessments, which are never entirely based on objective data, that can guide the planning and implementation of interventions by institutions and citizens' behaviour.

Promoting the development of trust both at institutional and community level in the field of natural disaster risk reduction appears central to adequately prepare communities to face natural disasters, develop effective protocols to improve the resilience of communities (Buzzanell, 2010) and mitigate disorientation (Covello et al., 1986) as well as the negative consequences that can occur in an emergency condition (Engdahl & Lidskog, 2014).

Criticality in risk communication between perception, resistance, and complexity

According to experts' testimony, the greatest criticality in risk communication lies in the gap between technical knowledge and public perception, due to a poor risk culture among citizens, accompanied by behaviors that do not prioritize self-protection when the risk situation becomes a full-blown emergency. The narratives highlight the distortions in citizens' perception of risk, pointing out non-functional behaviors, underlying the underestimation of the danger, as well as a poor culture of risk communication on the part of citizens, as evidenced by the excerpt below:

> *"People who, for example, during a storm have the wicked tendency to arrive on a pier just to take a selfie, with the risk of being dragged into the sea".* (Interviewee #13, M, Local Authorities)

Coordination among actors with different capacities in the risk management system is a necessary precondition for overcoming disinformation and enabling effective communication. Also important is the ability of the risk management system to promote the maintenance of communication networks (Buzzanell, 2010) between multidisciplinary knowledge, as highlighted below:

> *"Risk communication must undoubtedly be addressed to citizens because our ultimate goal is what we are also doing with the national campaign* "Io non rischio" *("I do not take risks") which is a campaign based on good practices of Civil Protection, but, indeed, without buts, mainly based on synergy between science, volunteering and institutions. Probably in my opinion it is the focus of everything that is inside this, to be able to convey content that is scientifically valid, because that is the fundamental part, that has an institutional language, but that is calibrated to the recipient of the message, so it must certainly be institutional, but simple and immediately understandable and a message that is possibly repeated constantly. It should be risk prevention, for us it should be something that people have in mind 365 days a year"* (Interviewee #29, M, National System of Civil Protection)

> *"In the meantime, we need to plan a communication. You have to plan it because you have to know who are the actors who also have to release the communication, so in a communication plan, in my opinion, I think this is the valid one, you have to know which is the actor who has to communicate and with whom you have to communicate".* (Interviewee #26, F, Local Authorities).

> *"And so, for example, it happened to us in a project, in the Manfredonia project, in which the research team... It was a participatory research and in the team there was a sociologist, (...), then there was a*

historian, then there were several figures who supported the whole research team, that is, the team was quite extensive. And I would add more in the latest research project on these issues... We have always set it up as participatory research, we have also involved a facilitation association that could in some way also act as a bridge on the communication of environmental and health issues between us, the research team and the population and therefore also be a bridge not only from the point of view of knowledge, but also on the emotions that sometimes come out when issues that affect us practically emerge, in short" (Interviewee #4, F, Public Research body).

The institutional fragmentation experienced in the field, especially in emergency phases, where timeliness is crucial, requires a reflection on risk communication strategies, as can be seen from the excerpt below:

"There must be coordination of this. It has happened that there have been misunderstandings, when, for example, on certain emergency contexts, there has been wrong communication, between the prefecture, the regional operations room, municipalities, mayors who are stormed; So, in those situations, especially when there are also deaths and injuries, journalists often press and making communication mistakes is easy. So on the one hand the form must certainly be taken care of and on the other hand by substance I mean that the coordination of communication must be taken care of, understood as a definition also of the channel that must be used so that it can come out unequivocally".
(Interviewee #9, M, Local Authorities)

Risk communication is a multidimensional process that requires integrating multidisciplinary knowledge, with communication remaining central. The experts interviewed highlight that communication is effective only when it is continuous, segmented, empathetic, and institutionally coordinated. Strengthening communication skills, inter-institutional collaboration, and the ability to manage uncertainty transparently (Cerase, 2016) is a priority for improving community resilience while maintaining essential communication networks (Buzzanell, 2010).

Key operational insights

Risk communication is currently challenged by risk perception, the plurality of audiences, the technical-scientific complexity of content, institutional fragmentation, and the increasing digitization of communication in today's society (Massa & Comunello, 2024).

The picture that emerged confirms the multidimensional nature of risk communication. The results suggest that a technicalist approach is insufficient: risk is not just a statistic, but a social and relational phenomenon. This perspective aligns with the literature emphasizing the need to integrate the cognitive and social sciences into communication processes (Renn, 2008). In view of this, the central points of the qualitative analysis can be summarized as follows:

- Risk communication is a process;
- The difficulty of translating technical complexity into simple messages persists;
- The citizen must have a central role in the communication process and be empowered;
- Institutions must act as guarantors of trust and transparency of communication activity.

The interviews reveal the need for an integrated approach that recognises the diversity of audiences, the emotional nature of risk, the importance of trust in the source institution responsible for transmitting the relevant content, and the importance of timeliness. Structural criticality, which cuts across narratives, concerns the transition from knowledge to behavior and requires the application of sociocultural and participatory approaches with citizens rather than traditional technical information and communication.

Divergences and convergences in the testimonies of the interviewees	
Convergences	*Differences*
Risk communication is a process and not a single event	Certainty vs. communication of uncertainty (Civil Protection vs. researchers)
Citizens' awareness and behaviour are the main objectives of risk communication	Technical Emphasis vs. Relational Approach
Clarity, simplicity, and adaptation to the recipient are essential criteria for effectiveness	Risk communication and emergency communication as separate phases or as a continuum
Prevention and training of citizens and professionals can contain the effects of the emergency	Citizen centrality vs. attention to interinstitutional communications

4.2 Engagement and Participation in Risk Communication

In this section, we address stakeholders' opinions on the value of citizen participation, as expressed in our interviews. Citizen participation emerges as a foundational value in risk communication. As highlighted in the initial phase of the project, the analysis of international guidelines indicates that many organizations responsible for risk management emphasize the importance of continuous, widespread community engagement to enhance resilience. In other words, citizen involvement reflects principles that are increasingly present in international theorization on participatory governance and territorial resilience. These engagement practices draw on the principles of a *whole-of-society approach*, which envisions collaboration among governments, private stakeholders, and citizens to achieve shared objectives. Such approaches share common underlying values, particularly inclusivity, as their effectiveness depends on reaching and involving the broadest possible segments of the population, including migrant groups, linguistic minorities, local communities, and civil society organizations. A structural form of engagement enables the creation of arenas for active participation, where trust and individual empowerment can be cultivated and collaborative decision-making tested. Under these terms, citizen involvement builds trust, transparency, and shared responsibility in the management, understanding, and preparedness for risks.

Communication professionals (with varying degrees of centrality and experience) emphasize that participation, understood as both engagement and listening, constitutes a key theme for reflection. At the same time, it provides a lens for interpreting broader ideas and orientations in risk communication,

as well as the conceptual, formal, organizational, and bureaucratic limits that hinder the concrete application of participatory principles in communication strategies.

There is, therefore, a strong convergence among stakeholders in viewing participation as a crucial element of risk communication and, more broadly, of risk management processes. Agreement on the importance of citizen engagement is widespread, being expressed by almost all the interviewees. However, not all accord it the same level of emphasis, nor do they express the same degree of confidence in the practical integration of participatory mechanisms into risk communication. Much of the familiarity with these practices depends on the stakeholders' roles. For instance, interviewees in active roles in the field (e.g., volunteers or coordinators) are more likely to emphasize the tangible value of participation. At the same time, institutional representatives or members of the scientific community tend to describe more nuanced forms of collaboration.

In most testimonies, participation is considered essential, especially in peacetime, as it helps citizens become familiar with the practices and language of risk communication. The trust and reputational capital built during these periods can then be mobilized in times of crisis, when the population is more prepared and responsive to institutional guidance.

As anticipated, participation takes on multiple meanings in the interviewees' accounts, positioning it at different levels of centrality in the practices and actions of the organizations involved.

A first group of stakeholders views participation as enhancing the cognitive and informational dimensions **of risk communication**. In this sense, participation becomes a space for learning and exchange, as illustrated by this interviewee, for whom participatory initiatives coincided with significant efforts toward public awareness and education:

> *"Well, now we've reached a good point. At first, we realized that citizens were largely disinterested in the whole issue of risk. They didn't even know what a wildfire risk was, for example. Then, of course, with the activation of all the relevant procedures and through the work of the Civil Protection plan and the constant presence of volunteers, young people working in the community, people began to understand what risk is and how to behave, and so on. […] And I repeat, with the adoption of the Civil Protection plan, we began to inform citizens through volunteer activities and through meetings organized district by district, so we could speak directly with them."* (Interviewee #21, M, Local Authorities)

Citizens receive information from volunteers and experts, and they also contribute to institutional and expert knowledge of risk-prone territories, thereby making messages more comprehensible and locally grounded. In these cases, local knowledge becomes a resource: themes such as the narrative construction of place, *place attachment*, and adaptation to local contexts are often cited as crucial to achieving more effective and meaningful risk communication. This type of direct involvement produces cascading effects — above all, the legitimization of institutional communication as a foundational and continuous component of risk communication, as clarified by this interviewee:

"We really have strong loyalty, which, as I always say, is something you have to keep alive, because it doesn't last on its own. If you leave it there, it kind of rots away. So keeping it fresh through public events is important, because people need to see you, and being seen is really crucial for building trust. Of course, you can't be everywhere; you can't just walk around with your bag... We worked with Civil Protection on this project called 'What do you know about weather alerts?', just before COVID. I even made some roll-ups about risks, and we set them up in supermarkets. […] People didn't come on purpose: they were shopping, saw the panels, stopped, asked questions. […] These are really valuable moments, exhausting, though, because you have to go in the evening, not at 9:30 in the morning when nobody's around." (Interviewee #30, F, Public Research Body)

Other interviewees describe **participation as a relational and community dimension**: a space for relationship-building, the creation of shared meaning, and the strengthening of ties between institutions, scientific expertise, and communities. From this perspective, trust and awareness arise from ongoing dialogue rather than isolated events. This view also informs critical reflections on the *"Io non rischio"* campaign, especially among those who question the effectiveness of sporadic public events not supported by continuous and widespread engagement:

"The whole idea behind 'Io non rischio' is that the citizen becomes a communicator and then a facilitator. The citizen becomes part of the system. With the new Civil Protection Code, the citizen is part of the system: they have to get organized, they have to know what's going on. They shouldn't just call Civil Protection in an emergency: they should already know the risks and take part actively. Of course, we push for organized volunteering, but even the ordinary citizen has to be organized and aware. That's what every communication campaign should be based on: knowledge, whatever form it takes." (Interviewee #26, F, Local Authorities)

These engagement strategies recognize citizens as competent actors rather than passive recipients of institutional communication. That said, such approaches remain in the minority compared to more pragmatic strategies that emphasize the immediate impact of risk messages. However, examples of best practices include local assemblies, school-based laboratories, and community drills.

Less common in the practices of Italian organizations involved in risk communication is the **operational and decision-making dimension of participation**. The idea of participation as a contribution to the planning and management of risks (for example, through monitoring activities or co-designing emergency plans) remains more a "wish" than a reality. This confirms the need, recognized by several interviewees, to engage citizens in preventive phases to enhance preparedness during emergencies. However, this aspiration often clashes with human limitations (e.g., low civic engagement or interest in risk-related topics) and organizational constraints (e.g., limited personnel, time, or dedicated listening tools). The scenario depicted by the stakeholders is nonetheless promising: across Italy, there are examples of channels or initiatives that can catalyze participation, such as public meetings, structured online feedback systems, and the extensive volunteer network coordinated by the Civil Protection. Yet, coordinated initiatives and shared instruments are still missing to transform these localized or occasional efforts into stable, structured practices. These oscillations also reveal the persistent difficulty of turning listening into operational decision-making.

Interviewees also point to various challenges. Some highlight that participation is often considered the final rather than the integral component of communication strategies. As a result, participation can become merely a formal or ritual tool, with limited influence—a cosmetic gesture of accountability toward citizens. Others emphasize the uneven levels of awareness across local contexts: not all communities display the same willingness or capacity to participate. In addition, citizens are often perceived as being at risk of "information overload." Some attribute this to limited scientific literacy; others, more pessimistically, to a general lack of interest. Still others note that the current cacophony of information can foster disengagement. All these factors are seen as barriers to meaningful participation, and, without trust and transparency, they risk becoming arenas of conflict rather than collaboration.

More practical obstacles were also mentioned. Many interviewees noted that project timelines and institutional rhythms are rarely conducive to sustained participatory practices:

> *"In general, participation is always a good idea, but there's never enough time. Usually, someone goes there, says what they have to say, a few questions are asked, and everyone goes home happy. Ideally, if there were more time, it would be really important to hear what the other side has to offer or suggest — of course, nobody has a magic wand."* (Interviewee #32, M, National System of Civil Protection)

Limited resources, which often mean that communication activities are carried out on a voluntary and uncoordinated basis, also hinder the creation of listening tools or mechanisms for collecting citizens' feedback, as this interviewee explains:

> *"A few years ago — quite a few, actually — we took part in an initiative called 'Weather Sentinels' to train citizens and volunteers interested in meteorology to collect information on events that are hard to measure, like hail or snow. But the initiative never really took off, because it required a specific kind of training and continuity."* (Interviewee #30, F, Public Research Body)

Finally, several interviewees point to the lack of training regarding the value of participation itself: citizens are not always aware of the importance of circular, cooperative approaches to risk management, as this stakeholder recalls:

> *And yet, for some reason, when we organize these meetings — even with the highest Civil Protection authorities — people aren't very interested in science. Think about it: we started these meetings back in 2017, after they'd been advertised, after the usual keyboard warriors had flooded social media with terrifying questions and protests… and then ten people showed up. Some are interested, some aren't. But in general, citizens in these situations are much more concerned about what kind of compensation they might get than about what's happening with the volcano. Because if you're there to tell them what's already in the bulletin, which they've read but not really understood, they'll still ask, 'So, is the eruption imminent?' And you tell them, 'No.'"* (Interviewee #10, F, Public Research Body)

At the same time, the testimonies offer valuable insights into possible improvements. Many suggest making participation a sustained, ongoing practice, involving schools, youth, and local communities to broaden the reach of risk communication. In the short term, integrating structured feedback and listening mechanisms through digital platforms could be a concrete step forward.

In conclusion, participation emerges as a key indicator of the maturity of risk communication. It reflects both the capacity of institutions and experts to engage in genuine dialogue and the willingness of citizens to build shared practices of risk communication. Integrating participation into long-term governance strategies, therefore, represents not only a necessity but also a measure of institutional and civic resilience.

Key Insights - *Stakeholders' Opinions on Participation*
Participation as a Foundational Value and a Method of Risk Governance Citizen participation in risk communication processes is both an ethical goal and an operational pillar of risk governance. Stakeholders view it as a necessary condition for building trust, transparency, and reciprocity. Structured participation serves as an indicator of maturity in risk communication processes. **Trust and Relational Capital Are Built in Peacetime** Almost all experts agree: participation must be cultivated in "times of peace." It is a relational process that must be developed consistently before emergencies occur, thereby generating trust and reputational capital that can be mobilized during crises. Participation and inclusion in communication processes are cumulative practices that strengthen institutional credibility over time. **Multiple Forms of Participation: Knowledge, Relationship, Action** Interviewees distinguish between different forms of participation, not all of which are equally widespread or feasible. Citizens can participate in knowledge of risks and territories, fostering two-way processes of mutual learning. They can also value participation as a relational process, understood as a space of encounter among experts, institutions, scientists, and volunteers. Finally, they can play an active role in decision-making processes through co-design initiatives or collaborations in disseminating information. Effective and widespread strategies should integrate these three levels to meaningfully engage citizens with diverse interests and competencies. **Recognizing Weaknesses** Acknowledging weaknesses is essential to strengthening the communication chain. Experts identify several areas for improvement in participatory approaches. Institutional limits (bureaucracy, funding, time, resources, coordination), cultural barriers (limited civic engagement, disaffection, misinformation), and communicative constraints (lack of dedicated listening tools within organizations) all hinder consistent participation. Without significant improvements in these areas, participation risks becoming a formal or episodic exercise. It should therefore be institutionalized as a routine practice within organizations. **Toward Constant and Inclusive Participation** Interviewees propose several operational directions: integrating participation throughout communication processes, engaging schools and young people as amplifiers of a risk culture, and adopting (also digital) feedback tools to collect and analyze citizens' opinions. Effective participation requires the involvement of multiple actors, is intergenerational, and must be supported by adequate communicative infrastructures.

5. Mayors, Emoticons, and Artificial Intelligence: Exploring Gen Z Preferences in Risk Communication

5.1. Materials and Methods

This research phase was conceived as a preparatory step for administering a survey to a representative sample of the Italian population. Its main objectives were to assess the clarity and consistency of the materials designed for the quantitative stage, to explore preferences and divergent opinions on risk communication, and to examine perceptions of trust and acceptability regarding the use of artificial intelligence in this domain.

Prompt Design and Material Generation

The materials shown to participants were generated with ChatGPT 4.0 (PRO version) and guided by detailed yet flexible prompts. The inputs included official texts on seismic and hydrogeological risk prevention drawn from the Italian Civil Protection website. ChatGPT was instructed to simulate Facebook posts from two alternative sources:

1. a **Mayor** communicating with citizens in a hydrogeological risk area;
2. the **Municipal Civil Protection** addressing seismic risk.

For each source, two types of messages were generated, based on *gain* (benefits from adopting preventive behaviours) and *loss* (negative consequences of inaction) framing. Each message included a **visual card**, progressively refined through several rework cycles to improve readability and correct minor errors. Each prompt was administered three to five times between May and June 2025, in short sessions to minimize response-set effects. The selected posts were chosen based on three main criteria:

- clarity and internal coherence of the text;
- accuracy and plausibility of the image;
- representativeness of the information provided.

The messages were formatted as **simulated Facebook posts**, labelled either "Mario Verdi Sindaco – Comune di Monterosso" or "Protezione Civile – Comune di Monterosso." The choice of a fictitious but plausible municipality enabled researchers to evoke a local dimension without directly referencing the data-collection context. Some "imperfect" design elements (e.g., slightly long captions or uneven alignment) were intentionally preserved to stimulate critical feedback and encourage participants' suggestions for improvement (see APPENDIX B)

Sample and Interview Procedure - Sapienza University of Rome

The sample included **32 university students** aged 21–28, studying communication or related disciplines, or working as collaborators or interns in university communication offices at Sapienza University of Rome.

This generational group (Gen Z) was selected for its baseline levels of media literacy and environmental awareness, with full recognition of its nonrepresentative nature. The students' sample is detailed in APPENDIX C.

Participants were recruited through course announcements and direct contact by the research team. All were informed about the aims and procedures of the study, provided written informed consent, and were guaranteed anonymity and confidentiality, in accordance with the ethical standards of Sapienza University of Rome. Special care was taken to avoid collecting sensitive or personal data and to ensure participants' full right to withdraw at any time.

Interviews were conducted online or in person between July 2025 and October 2025. Each participant was presented with two products (one *gain* and one *loss*), using both mixed and mirrored sequences to assess potential conversational effects associated with exposure order. After viewing the materials, participants were asked to summarise the main messages and identify three elements they appreciated and three they did not. The subsequent discussion focused on their evaluation of the use of AI in risk communication and on the perceived relevance of environmental and natural hazard information in their media routines.

All interviews were recorded (with explicit consent), fully transcribed, and analysed through **thematic analysis**. Rather than measuring message effectiveness, the study aimed to identify **emergent interpretive patterns**, including references to *media ideologies*, generational frames, *third-person effects*, and collective perceptions of responsibility.

Sample and Interview Procedure - University of Cagliari

Students from the Department of Political and Social Sciences at the University of Cagliari were interviewed between October and November 2025. Given the specific geographical context of Sardinia, an island characterized by distinctive environmental conditions and exposure to particular risks, this research action was conceived as an opportunity to test risk communication practices tailored to the needs and experiences of the local territory (La Rocca & Lovari, 2024). For this reason, additional communication products focusing on wildfires were presented to participants, and a dedicated section of the discussion explored the implications of insularity.

The general selection criteria involved recruiting students from the University of Cagliari as research participants, using purposive sampling to select individuals with expertise in natural risk communication. Fifteen students were interviewed during the designated period. Due to the limited number of participants, the sample cannot be considered statistically representative; rather, it is analytically salient for qualitative purposes.

Access to the field (Bichi, 2002; Cassell, 1988) unfolded through a combination of digital and in-person strategies. A first call for participation was disseminated informally via the master's program in Social Innovation and Communication's Microsoft Teams channel, prompting initial voluntary responses. Subsequently, three additional participants were recruited via snowball sampling. In parallel, face-to-face

interactions between the researcher and selected participants helped consolidate physical access to the field—what Cassell (1988) terms "getting in."

The semi-structured interviews (Knott et al., 2022) were conducted individually via Google Meet. Each interview lasted an average of 58 minutes (min. 51 / max. 75). All interviews were recorded and later processed using automated transcription tools.

Participation was voluntary, and complete information about the study's procedures and aims was provided in advance. Informed consent was obtained before each interview, and authorization to record and process participants' narratives was reconfirmed at the beginning of each session. The study complied fully with the University of Cagliari's Ethical Code.

Before the interviews, participants completed a semi-structured questionnaire (via Google Forms) that collected demographic and educational information, as well as additional data relevant to the study, including prior experiences with natural hazards and social media use.

The interview protocol was further refined by the Cagliari team to investigate the use of artificial intelligence in wildfire risk communication in island contexts, such as Sardinia. This choice was informed by recent empirical evidence on the seasonality and cyclicity of specific risks affecting large islands, including wildfires and heat waves (La Rocca & Lovari, 2024).

Each participant was exposed to two communication products (one framed as gain and one as loss), administered in mixed or mirrored sequences, to identify potential conversational effects related to exposure order. After reviewing the materials, participants were asked to summarize the main messages and identify three appreciated and three unappreciated elements related to two primary risks: hydrogeological and seismic. The discussion then moved to their evaluation of AI use in risk communication, followed by reflections on the relevance of environmental and natural-risk information within their media routines. Participants were subsequently invited to comment on the wildfire-related products. Finally, they were asked about their information pathways and habits and were prompted to articulate reflections on insularity as it relates to risk communication and perception.

Limitations and Added Value

Although based on a **convenience sample**, this qualitative phase allowed the research team to refine the survey materials and identify recurrent interpretive tendencies and potential communication barriers. The use of AI-generated content proved methodologically valuable for testing audience reactions in a controlled setting and exploring perceptions of credibility, trust, and ethical acceptability. Overall, this exploratory phase is a crucial step toward developing empirically grounded, context-sensitive tools for effective risk communication, consistent with the objectives of WP6 within the RETURN project.

Methodological Note on the Presentation of Testimonies

The collected testimonies are presented by territorial clusters, distinguishing between those from students at Sapienza University of Rome and those from the University of Cagliari. This choice stems from several reasons. First, it reflects the composition of the sample, which is only partially comparable. As previously illustrated, the students from Sapienza University of Rome were selected based on two main criteria. The first concerns age: all respondents belong to Generation Z, to investigate the familiarity and sensitivity of a cohort increasingly associated with fears of (and, in some cases, mobilizations for) environmental and climate-related issues. Second, the selection privileged students with some familiarity with communication practices (the majority of interviewees attend programmes in communication, journalism, or marketing). Furthermore, Sapienza has historically attracted students from across the country. As shown in the interviewees' composition (see Appendix C), more than half reported living outside Rome. This enabled us to include respondents who had directly experienced (or whose families had experienced) the risks discussed in the interviews (e.g., earthquakes). These heterogeneous local backgrounds also reflect the diversity of proximity-based institutions, which range from small municipalities to metropolitan areas like Rome.

For the Cagliari cohort, a slightly different selection criterion was applied. As detailed earlier, priority was given to students who self-reported familiarity with risk communication. This resulted in a partially different composition (including, for instance, participants adjacent to the primary age target and a predominantly female sample). The geographical homogeneity regarding residence (all respondents reported living in Sardinia) enabled a more focused exploration of the territory of reference, perceived vulnerabilities, place attachment, and contextual comparisons with the rest of the country. As such, this research activity took shape as an analytical reflection on insularity and the risks associated with it, conceptualizing Sardinia as a laboratory for examining territorial specificities and the communication products addressed to them.

This decision reflects the need to address the situated nature of risk communication. In a country as territorially complex and heterogeneous as Italy, risks manifest differently across contexts. Likewise, communication solutions (according to both the guidelines examined and the academic literature) cannot be *one-size-fits-all* products. The geographical, socio-cultural, and environmental specificities of the contexts considered must be incorporated into the design and evaluation of communication tools. Moreover, risk perception, communicative practices, and expectations regarding institutional behaviour vary significantly depending on territorial conditions, local histories of past disasters, and familiarity with specific hazards. Differentiated institutional response times, uneven perceptions of institutional attention to local problems, and varying degrees of trust and optimism regarding one's territorial positioning (Caporale & Rinaldi, 2025) all shape how risks and their communication are problematised.

Organizing the results on a territorial basis allows us to situate the plurality of perspectives, preventing the flattening of potential differences. At the same time, as the following sections will show, significant commonalities do emerge. The territorial lens allows us to highlight both the continuities and the divergences in how specific vulnerabilities are recognized. This provides essential insights for developing locally tailored communication products in line with the inclusivity requirements identified through the guidelines analysis.

This expository choice should therefore be understood as an analytical strategy that recognizes territory as a key interpretive variable in risk perception and risk communication processes.

Sociodemographic, Educational, and Media Profiles of the Sapienza Interviewees

The sample comprises 32 interviewees involved in research activities conducted by Sapienza University of Rome within the RETURN project. Selecting this group enabled testing each product sequence four times, making this phase a preliminary step toward developing communication materials and survey items for a representative sample of the Italian population. The data presented here derive from a short questionnaire administered immediately before the interview, designed to record (based on the students' self-positioning) their sociodemographic characteristics, territorial perceptions, and information practices.

The sample interviewed by the researchers at Sapienza University of Rome is relatively homogeneous in terms of age and educational background, enabling the interpretation of the results within a coherent framework of competencies, interests, and communication practices. The average age of participants is approximately 24 years (range: 21-28), confirming the project's focus on young adults, a demographic considered crucial for understanding the adoption of new digital languages and media in risk communication.

Regarding gender distribution, the sample is predominantly female (19 respondents), while 13 participants identify as male. Although not representative of the general population, this distribution reflects a well-established trend in communication-related academic programmes, where female students are frequently in the majority. Data from Almalaurea (2024) indicate that graduates in communication and political science comprised 32.2% men and 67.8% women. This element suggests that potential differences in gendered sensitivities toward prevention, risk perception, and the authority of information sources should be considered, even though the study's qualitative component did not reveal significant discrepancies in the interpretation or conceptualization of risk communication.

Regarding education, most interviewees (27) have completed a bachelor's degree, while the remaining five are currently enrolled in a bachelor's programme. The entire group consists of students or young professionals in training, with a clear majority engaged full-time in university studies. Only a minority combine study and work, delineating a sample that is highly embedded within academic environments (both in terms of everyday attendance and participation in campus life) and therefore exposed to media and communication practices typical of university settings.

The analysis of educational paths confirms a pronounced concentration in the communication and media domain, the primary criterion for participant selection. Respondents are primarily enrolled in programmes offered by the Department of Communication and Social Research at Sapienza, with a significant presence of students in curricula oriented toward marketing, digital communication, and media studies. This disciplinary specificity is particularly relevant for interpreting the data: participants possess well-developed competencies, attitudes, and expectations regarding communication processes, digital languages, and the credibility of sources, factors that inevitably influence their evaluation of risk

communication messages. Marketing students, in particular, expressed heightened sensitivity to communication formats, whereas students in journalism-focused master's programmes raised issues related to sources and the media system as a whole. In all cases, however, the role of "recipient" prevailed over the possibility of acting as a technical evaluator of the messages.

In territorial terms, most respondents reside in the urban area of Rome or nearby municipalities in the Lazio region. Thirteen students report living permanently in Rome, while the remaining 19 indicate a different residence. This geographical distribution must be interpreted with the understanding that all interviewees who report living outside the region currently reside in, or have resided in, Rome. This condition enables more consistent comparison of the collected perceptions while also indicating widespread familiarity with local institutional references, official communication platforms, and civil protection dynamics in the Roman context. Such territorial data will be particularly valuable when comparing results with other RETURN project sites, such as Cagliari, which present distinct geographical conditions and risk perceptions. Some students also report permanent residence outside the Lazio region, as indicated in APPENDIX C.

Regarding territorial risk perception, most respondents (16) do not consider themselves to live in an area exposed to natural hazards. Ten participants state the opposite, while six are unsure. More than half of the sample (18 participants) report never having experienced an emergency related to natural or environmental risks. The experiences mentioned primarily concern extreme weather events and hydrogeological alerts; some respondents recall perceiving seismic tremors in the Lazio region, including those associated with the 2016 earthquake in the Amatrice area. One student residing in Taranto reported exposure to environmental risks connected with the former Ilva steel plant. Overall, the scenario portrays varying levels of familiarity with natural and environmental hazards, resulting in corresponding degrees of awareness and preparedness, as further explored in the interview protocol.

The analysis of information practices reveals significant trends. Nearly all participants use social networks and digital platforms as their primary sources of information. Instagram, TikTok, and YouTube are the most frequently cited environments, often complemented by news websites, television, and, to a lesser extent, podcasts and radio. The sample, therefore, displays a clearly multichannel information behaviour, combining professional and institutional sources with user-generated content and materials disseminated by digital creators. However, this preference for social media does not automatically translate into trust in influencers, particularly when dealing with complex and uncertainty-laden topics such as natural and environmental risks, as discussed in other sections of the report.

A particularly relevant finding for the project concerns interest in environmental and climate-related issues: 22 of 32 participants report actively seeking information on natural hazards, climate change, and related phenomena. Yet, during qualitative exploration, only a minority confirmed regularly searching for such content or being exposed to it through online channels or broadcast media. This discrepancy (likely associated with social desirability-related motivations) highlights a shared perception that being informed about risk and climate-related issues is civically appropriate and desirable.

Overall, the sample is consistent with the research aims, representing a social segment highly exposed to digital media, central to the evolution of institutional communication practices, and strategically positioned to innovate contemporary risk communication models.

Sociodemographic, Educational, and Media Profiles of the University of Cagliari Interviewees

The general selection criteria required participation by students from the University of Cagliari. The specific inclusion criteria required students to possess competencies or familiarity with risk communication.

The majority of the interviewees (except one female student) hold a bachelor's degree and, as students enrolled in the master's programme in Social Innovation and Communication at the University of Cagliari, have developed competencies and gained familiarity with risk communication. The interviewees' ages range from 23 to 31, with an average age of 25. The predominant gender is female, as shown in Table C of the APPENDIX.

Given their average age, the participants can be considered members of Generation Z, individuals born between the late 1990s and early 2000s. In a highly interconnected and digitalised world, they are often referred to as "digital natives" (Prensky, 2001). This definition reflects their early and ongoing experience of digital socialisation in a contemporary culture in which social media represent an essential tool for knowing the world (Vittadini, 2018). This generation is characterised by flexible emotional and relational competences, easily adaptable to contemporary social contexts (Ciampi & Finco, 2024), supported by a digital identity that accompanies young people across the various microsystems of their lives.

Most of the sample considers their domestic area to be exposed to natural risks. This supports one of the criteria guiding participant selection, as these individuals appear to be attentive observers of the hazards that have affected or continue to affect their municipalities of residence. Narratives highlight that living or regularly staying (as commuting students) in some regions of Sardinia (such as the Cagliari district of Pirri, prone to severe flooding during heavy rainfall, or the Montiferru region, devastated by Sardinia's largest wildfire in 2021) enhances individuals' capacity to recognize and internalize information related to natural risks.

The 100% rate of social media use among the interviewees is unsurprising. It reflects the central role of these platforms in the lives of Generation Z. For this generation, social media platforms are not merely tools for entertainment or socialisation but rather ecosystems in which much of their digital life unfolds, from product discovery to information seeking.

The strong preference for Instagram (63%) indicates Generation Z's inclination toward visual, immediate content. Instagram's focus on images, Stories, and especially Reels reflects its preference for rapid, aesthetically curated content, primarily consumed on mobile devices. Although its share is smaller in the present study, TikTok's presence is crucial. For many young people, TikTok serves as a visual search engine, often preferred over Google for reviews, places, "how-to" advice, and trends. Its interest-based algorithm,

rather than follower-based logic, provides a continuous stream of authentic and highly personalised content, a key element for this generation.

Generation Z uses these platforms not only for leisure but also as genuine discovery environments for news, brands, and information—often preferring the immediacy of short videos and user-generated content to more traditional sources (Castellano, 2023).

Information-related data reveal both a transition and a coexistence with more "traditional" web channels. The 60% who also use websites as an additional information source suggest that, while social media serves as the starting point, a significant portion of Generation Z still turns to websites to verify or deepen the information. This suggests potential awareness of, or need for, more structured content than is available on social media, where information is often fragmented.

The small percentage (13.3%) who report using traditional search engines (e.g., Google) for information is particularly significant and aligned with recent trends: information searches increasingly begin within social media apps (e.g., Instagram, TikTok) rather than Google's search bar. Social media are perceived as more immediate and visual for rapid discovery. At the same time, search engines are used primarily for topics that require more complex analysis or authoritative sources (e.g., academic or professional information).

5.2. Risk Communication as a Mediation of Polarities

This first section presents the overall picture that emerged from the interviews. For the Sapienza group of respondents, risk communication appears to be a field rich in semantic complexity: defining what "ideal" risk communication should look like is often perceived as a demanding task, partly because it appears distant from common experience. In fact, the risks that come "top of mind" are not always natural, environmental, or related to climate change. Most interviewees acknowledge that this form of communication has a significant strategic value. Although the boundaries often blur with those of crisis or emergency communication, many students believe that, to be effective, risk communication must focus on prevention—a sustained effort undertaken in peacetime to avoid responses driven by anxiety.

> *"An effective risk communication... well, definitely direct. I'd want a person, or someone, to tell me directly, 'Look, this is what can happen, this, this and that can happen.' I'd definitely want there to be something preventive in this communication, I mean, I wouldn't want it to be an 'Okay, this thing is going to happen, how can we reduce the damage,' which is fine and I think it's 50%, if not more, of the communication we usually get about risks: not about how we can prevent it, but about how we can reduce the damage from it."* (M_11_LM_M_RM)

> *"Probably communication that has to do with providing information about probable or actual risks, and therefore giving people a whole series of pieces of information about how to manage it all, I imagine."* (F_27_LM_M_RM)

"It's an extremely strategic area of communication, maybe even more than other areas, and difficult to carry out (…) timely, recurring: I know those are two things that don't always go together." (M_10_LM_M_RM)

"I see it more as a kind of 'open your eyes!' (…) be aware of what's around you, be aware of what's happening and be careful (…). I don't see it as something that should create anxiety and make you act immediately, like 'take action now,' but more like 'let's try to prevent, let's understand what could happen.' I mean, I'm telling you that there's this thing, that this risk could exist, that we live in a situation where this could happen, so let's try to do something. I see it more like… not even activism, more like 'let's try to prevent.'" (F_18_LM_M_RM)

These accounts situate risk communication in a hybrid field, between public and institutional communication and a more participatory approach to communicative processes. For most participants, therefore, the label "risk communication" does not refer to familiar practices but to a set of messages oscillating **between public utility and emergency**. As will be discussed when examining tone, most students imagine risk communication as a space of balance, suspended between alert and reassurance, vertical prescriptions and involvement.

Moreover, viewing posts and guided discussions around these visual stimuli prompted meta-communicative reflection, during which interviewees not only discussed the proposed products but also reflected on how risk communication content should appear on social media platforms, thereby revealing their expectations for institutional communication. As expressed by one student, who does not particularly appreciate either the use of emoticons or a tone perceived as too informal:

"Maybe a slightly more institutional tone, I mean, I wouldn't really expect the Civil Protection Department to talk directly to me, like, using 'you.' Maybe I'd expect a 'sir,' a 'you all,' or something more formal from the Civil Protection Department. This one feels very familiar, very conversational." (F_17_LM_S_RM)

This led to the identification of generational or ideological dynamics. First, many of the statements are imbued, often unconsciously, with media ideologies (Gershon, 2010), which define the contours of platforms (i.e., which messages and representational techniques are most appropriate) and the audiences that inhabit them.

"Definitely not on TikTok, maybe on Instagram, but I think this works better on Facebook because, well, for the target audience, it's a bit more mature, older, because, you know, there's no immediacy of risk; so it's more of a piece of life information." (M_12_LM_S_RM)

This also reverberates in reading (or scrolling) habits, which are most often described as hurried and distracted, across the imagined audiences for risk communication. In this case, for example, one respondent highlights the importance of repeating, within the same text, who is issuing the message:

"The line under the title saying 'message from the Civil Protection Department.' Yeah, it's true they're writing from the Civil Protection page, but we all know we scroll through social media feeds in a very vertical, fluid, fast way. So maybe it could escape the attention of some slightly more distracted users

who don't notice who's writing, who's spreading the message. So repeating that it's from the Civil Protection Department is definitely another element that captures attention and maybe makes you stay there with your ears pricked up." (M_21_LM_S_RM)

This aligns with the belief that informational behaviors differ across generational cohorts. In particular, *boomers* (who often take the form of interviewees' parents and/or grandparents) are seen as model audiences for a social medium perceived as "static," such as Facebook, and as the primary recipients of the messages imagined by the AI: long, sometimes excessively detailed, and full of references to property or family members.

"Age group, I think, as a generation, from boomers onwards. Besides [the fact that it's published] on Facebook, the text is full of information, both in the bio and in the text itself. Also, the size, since there's the title 'message from the mayor, let's act for everyone's safety.' Yeah, that's meant to catch attention, but maybe it's also written big because... I don't know, since it's addressed to an older audience — I didn't want to say 'elderly.'" (M_08_LT_S_RM)

"But looking at it now on Facebook, it really seems like a post for the so-called boomers, honestly. Like, really for that age range — sixties, fifties, forties. Yeah, let's say Generation X, boomers, more or less, that age group. Older adults, basically." (F_28_LM_S_RM)

However, these descriptions often imply a predisposition toward ageism (Comunello et al., 2022; Marrie, 2024), in which older people are considered "not suited" to using social media content, suggesting a lack of understanding of the mechanisms that drive its spread. This sometimes leads to positions—sometimes ironic or conflictual ones —toward the language of boomers, often seen as overlapping with that of institutions. Therefore, adults (including those close in age) are not always perceived as aware or literate, as recounted by one student when talking about a post he considered not particularly successful or trustworthy:

"I can totally picture a situation where my mom shows me this, and I go, 'Mom, be careful, check who posted it.'" (M_10_LM_M_RM)

But things are not much better for Gen Z. In this case, the students' self-criticism centers on their information consumption, characterized by distracted scrolling rather than deeper engagement.

"So, it tries to catch the attention of young people, who very often just keep scrolling if they see more basic things. So I'd say it's informal mainly because, you know, there are emojis." (F_07_LT_M_RM)

"It looks like the kind of content that maybe my dad would see more than me. Or maybe the opposite, I might see it more than he does. Maybe it's because of how it's written, or how long it is. I mean, young people —someone around 20–23 years old —would hardly read it all. As I said before, it's a matter of attention span; it doesn't immediately grab you, and you don't get right away what it's about." (F_04_LM_S_RM)

This leads (as will be explored in the following paragraphs) to a request for risk communication content that is more engaging and appealing, without sacrificing institutional seriousness. In this sense, there is

also a "normative" tendency regarding what risk communication should do and which tones and formats it should use, because it is perceived as communication that produces an effect on others, a **third-person effect** (Van Belle, 2015). Yet those effects are often imagined as affecting others—idealized or generalized "others"—depending on how they are expected to behave. The prevailing feeling is one of distrust, disinterest, and the perceived need for more "coercive" risk communication, in which authority replaces credibility, as the following statement shows:

> "Honestly, these things are important, but I repeat, I don't think the issue is that institutions need to improve their communication. The real problem is citizens' awareness... that's it. Because if people always say, 'Well, if they're not doing it, why should I?,' whether it's about crises or trash collection. That, for me, is the main issue: people just don't have awareness." (M_03_LM_M_RM)

The Sapienza testimonies collected highlight the civic value and the necessity of a widespread and inclusive risk communication, even though the conceptualizations and interpretations that emerge tend to place this communicative practice as somewhat distant, or only marginally connected, to an information ecosystem driven by fragmented interests and sustained by algorithmic selection.

Compared to the Roman participants, students from the University of Cagliari reinforce a four-dimensional understanding of risk communication (1. objectives, 2. content, 3. recipients, and 4. senders) and introduce an additional element linked to the territorial contextualization of risks (La Rocca & Lovari, 2024), which, when read through the lens of inclusivity, calls for differentiated communication strategies tailored to local vulnerabilities.

Across all interviews, risk communication is described as a practice oriented toward informing citizens about potential hazards and enabling preventive behaviour. Communication is perceived as an anticipatory tool that prepares individuals for emergencies by offering guidelines and self-protection strategies:

> "It informs about human and natural risks and helps prepare people for possible hazards... we are in the domain of prevention" (F_01_LT_S_CA)

> "Risk communication is an exchange of information... first, to prevent." (M_07_LT_M_CA)

Prevention emerges as the defining purpose of this domain. Communication is not only reactive, offering instructions during crises, but also proactive, cultivating risk awareness and responsible behaviour in ordinary conditions:

> "Preventive communication is needed... the citizen must be educated beforehand." (F_04_LT_S_CA)

Cagliaritarian participants understand risk communication as the dissemination of information on natural hazards, intended as events that disrupt everyday life and require behavioural shifts. These hazards include atmospheric phenomena, floods, earthquakes, wildfires, and other context-specific threats. This tendency confirms students' perception of overlap between risk and crisis communication.

> "Risk communication warns me about all dangerous situations... floods, earthquakes, etc." (F_06_LT_M_CA)

Communication also concerns the promotion of self-protection behaviours designed to reduce damage and mitigate cascading effects:

"It tells me what to do at the moment a disaster occurs." (M_12_LT_S_CA)

Territorial differentiation is perceived as essential, particularly in regions exposed to recurrent risks or marked by insularity, where climatic conditions and vulnerabilities vary significantly (La Rocca & Lovari, 2024):

"Differentiation is necessary... heat waves in the South, earthquakes in island regions." (F_11_LT_M_CA)

Students consistently identify citizens as the primary recipients of risk communication. While general audiences are targeted, specific sub-groups may require tailored messages, as stated in this testimony:

"It raises awareness among people, citizens, or specific categories." (F_03_LM_M_CA)

The senders are recognized as institutional actors (Civil Protection, local authorities, and other public bodies) responsible for disseminating authoritative and actionable information:

"The senders are almost always public institutions." (F_09_LT_S_CA)

This institutional anchoring positions risk communication as a trust-building activity. Establishing credibility is seen as a prerequisite for preventive effectiveness:

"Risk communication must create a bond between the institution and the citizen and help build trust between the two." (F_13_LT_S_CA)

The following paragraphs discuss the preferred tone and sources, as well as participants' views on artificial intelligence.

5.3 Tone and Sources: Empathy, Urgency, Authoritativeness

This section examines how the control variables provided to the artificial intelligence when generating posts—tone (gain vs. loss) and source (Mayor vs. Civil Protection)—were perceived by students, thereby influencing their trust, engagement, and evaluation of risk communication.

It should be noted from the outset that no "overwhelming" preferences emerged: interviewees mostly recognized that each of these elements serves a specific function and may produce different effects depending on the target audience. Nevertheless, with respect to tone, opinions tended to polarize between those who preferred the *loss* frame and those who found the *gain* approach more effective.

Specifically, the *loss* tone was appreciated for its **functionality**, in line with expectations for risk communication (i.e., direct, urgent, and action-oriented). The *gain* tone, on the other hand, was valued for its **expressive and emotional dimension**: respondents frequently noted that risk communication, especially when coming from institutional sources, "should make people feel."

Loss Frame

Sapienza students perceived messages framed in terms of loss as conveying a stronger sense of urgency, often associated with imminent risk. The related visual codes (red coloring, warning emojis, bold fonts) were seen as closely linked to the idea of alertness and, therefore, more effective at attracting attention. Only a few interviewees questioned this choice: some felt that red is overused in their timelines (as institutions or creators frequently adopt it) and therefore risks going unnoticed; others perceived the "shouted" graphic layout as counterproductive for attention.

Overall, the alerting and urgent dimension conveyed by *loss*-framed messages **encourages action** more strongly. For many participants, these messages were seen as functional to activating protective behaviors, since they draw on anxiety and make the possible consequences of non-compliance immediately clear.

> *"It's like when you go... I don't know, to the emergency room, to the hospital, and you see the sign 'radiation hazard alert'. You pay more attention. It also makes you a bit more anxious in that sense [...] phrases like 'if you ignore the rules you can lose everything, danger of death' — they make the situation more immediate. It's not saying 'Let's do this for a better future', for example, to avoid certain situations later. It says 'The danger is now.' If you don't do this, you risk that. It puts it on a practical level: if – consequence."* (M_08_LT_S_RM)

> *"It's basically about how you see the causal link between things, right? So the fact that sleeping in a basement can mean you wake up dead — to me, that works. It would scare me and make me say, 'Okay, I'm not doing that anymore.' So for me, this is fine, even though I realize that there are people who would reject this kind of content because it makes them anxious, so they immediately scroll away from it because it's kind of strong."* (F_27_LM_M_RM)

> *"The phrase 'If you ignore the rules you can lose everything,' since it's a strong phrase, might attract attention, create that sort of fear, you know, during an alert, and make people read more carefully what they're supposed to do and what the risks are."* (F_16_LM_S_RM)

A smaller number of testimonies, though less frequent, tended to reject this kind of content, finding it **overly anxiety-inducing or guilt-driven**, as it assigns disproportionate responsibility to individuals. In some (marginal but significant) cases, this alarm tone was also criticized for overlooking the **unpredictable nature of natural hazards**. These statements reflect a certain fatalism and a partial awareness that, while it is often impossible to fully control or predict the occurrence of adverse natural events, it is still possible to act on preparedness and risk mitigation.

> *"[I don't like] the reference to 'it could cost you dearly', because many times it doesn't depend on the individual. I mean, if a house was built in an area where it shouldn't have been, the fault isn't with the person living there. So blaming them isn't right."* (F_02_LM_M_RM)

> *"Cognitive dissonance happens when a text emphasizes a behavior that the person knows they should adopt but doesn't, so they feel guilty. (...) So 'you might regret it' could trigger that dissonance, making*

people feel guilty. But at the same time, since it's an alert or informational message aiming to change a behavior, it actually makes sense." (M_12_LM_S_RM)

There were also **divergent opinions regarding the intended audience** of such communication. For some respondents, these messages appeared more suitable for older adults, who were perceived as needing stronger stimuli to take preventive action in the event of natural hazards, or as more accustomed to alarmist tones, such as those circulating in group chats or in certain types of journalism. Others, conversely, argued that such harsh, moralizing language would not resonate with Generation Z, who might find it exaggerated or even caricatured. Many students also noted that older adults could be easily alarmed: several said they would avoid sharing these posts with their parents or grandparents, not wanting to increase their anxiety. Some adults, however, might be particularly **susceptible to the kind of moral responsibility promoted by institutions, perceiving it as pressure or an emotional burden**. The following excerpts summarize this range of perspectives:

"There are already so many daily debates about political correctness, about being told what to do… For how Gen Z is, a tone that threatening would probably be taken as a joke. You could easily see memes in the comments, people making fun of it, ridiculing the message." (F_17_LM_S_RM)

"I can just imagine a flood of angry boomer comments under a post like that, directed at the mayor for talking that way…" (M_10_LM_M_RM)

Even the students from the University of Cagliari confirmed that loss-framed messages were perceived as conveying a heightened sense of urgency, often associated with an imminent threat. Visual and chromatic elements (particularly the colour red) and related cues such as warning emojis and bold fonts, which the Sapienza cohort had also identified as salient, were interpreted by the Cagliari participants as graphic devices explicitly designed to capture attention, as illustrated below:

"The red colour of the infographic immediately makes you understand that there is something important you need to pay attention to, and also the icons showing the situation being described, like falling furniture or the first-aid kit." (F_10_LT_M_CA)

Overall, the sense of alertness and urgency produced by this framing was perceived as facilitating faster operational responses. For many participants, such messages were considered functional in activating proactive and protective behaviours, as they evoke anxiety while making the potential consequences of inaction immediately legible:

"It makes you feel responsible, absolutely. I think the checklist helps you understand what the next steps should be, even before starting to build a house." (F_10_LT_M_CA)

A smaller number of testimonies, although less frequent, expressed a markedly critical stance. These participants perceived the messages as excessively anxiety-inducing or guilt-driven, arguing that they placed disproportionate responsibility on individuals—sometimes to the extent of inhibiting action when transitioning from risk to emergency:

"It leaves me with a sense of fear because they don't give me the tools. If I saw this post from the local Civil Protection, I would feel like I had a problem on my shoulders without any means to address it, and it would be easier to ignore it rather than deal with it." (M_02_LT_M_CA)

"The post is informative, but at the same time it relies on fear appeal." (F_04_LT_S_CA)

"The post projected me into an apocalypse." (F_09_LT_S_CA)

"It's a very aggressive tone, but sometimes, if the carrot doesn't work, you need the stick. Still, it scared me." (M_07_LT_M_CA)

These critical reactions underscore how, while loss-framed communication can enhance the salience of recommended behaviours, its emotional charge may backfire when perceived as disproportionate or unsupported by actionable guidance.

Gain Frame

Regarding messages framed in terms of gain, the Sapienza interviewees were most impressed by a stronger sense of **empathy and emotional involvement**. In particular, respondents appreciated references to collectivity and community, as well as the reassuring feeling that institutions were actively addressing risks.

"Let's act together: I like that message. It gives a sense of solidarity, of a community that can protect itself together. I already like this idea, the slogan of the message, let's say. And also in the text below, when it says, 'Together we can face even the most difficult emergencies.' This idea of solidarity appeals to me because a mayor is usually a leader, a mediator, and I like to think that someone sending this kind of message would also try to calm people down in such a situation." (F_04_LM_S_RM)

"The last sentence, where it says, 'Every correct behavior is a step toward collective safety. Thank you for your attention, your civic sense, your cooperation.' I like it because it makes you feel part of the message, like if you behave this way, you're actually helping others." (F_20_LM_S_RM)

"It gives me a more relaxed feeling, kind of a sigh of relief… I like this more conversational tone, more like, 'let's build a community, let's help each other, let's collaborate.' If we work together on prevention and these situations, we can face emergencies together." (F_18_LM_M_RM)

"The reference to collectivity makes me feel — or at least would make me feel, if I were a citizen of this town — like I'm part of a community." (F_02_LM_M_RM)

However, despite these empathetic reactions, indicative of a certain level of trust toward institutions, this type of message was generally considered **less effective in practice**. Many respondents felt that it conveyed **less urgency**, partly because of its **softer, more reassuring visual codes — pastel yellow or institutional blue as primary colors —** and therefore tended to be easily overlooked in a social media feed.

"Honestly, it depends on the situation and the place you're in, because this one, as I said, has a calmer tone. So overall, I don't mind coming across something more peaceful while scrolling through my feed. But at the same time, I'm not sure how effective it is in helping the information stick. So I see it both as a positive and as a negative thing." (F_28_LM_S_RM)

"The graphic, which isn't red anymore but blue, gives me a much more institutional feeling... maybe something that, even just by reading the profile name, I would stop to read. And above all, it's not as accusatory as the previous one." (M_10_LM_M_RM)

"Paradoxically, even the use of blue emojis doesn't give me the feeling that it's something I need to read to stay safe, something urgent or important to read right now. Maybe it could just be a general piece of information, though…" (F_17_LM_S_RM)

"Well, the other one was much more eye-catching, much clearer and more immediate in its colors; it was red, so red attracts more attention. This one is kind of yellowish, it goes a bit unnoticed. I'd keep the central text because it tells you well what to do, but without the obligation that the other one had. So it tells you what you should do, but without that 'act now' kind of peremptory tone." (M_15_LT_M_RM)

As this final statement suggests, this type of message is more readily amenable to **hybridization**. Many participants proposed intermediate solutions that preserve the collective dimension and the salience of institutional risk communication while maintaining sufficient activation.

"Something that combines individual responsibility with collective responsibility. In the first case, there was definitely a strong claim to collectivity, maybe even a kind of de-responsibilization of the individual, while in the second, perhaps the opposite excess. I'd go for something in between, always aware that prevention should primarily come from institutions, but still communicating the importance of saving yourself and taking the right actions to protect yourself and those around you. If you're in a place with 50 people, trying to do what you can to keep everyone safe... So, first of all, a kind of communication that reconciles individual responsibility with collective action, and reassures me that the institution, hopefully, is actually working on prevention. In that sense, a communication that's constructive." (M_14_LM_M_RM)

The audiences for this type of communication were perceived as **transversal**, precisely because the messages conveyed a sense of community and belonging. In loss-framed products, limited reach, according to some, was linked to the demographic characteristics of the target publics; in this case, such messages were seen as less effective for individuals **who act only when they feel fear or urgency**. As a result, message diffusion (also encouraged by the invitations to share embedded in both texts and visuals) was interpreted by many as a **preventive or discursive condition**, a pretext for discussion rather than a genuine enabling factor for protective behaviors. The tension many interviewees experience between recognizing the emotional validity of these posts and perceiving loss-framed ones as more operational and functional clarifies the delicate, **situated nature** of risk communication.

"I think this is kind of the core of it, at least the way I see it. Maybe it's because the post is less alarming, but you perceive a weaker sense of alert, and therefore a lower inclination to act immediately. But that's subjective. Maybe an anxious person like me is more motivated to act if the content is more

anxiety-inducing, something that activates you. Seeing something like this, you just relax more. But I also think that, at a certain point, there's only so much you can do — as Civil Protection, you can transfer useful knowledge, you can try to get the tone right, but beyond that, there's not much more you can do." (M_21_LM_S_RM)

Regarding messages framed in a gain perspective, the University of Cagliari interviewees reported strong empathy and emotional engagement. Respondents particularly valued the references to collectivity and community, as well as the reassuring sense that institutions were actively addressing risk:

"Yes, of course this post reassures me because it is still a Civil Protection notice informing me about a potential catastrophe—an important environmental hazard. But it is also a message about awareness and prevention, so it reassures me because an important national authority is giving me information for my safety." (F_01_LT_S_CA)

"It conveyed trust and also a sense of responsibility toward the community. The final call to action— 'every correct behaviour is a step toward safety'—was very nice." (F_06_LT_M_CA)

"It's a tone that reassures you. It's informative, but there is always a bit of alarmism when they say 'do it for your loved ones; otherwise you don't know what could happen to them.' But it also says, 'do these things calmly,' so it's more informative." (F_09_LT_S_CA)

However, despite these empathetic reactions, indicative of a certain level of trust in institutions, this type of message was generally perceived as less effective at prompting action. Many interviewees argued that it conveyed a reduced sense of urgency, partly because the more reassuring colour schemes (the same elements highlighted by the Sapienza cohort, such as pastel yellows or institutional blues) made the messages easier to overlook within a social media feed. This was seen as particularly problematic for younger audiences, who are accustomed to more immediate and visually salient communication dynamics:

"They could have made it clearer, like the Civil Protection post, with icons showing the solutions. Otherwise, it's a post I would never read: too dispersive, too long, definitely targeted at people aged 65 and over." (F_10_LT_M_CA)

In sum, while gain-framed messages were appreciated for their empathetic tone and community focus, their lower perceptual salience and limited capacity to trigger operational responses were identified as substantial limitations, underscoring the importance of format, design, and urgency cues in risk communication to younger publics.

Perception of Sources: Mayor and Civil Protection as Figures of Trust

Among the young interviewees from Sapienza University of Rome, the approach to sources appears ambivalent. On the one hand, participants rarely mention the sender as a relevant factor in evaluating the message's effectiveness. On the other hand, their statements reveal considerable attention to source credibility, particularly regarding traditional and locally grounded figures. The **mayor emerges as the most trustworthy source**, owing to both territorial proximity and a tone perceived as direct and recognizable.

As the following comments suggest, the explicit indication that the message comes from the mayor, as well as visual cues such as the sash or the signature, enhances credibility, particularly when the mayor is seen as a direct expression of the community ("if I was the one who voted for them").

> *It really makes a difference if it says "mayor," if you see the person with the sash, or if there's the Civil Protection logo and the signature. That changes things.* (M_08_LT_S_RM)

> *It's the mayor, so yes, I'd say it's about the credibility of the person more than the message itself. Maybe if I saw it alone, without knowing who wrote it, I might have some doubts. But the information seems quite valid, so I probably wouldn't doubt it even if I only saw the image, without knowing who it came from.* (F_23_LM_M_RM)

> *Maybe a direct message from the mayor, especially if I had voted for them, would work better for me. I have the utmost respect for Civil Protection, but a direct message from the mayor has a stronger impact.* (M_03_LM_M_RM)

This perception of involvement and proximity makes even **less conventional forms of communication** appear plausible and credible. In one case, for instance, a mayor perceived as close and active in the community is considered legitimate enough to use a *loss frame* and a more assertive tone:

> *[That tone] I'd expect it from a mayor who's close to the community, a mayor who knows that if people don't listen to the shopping list, they might listen if you tell them they could lose something more important than their old car.* (M_11_LM_M_RM)

The centrality of the mayor is therefore identified as a factor that can strengthen risk communication. Several participants suggest leveraging mayors' communication on "visual" platforms such as Instagram and TikTok, emphasizing the ***personification* of leadership**.

> *The first thing I both liked and didn't like was the personification. It talks about the mayor. And if I can add, why I didn't like it, it's because the mayor doesn't appear.* (M_10_LM_M_RM)

Some figures are seen as more suitable than others. In particular, students from Rome — who are accustomed to Mayor Gualtieri's online communication, often featuring short, engaging update videos that reflect a broader shift in the city's institutional communication (D'Ambrosi et al., 2025) — find it plausible that the mayor could adopt a **more engaging style** in risk communication.

> *I don't know, but for me now it's him [Gualtieri]... he's a super reliable source! I mean, I can't really see the previous mayors doing that. Like, I just can't imagine Raggi filming herself on a bus or in a park with kids. But him, yes...* (F_09_LM_S_RM)

A single dissenting voice questioned the idea of sharing messages through the mayor's personal page, emphasizing the importance of maintaining an institutional voice.

> *Instead of the mayor's personal page, I'd prefer the municipality's page, because it feels more like the institution, not the person representing it at that moment. So I think a message from the impersonal*

institution is more effective than one from the person who temporarily holds that position. (M_15_LT_M_RM)

In summary, students tend to associate trust and credibility with figures perceived as close and familiar, while also recognizing the institutional dimension as a guarantee of neutrality and continuity. Risk communication is shaped by a tension between *personalization* and *institutionalization,* a dynamic that is particularly relevant to the design of future communication strategies.

Civil Protection is generally perceived as an **authoritative and competent source**. It is regarded as a legitimate actor for disseminating messages on risk prevention and public safety. As illustrated in the following excerpt, some participants even consider it more trustworthy than the mayor:

> *"Even just the fact that it comes from Civil Protection inspires more trust."*
> *"Would you trust less a message published by the mayor?"*
> *"Yeah, because it's not really his field, that's Civil Protection's field, so yes."* (M_06_LT_M_RM)

This trust is also confirmed by those who regard Civil Protection as a more generalizable and **less personalistic** source, especially when compared to mayors' communication, which is often perceived as more self-promotional than focused on collective safety:

> *"I imagine that certain messages come from Civil Protection or other kinds of organizations. Usually, a mayor – I'm thinking of mayors of big cities that I follow, for example, on social media – doesn't post this kind of message. I come from a small town of about 50,000 inhabitants, and the mayor [...] usually posts messages that make citizens feel safe and appreciated, because it shows he cares about their safety and about spreading these messages."* (M_24_LM_S_RM)

In some cases, however, Civil Protection is perceived as a source somewhat distant from people's usual information paths, less accessible to those who are not already interested in the topic:

> *"The thing is, you'd read a message from Civil Protection only if you're already interested, because otherwise you don't go on their page to check what they do or what they write (…) I don't know if I'm making myself clear, but young people don't usually look for that kind of information… maybe a small percentage does, but not the majority, unfortunately."* (F_13_LM_S_RM)

In other cases, participants emphasize the need to corroborate institutional or Civil Protection messages with **evidence from scientific institutions**. This happens especially when alerts or risk communications are perceived as unusual for the area in which people live:

> *"So yes, it's credible, but only if they give me some kind of certainty, maybe from a researcher or someone who studied the issue, or if there are actual data supporting the alert. For instance, if Gualtieri [Rome's mayor] were to post this message today, I don't think I'd take it seriously, mostly because Rome usually doesn't have these problems, maybe only in very rare cases, and many years ago. But if a mayor from an area actually exposed to this risk sent the same message, yes, that would be credible."* (F_04_LM_S_RM)

Then, Civil Protection emerges as a source perceived as highly credible and competent, yet distant: an institutional actor whose messages resonate more strongly with those already attentive or informed about risk-related issues.

Overall, the University of Cagliari participants expressed a clear preference for institutional sources of information, primarily the Mayor and Civil Protection authorities at both regional and local levels, which they regard as central actors within the risk management ecosystem. Conversely, interviewees expressed widespread distrust toward influencers, whom they perceived as lacking the necessary authority and legitimacy to communicate risk-related information.

Among all sources mentioned, Civil Protection emerged as the most frequently cited and most trusted. This preference was attributed to its accredited status, institutional mandate, and operational proximity to emergency management, as illustrated by the following testimonies:

> *"In case of risk, I would prefer to be informed by the Civil Protection or other public institutions. Not influencers. It really depends on the authoritativeness of the person speaking. A scientific team, for example, I would certainly trust them much more"* (M_12_LT_S_CA).

> *"In case of risk, I would prefer to be informed by the Civil Protection and public institutions, not by an influencer. But there should be more public education, because many people don't really understand what Civil Protection is. A post from the Region of Sardinia linking to the Civil Protection and explaining what it actually does, maybe through a video, would be very useful, especially for my generation"* (F_09_LT_S_CA).

> *"In case of risk, I would not want to be informed by an influencer. I prefer Civil Protection because it is an accredited and authorized body. I trust institutional sources more"* (F_03_LM_M_CA).

The Mayor was also perceived as a highly credible communicator, primarily due to the municipality's perceived proximity to citizens and its role as a territorial reference point:

> *"What makes me feel safest is certainly an institutional figure, such as the Civil Protection or the municipality."* (F_04_LT_M_CA)

> *"I would trust more, much more, if the information came from someone working in the field, like a Civil Protection operator or someone from the municipality"* (F_05_LT_S_CA).

> *"To be honest, I would prefer to be informed by an institutional broadcaster—so the Civil Protection or the Municipality."* (F_08_LT_S_CA)

A smaller subset of respondents (similarly to what emerged in the Sapienza cohort) extended their preference beyond local authorities to include institutional sources more broadly, particularly the academic community and research entities. These actors were considered credible knowledge brokers capable of complementing institutional communication with scientific expertise:

> *"It's certainly good to be updated by the Civil Protection, but also by the academic community."* (F_01_LT_S_CA)

> *"I prefer to get updates from institutional channels, but a combination of scientific institutions and the local community, like the municipality, would also be good."* (F_06_LT_S_CA)

Debating Alternative Sources

Students also commented on the possibility of relying on alternative sources for risk communication. Their reflections emerged from a guided discussion of their communication habits and the information and alert networks they typically rely on. In general, figures associated with digital imaginaries, such as influencers and content creators, are not considered particularly credible, especially when perceived as "generalist" content producers, such as lifestyle influencers. These figures are seen as overly dependent, out of ego or the need for monetization, on the visibility logics that sustain their presence on digital platforms. Only in rare cases is their involvement considered functional to risk communication, and almost exclusively among students who emphasize the importance of broadening the audience for risk communication by using every available channel.

Some Sapienza interviewees also pointed to a perceived lack of authenticity in institutional messages, particularly when they appear suddenly or seem to result from a public relations campaign. In one isolated case, however, the visibility of a centralized and coordinated operation was interpreted as a possible sign of greater reliability, precisely because it was assumed to involve direct coordination with central institutions. The following excerpts summarize these positions:

> *"It's true that there are some creators, maybe with fewer followers, who talk about these things, but in their life they also do something to be able to talk about it — maybe they're activists (…). Seeing a fashion show and then talking about environmental risks doesn't seem on the same level to me, because if you go to a fashion show, you're already, so to speak, promoting what the show promotes. So you can't then talk to me about natural risks, in my opinion."* (F_04_LM_S_RM)

> *"There must always be an expert behind it who gives a clear picture of what's really going on (...). So I don't think an influencer can really fit into this kind of communication chain, because as I see them, they shine with their own light, they have their own logics to follow on the platform, and they serve those. Maybe I'm pessimistic."* (M_21_LM_S_RM)

> *"If this person is taken from a group of influencers who (...) don't deal with these topics, I'd understand that it's a message someone wants to spread. So if it's done collectively, it's okay; but if they're chosen individually, just as a messenger for that topic, I don't think it has much value."* (F_13_LM_S_RM)

Different considerations apply to science communicators and journalists who use online platforms as spaces to amplify explanations or investigations. In these cases, the use of channels devoted to self-expression is seen as an opportunity to engage more closely with the public. Many interviewees, for instance, said they follow accounts such as *Geopop*, which are perceived as authoritative yet accessible. For journalists, credibility is linked to independence and neutrality: their trustworthiness stems from their autonomy from traditional editorial lines and their ability to produce well-documented, transparent content.

In other words, **expertise** (sometimes built through self-representation and personal branding strategies) emerges as the primary criterion for assessing credibility in risk communication. This, in turn, helps recognize that risk communication, though not central to everyday media practices, has substantial **civic and integrative value**. The following testimonies summarize these perspectives:

> *"Well, contrary to what many people would say, I think [online sources] are very objective and neutral, not partisan. They basically explain what's going on, and they do it in a very structured way (…), they list point by point what the problems are, where they come from. I mean, they really answer the fundamental questions, right? When? How? Why?"* (F_22_LM_M_RM)

> *"And the fact that they're freelancers working in major international investigative journalism networks, much more independent from production logics or editorial guidelines of traditional outlets (…), makes me see them as more credible and reliable people, and of course, their work speaks for itself."* (M_21_LM_S_RM)

> *"If I saw a video explaining what to do in these situations from a scientific or educational point of view, I'd be much more likely to stop and watch it, more out of curiosity than out of a perception of risk."* (M_10_LM_M_RM)

Similar to the Sapienza cohort, most University of Cagliari participants did not consider influencers suitable sources for risk-related information, primarily due to their perceived lack of credibility and authority. Influencers were generally portrayed as non-experts in environmental and emergency domains, whose communication styles and content were deemed insufficient or inappropriate for conveying risk messages:

> *"Influencers are not appropriate for informing about risks"* (M_02_LT_M_CA).

> *"If I had to be informed in a risk situation, I would trust an influencer only partially. They may say true things, but I would still prefer an institution"* (M_07_LT_M_CA).

> *"An influencer doesn't seem appropriate. I can't think of any influencer who could communicate risk, unless they were involved in a campaign. But for society as a whole, a combination of scientific actors and institutions would work better. Influencers could be added only if the aim is a large-scale communication campaign, but they will never reach the entire audience the institution needs"* (F_06_LT_S_CA).

Interviewees further stressed that influencers specialising in travel, gastronomy, or lifestyle, although familiar with local contexts, do not possess the expertise required to speak authoritatively about environmental risks, rendering their contribution inadequate and potentially misleading:

> *"I would not want to be informed by an influencer, because (...) I couldn't see the connection between risk communication and influencers—it's useless to me. It doesn't help if a food influencer tells me 'don't do this because we're in wildfire season.' They're not authoritative; they're just citizens like me. Risk communication must come from authoritative institutions and be adapted to the target—simplified for children, adjusted for young people, different again for adults. But an influencer? No. Not credible at all"* (F_10_LT_M_CA).

"I'm not sure I would want to be informed by an influencer, especially for my age group. Many famous influencers lack seriousness. If the influencer is consistent with the message, for example, someone who actually speaks about the territory, I might appreciate it more. But a food influencer promoting preventive messages? I wouldn't take it seriously. For example, Chichi Marras promotes food excellences from the territory. If she posted something like the Civil Protection does, I wouldn't pay much attention, because it's not her topic" (F_11_LT_M_CA).

"An influencer can influence people in their area of expertise, but I don't see them as relevant for environmental issues" (F_03_LM_M_CA).

Some respondents, however, did identify a potential secondary role for influencers—not as primary sources of information, but as amplifiers capable of resharing institutional messages or reinforcing awareness of recommended behaviours:

"Influencers could reshare institutional communication, maybe in a story—but just repost it, nothing more" (M_02_LT_M_CA).

A possible collaboration between influencers and institutional actors was considered acceptable only under strict conditions: institutional visibility must remain explicit, and the authoritative source must remain clearly identifiable:

"Influencers could actually be effective in reaching a much wider audience. But what gives me confidence is definitely an institutional figure, like the Civil Protection or the municipality. Influencers could collaborate with the Civil Protection so that there is still a figure the public trusts" (F_04_LT_S_CA).

In summary, students articulated a marked preference for institutional and scientific actors, particularly the Civil Protection and the Mayor, due to their credibility, authority, and perceived legitimacy. Influencers are viewed with strong scepticism as primary communicators of risk; their potential contribution is acknowledged only in ancillary, controlled, and institutionally anchored forms of message amplification.

5.4 Recognizing Artificial Intelligence: Trust, Ethics, and Civic Responsibility

This section discusses the implications of using Artificial Intelligence (AI) in risk communication. It should be reiterated that participants were not initially aware that the materials they were shown had been generated by AI. The first section of the interview was dedicated to discussing and comparing the different products. Only after this stage did we specify that the products had been created with AI support. At that point, we recorded participants' reactions and initiated discussions on the appropriateness of using AI in risk communication.

Some participants had expressed suspicion, or even certainty, that AI had generated the materials before this disclosure. In such cases, the interviewer lets the comment pass without further elaboration, returning to it later during the dedicated section of the interview (usually introducing the topic with a

touch of irony, using expressions such as "So, you caught us! We used artificial intelligence to create this product"). This choice helped avoid influencing the discussion and responses, which might otherwise have converged prematurely on the technical aspects of AI.

It should also be noted that the decision to leave certain recognizable, **typical AI elements** (such as default fonts or bullet points) in the communication products was deliberate. It was meant to test whether the explicit presence of AI markers would be relevant to participants' remarks. In some ways, this proved to be the case: when participants spontaneously pointed out that the materials seemed AI-generated, they usually did so to criticize their tone or quality (e.g., lack of personalization, simplistic tone), as illustrated in the following testimonies of a Sapienza student:

> *"Basically it seems like a message that could easily be given by artificial intelligence. I mean, if I asked ChatGPT, for example, 'how can I prevent this?', it seems like the text it would give me. I don't know how to explain it even the emojis used, it all just seems very, very simple."* (F_17_LM_S_RM)

Many of the "imperfect" features of the messages, however, were interpreted as signs of *human* incompetence (imprecise prompts and unrefined results). As one Sapienza student put it:

> *"In the case of the mayor's post, I thought there was some incompetent social media manager behind it."* (F_02_LM_M_RM)

As for whether AI use should be disclosed when a message has been generated or revised by it, participants' views clustered around two opposing poles. On one side were those who preferred that the use of AI be clearly stated, primarily for **ethical and transparency reasons**. On the other hand, some preferred not to include any such indication. The latter group was quite heterogeneous: it included those who did not consider it necessary to disclose AI because they saw it as a mere technical support, and those who believed that disclosure could harm credibility and trust, especially among people unfamiliar with such tools:

> *"It makes me think that whoever sees that little line saying 'created with AI' would just skip the post altogether, given the reputation artificial intelligence has, the way it's currently seen."* (F_13_LM_S_RM)

Some argued that less experienced users would not require explicit indications, as they would be unable to recognize AI-related stylistic features.

Overall, the use of AI in risk communication evoked **mixed feelings**. Participants expressed a wide variety of attitudes. Some were curious about the potential of AI as an innovation and a way to improve readability and clarity—especially when compared with what they perceived as the often cumbersome communication style of institutions:

> *"[If my municipality used AI] Finally! I think so many things! Like finally they've woken up in some sense, because we are really behind on so, so many things. But at the same time, I don't know if I would trust it, depending on who's behind it, who's working on it, because I'm not sure they would know how to use artificial intelligence properly."* (F_13_LM_S_RM)

Others expressed distrust, primarily due to fears of **job loss**—particularly relevant since almost all participants were communication students—or to the perceived loss of control and intentionality in the messages. Several interviewees remarked on their expectation that locally relevant or emotionally resonant content should carry a more human tone:

> *"If it had been a real person creating content on these issues, it definitely would have been more effective."* (F_16_LM_S_RM)

The acceptability of AI use also depended strongly on the **source**. Once again, views were polarized. Some participants stated that supervision by scientific bodies or institutional experts would be both a necessary and sufficient condition for trusting AI-generated content:

> *"If it's content made by artificial intelligence, but at the same time experts have agreed and checked the accuracy of the information, I'd be totally fine with that—I'd have no problem at all."* (F_19_LM_M_RM)

> *"In the end, you also need to know how to use artificial intelligence properly. So if it's published by the municipality—by the mayor or by Civil Protection—I trust it, because they give me credibility. They can't possibly want harm for the community."* (F_26_LM_M_RM)

Some participants viewed the integration of AI as already underway and thus inevitable. For them, ethical questions seemed marginal or redundant, given that such practices were already perceived as widespread:

> *"If it's only partially created by AI, personally, I don't feel the need to know, because at this point everyone uses artificial intelligence, from the most trivial things to more important ones. So I don't know; if it's used just as an aid, I don't think it needs to be clarified. Unless, like, you take something directly from ChatGPT, copy and paste it graphically or textually as it is, then yes, I'd add a note saying it was generated by AI. But if you only use it as a starting point and then modify it or create a product, I don't think there's any need to specify that."* (F_16_LM_S_RM)

Others, by contrast, considered AI use ethically questionable or unnecessary for communication tasks that people could handle:

> *"I would prefer, purely from an ethical standpoint, that it not be used. But at the same time, I know it already is, and I don't take it lightly or differently from other content, because I know the message's purpose would still be the same as if written by a real person. My reasoning here is ethical: there's just no need to use artificial intelligence in this case, in my opinion. It seems pointless for a message where a person, a copywriter who knows how to write and use Canva, would suffice."* (F_22_LM_M_RM)

> *"I might wonder why they'd even need artificial intelligence if it's a scientific institution, they already have all the tools and people to do it. Maybe that would make me a bit suspicious."* (M_03_LM_M_RM)

The most oppositional positions reflected a sort of "apocalyptic" distrust toward AI, or the perception that its use signaled negligence or detachment on the part of institutions. In such cases, AI use was seen as a **loss of human commitment and relational investment**:

"Thinking as an average citizen, okay, it would kind of piss me off that they didn't even bother to write a message themselves, just to tell you this, this, and that. On the other hand—and this is a terrible thing to say—maybe I'd trust artificial intelligence more than the institutions. Yeah, but I'd want to know something they'd never tell you." (M_11_LM_M_RM)

"In the end, artificial intelligence, in my view, doesn't include the emotional factor. So in that case, I'd think it was done just not to waste time writing… that the message doesn't really matter, since no human even took the time to write an important message." (F_02_LM_M_RM)

Regarding potential future developments, AI was generally viewed as beneficial for automating message production. Yet reservations remained about replacing human labor, especially in public-sector communication, which was regarded as inseparable from trust. The human factor thus remains essential, reflecting the substantial emotional and fiduciary investment that students attach to risk communication.

Interviewees from the University of Cagliari were divided between those who recognised (n=11) and those who did not recognise (n=4) the presence of artificial intelligence in the communication materials shown during the interviews. Recognition was typically associated with visual or textual cues perceived as unusual, overly stylised, excessively alarmist, or reminiscent of widely circulating AI-generated aesthetics, together with minor linguistic inaccuracies. These elements were not read merely as technical imperfections, but as signals that weakened the expected institutional tone, thereby compromising the credibility of the message:

"There's no middle ground in these posts: they are either too extreme or too alarmist" (F_01_LT_S_CA).

"From a graphic point of view, it was very obvious. Maybe older people who are not familiar with certain tools would not notice, but it was clearly evident" (F_04_LT_S_CA).

"I thought: 'It seems too strange to have been made by a human.' The image looked too odd" (F_05_LT_S_CA).

"Yes, I noticed it, but AI risks undermining the institutional tone by using too many emoticons" (F_08_LT_S_CA).

This sensitivity to stylistic coherence suggests that, for these respondents, *recognising AI* is not only about detecting technical artefacts. It becomes a broader interpretive act that centres on the **alignment between message form and institutional authority**, confirming that communicative legitimacy in risk contexts is anchored in recognisable markers of expertise, restraint, and professionalism.

Some interviewees explicitly opposed the use of AI for producing infographics, asserting that such tools may obscure or weaken the identification of the institutional sender, an aspect perceived as crucial in risk communication, where trust is relational and source-dependent:

"I don't think AI-generated posts are appropriate for communicating a tangible risk. Adding text where it's clear that AI created it makes it look like a rushed post. Speaking for my generation, if I see something like that, it becomes less credible. You may no longer associate it with the Civil Protection but with an AI-generated advertisement" (F_09_LT_S_CA).

Conversely, those who did not recognise AI described the posts as realistic and consistent with common communication practices. Interestingly, once informed of AI use, they retroactively articulated a higher standard of expectation, implicitly acknowledging AI's potential to produce more refined content:

"Most AI-generated posts look like that. They seemed real enough to me" (M_12_LT_S_CA).

"No, I didn't realise it was AI, it all looked very real" (F_14_LT_M_CA).

"No, I didn't realise it, but now that you say it, I think AI could have done better" (F_06_LT_M_CA).

Other comments highlight subtle recognition mechanisms—such as incomplete hashtags—and point to a broader perception: **AI produces communication that lacks emotional depth**, which in turn reduces affective resonance, a key dimension in risk response:

"I didn't notice it, although there was a post with a hashtag and nothing after it, and I thought: 'Well, they must have forgotten something.' AI can also make mistakes" (F_03_LM_M_CA).

"Extremely evident AI-generated content feels cold" (F_11_LT_M_CA).

Existing research (Zaiac et al., 2025; Ogie et al., 2018) emphasises AI's potential to organise complex data and enhance communication effectiveness, primarily through visual formats. Responses from Cagliari, however, stress an essential nuance: **trust in AI is conditional**. While some interviewees regard AI-generated materials as potentially credible, they also describe them as standardised, overly generalist, and lacking authenticity—traits that undermine message salience and the perceived seriousness of risks:

"It's banal and doesn't emphasize what truly affects people. There is no authenticity. I might trust it, but it reaches me less: it feels too standard, too generalist" (M_12_LT_S_CA).

"Not everything ChatGPT says is accurate: you need to verify it" (F_05_LT_S_CA).

Crucially, trust increases when AI-generated content is not positioned as a substitute for institutional expertise but as a **human-guided artefact**. The interviewees repeatedly stress the need for validation processes that assure not only technical correctness, but also contextual relevance and symbolic accountability:

"You must use real images, you need to guide the AI" (F_09_LT_S_CA).

"You can generate good graphics or images with AI, but they still need corrections, especially the copywriting" (F_08_LT_S_CA).

"If someone competent is revising it, then I would trust the institution" (F_06_LT_M_CA).

"If it were validated by a scientific institute, yes, I would trust it. Those organizations have years of research behind them" (F_05_LT_S_CA).

"Yes, because then you would have the guarantee that what AI produced has been supervised" (F_08_LT_S_CA).

These comments reinforce a finding already observed in other sections of this deliverable: **institutional credibility is not granted by content alone but by the transparency of the governance of its production**, including oversight, territorial knowledge, and professional communicative competence.

Conversely, trust decreases when AI is perceived as an autonomous agent replacing human judgment, primarily when associated with political actors such as mayors:

> *"It would be better if the mayor had someone write it—a communication office, for example"* (M_07_LT_M_CA).

> *"I don't agree that a municipality should rely on AI to produce such communication for such serious risks" (F_04_LT_S_CA).*

> *"Corrections require visual knowledge, knowledge of the territory—things AI lacks" (F_01_LT_S_CA).*

Most respondents desire transparency over AI use, but not as a generic disclosure requirement. Rather, transparency functions as a **situated communicative choice**: desirable when it contributes to accountability, potentially counterproductive when it generates confusion among publics with lower digital skills, as proven even by the Sapienza testimonies.

> *"It's not that I don't trust AI, but knowing that a human has rewritten or thought through the message is different. If the Civil Protection didn't declare AI use, I would take it less seriously: trust would decrease"* (F_10_LT_M_CA).

A minority of Cagliari's interviewees considers disclosure unnecessary if the content is accurate and revised, signalling an emerging shift from **tool-centric** to **outcome-centric** trust:

> *"If the content is well revised and valuable, there's no need to state it explicitly"* (F_08_LT_S_CA).

Respondents converge on one principle: AI must remain subordinate to human oversight, not only for technical refinement but as a guarantee of institutional legitimacy and epistemic responsibility:

> *"AI isn't a bad thing—it helps, but it needs supervision. It's fine if the mayor uses it, but the final product must be reviewed"* (F_14_LT_M_CA).

> *"I wouldn't like the label 'created with AI'. But if it said 'created with ChatGPT', I'd appreciate knowing the tool used"* (M_02_LT_M_CA).

> *"As a citizen I want transparency. But as a communicator, writing it might scare people and hinder message effectiveness"* (M_12_LT_S_CA).

> *"It is not correct to publish an unrevised product. Public institutions must revise many elements before publishing"* (F_08_LT_S_CA).

> *"AI is a tool, not something you can just let run 'Make a summary and I'll post it.' You can take inspiration from AI, but you need to align it with official prescriptions and make it more fluid and less bureaucratic"* (F_10_LT_M_CA).

Interviewees do not oppose the use of AI in risk communication. They instead conceptualise it as a **support infrastructure** capable of improving efficiency and visual production. However, AI cannot replace human intervention, which remains indispensable for ensuring contextual relevance, territorial sensitivity, and institutional credibility. This configuration confirms a broader pattern emerging in research on risk communication and governance, namely, the role of participation and transparency. **Trust in risk communication does not depend on the technology itself; rather, the final outputs should reflect the human and institutional architectures that govern it**.

5.5. Insularity, Vulnerability, and Territorial Specificity

This section presents the findings emerging from the activities conducted by the Cagliari WP6 research team, as anticipated in paragraph 5.1 of this deliverable. These findings illustrate University of Cagliari students' reflection on what they perceive as predominant risks in Sardinia (Meloni & Podda, 2014) and on how insularity shapes both the vulnerabilities of these territories and the communicative strategies required to address them (La Rocca & Lovari, 2024).

Participants consistently emphasize the need to adapt risk communication to island contexts, particularly for seasonal and persistent hazards such as heatwaves and summer wildfires (Delitala, 2021). Insularity is recognized as a condition of vulnerability that warrants greater attention from risk management actors, who must tailor communication strategies to territories characterized by increasingly diverse publics and compounded forms of territorial fragility. These vulnerabilities manifest in multirisk scenarios, whose effects are further amplified by climate change.

Communicating wildfire risk in island contexts: between engagement and alarm

The testimonies clearly highlight the distinctive features of wildfire risk in Sardinia and Sicily. Interviewees point to heightened risk in these islands due to factors such as wind, which can lead to extremely rapid, uncontrollable fire propagation. Another critical aspect concerns the logistical challenges associated with insularity. Although local airborne firefighting units are stationed, reinforcements face greater obstacles and longer mobilization times during severe wildfires. This geographical and logistical specificity increases the vulnerability of these territories, as illustrated in the following excerpt:

> "*There is a higher specific risk for the islands of Sicily and Sardinia: there is a risk posed by wind, for example, and by the fact that fires can spread very rapidly and uncontrollably. And although heavy aircraft like Canadairs can arrive, there are units deployed locally reinforcements take longer to reach the area in the event of a disaster. There are issues and specificities that must be considered even in the way the population is alerted*" (M_02_LT_M_CA).

The students interviewed express a preference for messages that are clear, accessible, and empowering, yet not alarmist or punitive. Wildfire risk is perceived as an ever-present threat, even when communication aims to raise awareness rather than respond to an active emergency. This perception appears to be linked to both the participants' understanding of the risks to which insular territories are exposed and their personal experience with such hazards, as the following narrative illustrates:

"Yes, the car from which the fire started was parked between Santu Lussurgiu and Bonarcado, an area I know well because I live there. So I remember that fire (in 2021) very clearly. Because I saw it, I lived it" (M_07_LT_M_CA).

The reference is to the major wildfire that occurred between 24 and 25 July 2021, which, fuelled by strong Libeccio winds, burned 63% of the Montiferru-Planargia area. It was the most extensive wildfire in Italy that year by area burned (ISPRA, 2022). Two years later, the 2023 wildfire map shows limited change: burned areas decreased in northern and central Italy but increased in southern regions and on the islands. This trend on the two major islands is particularly noteworthy when examining the correlation between wildfires and insular territories (Delitala, 2021), particularly given summer climatic conditions (Siddi & D'Andrea, 2024). Large wildfires are gradually losing their exceptional character, with their growing frequency linked to the structural abandonment of rural and inner areas, spaces increasingly devoid of people and agricultural practices (Camarda, 2021).

Wildfire risk evokes a shared civic responsibility. Interviewees note that communication from the institutional actor closest to citizens (the Mayor) tends to be more effective when delivered in an informative and empowering tone rather than an alarmist one. Alarmist messaging, according to participants, risks undermining the intended call to action, as illustrated in the following excerpts:

"It strikes me as a fair balance: it calls for responsibility, still in a prescriptive way, but also conveys trust overall. I would even say it gives confidence, because it provides citizens with tools for action rather than leaving the issue to unclear personal initiative (…) The instructions are clear" (M_02_LT_M_CA).

"They really want to draw attention to wildfires (…) They're not alarmist, but they want you to realize that if a part of that land burns, a part of your land is burning too" (F_06_LT_M_CA).

The communicative risk associated with the use of a loss frame is therefore the emergence of a "call to inaction" rather than a call to action. In such circumstances, the public feels insufficiently motivated to act because the alert appears too generic, distant, or overly dramatized. This dynamic is particularly relevant in island contexts, where historical exposure to large wildfires can lead to a "normalization" of risk, weakening the impact of negative-emotion narratives.

The anthropogenic dimension is strongly evident in the testimonies. Risk communication, when structured with clarity and specificity, can become a key lever for promoting self-protective behaviours among citizens:

"The post is educational because it appeals to emotions and makes you feel part of something aimed at preventing risk" (F_05_LT_S_CA).

"It is empowering, but in the right way. It's not accusatory, unlike some wildfire-prevention campaigns where the language was far more peremptory. Here, the tone seems more informational" (F_01_LT_S_CA).

Attention is also drawn to the compositional elements of public risk communication. Emoji, for instance, are regarded as tools of simplification—communicative devices that attract attention when appropriately combined with concise text, as the interviewees suggest:

> *"The post talks about our forests, giving a sense of belonging; this can strengthen identity. So emoji and identity—because emoji, when used well, are useful (…)"* (M_12_LT_S_CA).

> *"Structuring the message in a slightly less formal manner through the use of emoji makes the communication clearer, and I appreciate that it is organized in bullet points"* (F_05_LT_S_CA).

Emoji thus emerge as a transversal element that, while not constituting an autonomous communication strategy, functions as a multimodal enhancer of the message. Emoticons, indeed, make communication more immediate and less formal; help construct territorial identity (e.g., trees, fire, landscape); and attract attention in a non-intrusive way.

Their effectiveness is greatest when they accompany concise, clear, and well-structured messages. In this sense, emojis act as semantic and visual markers that guide comprehension and reduce the communicative distance between institutions and citizens.

Differentiation: Beyond Insularity

There is unanimous agreement on the need for the two major islands to adopt differentiated strategies and tailored risk communication for the specific types of natural hazards to which they are exposed. Participants argue that Sicily and Sardinia require distinct approaches because they experience different phenomena and host different populations, including non-residents and temporary residents who move to the islands for work or tourism. This differentiation is not only desirable but necessary to address the unique challenges of these territories effectively:

> *"Yes, Sicily and Sardinia are the regions most exposed to wildfires and the most vulnerable. These risks are seasonal, and communication campaigns must also be seasonal. They should not be launched too close to the risk season, but not be annual either: constant repetition flattens citizens' awareness. Campaigns should take place especially after the season (September, October, November) and resume in April"* (M_12_LT_S_CA).

> *"Yes, these two regions deserve special attention because wildfire data are much higher in Sardinia and Sicily than elsewhere, and they also face issues related to emergency management, such as accessing Canadair aircraft"* (F_14_LT_M_CA).

> *"In many regions, wildfires are not communicated at all because they simply don't happen there. Risk geography differs. In Sardinia and Sicily, campaigns should focus more on wildfire risks. Focusing on earthquakes in Sardinia feels decontextualized"* (F_10_LT_M_CA).

While differentiation is particularly relevant for island contexts, participants argue that this approach should apply to the entire national territory, highlighting the heterogeneous "risk geography" of Italy:

"Communication strategies can be differentiated for the two islands, but I must say that Italy's territory varies greatly. We can talk about earthquakes outside island contexts or heatwaves in the South and the islands. Differentiation is necessary, but not solely because they are islands" (F_11_LT_M_CA).

Multitarget Communication Strategies

A key theme emerging from the narratives is the importance of differentiating risk communication according to the target audience. Communication must be segmented according to the degree of exposure, capacity to act, and the type of information required. Primary targets include the general population and, in particular, the most vulnerable groups, elderly people, minors, people with disabilities, and specific categories of outdoor workers. Participants stress the need for multi-level targeting:

"For wildfire risk, more structured campaigns are needed to protect these territories, addressing different targets: agricultural and livestock workers, who work outdoors during summer heatwaves; and those who frequent the area for environmental or tourism purposes. I would create different communication products for different targets" (F_08_LT_S_CA).

"A more targeted communication is needed, especially because many elderly people do not use social media. If my grandmother doesn't use social media, she will never know unless my mother tells her" (M_07_LT_M_CA).

Tourists are highlighted as a key target in island territories:

"Tourists also need information, often in English, because most wildfire posts are addressed to Sardinian citizens, not to visitors " (M_07_LT_M_CA).

"Yes, the target must be differentiated: tourists, elderly residents, young residents, people living near the coast. The more you differentiate communication, the more effective it becomes" (F_09_LT_M_CA).

Suggested actions for different targets:

- Tourists: 1. Posts or hashtags in English; 2. Integration with common tourism-related hashtags; 2. Links to wildfire prevention campaigns;
- Elderly population: Multichannel communication (e.g., print, radio, local TV), including non-digital channels accessible without social media.

The overarching goal is to expand communication from tourists to elderly residents in inland areas.

In summary

The analysis highlights the importance of focusing campaigns on territory-specific risks. In Sardinia and Sicily, wildfire risk is recurrent and dominant, whereas earthquake communication, though useful, is not cyclical and does not align with the islands' exposure profile.

The testimonies reveal a strong awareness among interviewees of the need for a strategic and tailored approach to risk communication in island contexts such as Sardinia and Sicily. This approach must consider:

- Geographical and logistical specificities;
- Heightened vulnerability due to insularity;
- Diversity of target audiences (residents, elderly, digital workers, tourists);
- Appropriate channels and accessible content;
- Seasonality of risk and communication timing.

Only through a differentiated, inclusive, and context-aware strategy can risk communication effectively support prevention and emergency management in these insular territories.

The interviewees' testimonies reveal a clear awareness of the need for a strategic, calibrated approach to risk communication in insular contexts such as Sardinia and Sicily. This approach must take into account geographical and logistical specificities, heightened vulnerability, the diversity of target publics, the appropriateness of channels and content, and the seasonal nature of certain hazards, to ensure maximum effectiveness in both prevention and emergency management.

The accounts collected indicate that the *gain frame*—characterised by informative, reassuring, and responsibility-oriented language—is perceived as the most effective communication strategy in the preventive phase. This perception is particularly shaped by three factors:

- **Trust in local institutions**, especially the mayor, when messages propose feasible and non-blaming actions;
- **Greater predisposition to engagement**, since the message offers concrete tools rather than evoking fear or guilt;
- **A sense of belonging to the territory**, which is crucial in insular contexts where wildfires affect areas perceived as integral to local identity.

These elements make the gain frame not only practical but also aligned with the communicative needs of communities living with recurrent rather than exceptional perceived risk.

From this perspective, the model emerging from the interviews can be described as an **"empowerment-based risk communication"** approach, one that provides citizens with tools, awareness, and a sense of participation.

The following key insights summarize the main findings from qualitative interviews with Generation Z students and provide operational guidance for designing risk communication campaigns that leverage digital and artificial intelligence tools.

Key Insights - *Gen Z Discussing Risk Communication*

1. Credibility and institutionalization of the source as a critical variable

Mayors represent local proximity and recognizability. Their visibility and communicative transparency make them powerful vehicles for local risk communication, primarily when the messages aim to convey a sense of community, institutional commitment, collaboration and solidarity, and collective safety.

> **What to do:** integrate the mayor's voice and image (e.g., photo, signature, video) into local risk communication campaigns. Ensure that messages are supported by scientific authorities so that the factual accuracy of information is never questioned, particularly for risks that are uncommon or peripheral to the territory.

Civil Protection is recognized as an authority and an actor with specific expertise in risk management. However, there is a risk that it may be perceived as distant from people's information paths or overly technical.

> **What to do:** humanize Civil Protection messages through localized, platform-friendly formats, such as short videos, carousels, or visuals featuring volunteers, to improve integration into information routines, even for those less familiar with risk communication.

2. Each communicative intention requires its own tone

Although the literature presents divergent views on the matter, posts employing a **loss frame** (*i.e., what you lose if you do not follow the rules)* are perceived as more effective at prompting immediate activation during an alert and at encouraging compliance with recommendations. However, they may cause defensive reactions or anxiety that inhibits action.

> **What to do:** combine these frames with clear, direct operational instructions (what can be done concretely) so that citizens can connect the sense of immediacy and inevitability of risks with their own ability to act and their sense of empowerment.

Messages characterized by a **gain frame** (*what you gain if you follow the rules*) are considered helpful for strengthening trust in institutions. Still, they risk framing risk itself as a remote possibility, something not worth worrying about.

> **What to do:** use this type of message in the preventive phase to strengthen trust and preparedness, while also including clear, detailed, low-impact operational suggestions (e.g., "Read the Civil Protection Plan at the following link: www.xyz.it"; "Consult an expert: see the list of authorized technicians on the municipal website"; "Check that your school is safe: here is the list of structural improvements completed in recent years".

3. Artificial, but not too much

Visuals also matter. The aesthetic cues of artificial intelligence (e.g., emoticons, fonts, layout) may distract or irritate users familiar with AI tools, who may perceive an artificial or mechanical tone.

What to do: maintain a coherent and "human" visual style by using customized fonts, incorporating locally relevant images, and mitigating the artificial dimension through aesthetic care consistent with institutional visual identity.

4. A matter of trust: emphasizing human agency

Undeclared or unsupervised use of artificial intelligence can generate opposition and distrust. Therefore, it is advisable to use AI primarily to enhance the fluency and readability of the messages organizations promote. Participants stated that they accept the use of AI mainly when scientific actors or institutions supervise it.

What to do: plan disclosure strategies for "borderline" cases that also serve as reassurance of human oversight. For example: "This content was drafted (layout and wording refinement) with the support of certified artificial intelligence tools and approved by Civil Protection experts."

5. Reaching everyone, everywhere

Even younger audiences can be challenging to reach. At the same time, online platforms are increasingly frequented by users of various age groups. Therefore, a multi-platform strategy is recommended. Younger participants perceive Facebook as an "adult" social network but would engage with risk communication content online if it were short, visually engaging, and emotionally "smart".

What to do: try adapting content across multiple platforms, reformulating key messages into formats suitable for Instagram Stories, TikTok, or Reels, while maintaining an institutional and consistent tone.

6. Listen to who's speaking: alternative voices and hybrid credibility

Influencers and content creators are not seen as credible messengers. They could become credible only if risk communication, supported by experts and institutions, appeared coherent and the result of a broader, coordinated effort.

What to do: adopt a multi-phase communication flow in which institutions create the messages, and reliable creators, consistent with the thematic areas of risk communication, contribute to their dissemination.

Science communicators (including digital ones) and independent journalists are perceived as more credible figures who mediate between expert knowledge and the public.

What to do: collaborate with these figures to design campaigns that combine accuracy and accessibility.

7. Transparency matters

Being transparent and maintaining a constant presence with information are particularly relevant in risk communication. The interviewed students expressed ethical expectations regarding risk communication, not only preferences about formats. Risk communication, especially for those not accustomed to receiving it, is perceived as a civic value, a sign of institutional effort, care for citizens,

and commitment to relationship-building.

> **What to do:** define transparency as a civic value, also including details on how the communication process is developed and validated.

6. Hard to explain: Insights on communicating uncertainty

Uncertainty constitutes an intrinsic and unavoidable element of risk communication, permeating both the production and the reception of messages. It is a foundational dimension of communicative and cognitive processes related to risk. In fact, several forms of uncertainty coexist, shaping how decision-makers, the scientific community, and citizens interpret and respond to risks.

In the literature, at least four main types of uncertainty can be distinguished (**scientific, epistemic, social, and communicative**), which intersect in the process of constructing and circulating risk messages.

Scientific uncertainty concerns the objective limits of scientific knowledge regarding a specific risk phenomenon. This form of uncertainty may stem from insufficient data, the natural variability of phenomena, or the intrinsic limitations of commonly used measurement tools or predictive models (Fischhoff & Davis, 2014; Weiss, 2003). A "classic" example is weather forecasting. While models may predict a high probability of heavy rainfall, they cannot precisely determine the affected area or the exact timing of the event. This kind of uncertainty is difficult to communicate, as it involves a gray area (what *might* happen) that is not easily conveyed without risking either a loss of trust in the source (Jamieson, 1996) or misunderstandings about how science works.

Beyond the limits of scientific knowledge lies **epistemic uncertainty**—the limitations of our interpretive and theoretical models, i.e., how we know and interpret risks. This type of uncertainty does not depend solely on data but also on how data are selected, analyzed, and translated into knowledge and operational guidance (Bedford, 2013; Rougier et al., 2013). Communicators bear considerable responsibility in addressing this kind of uncertainty (Friedman et al., 2012). In recent years, for example, public debates have often featured members of the scientific community advocating different models to explain climate change. This divergence generates confusion and disorientation among citizens, who may end up "siding" with one position or another (for an overview of climate change representation, see Barkemeyer et al., 2017; Brüggemann & Engesser, 2017). Such uncertainty is inherent to science itself: acknowledging it means recognizing that scientific knowledge is not immutable. That progress often takes the form of refining or revising what was once considered established knowledge. From a communication perspective, acknowledging this aspect means clarifying that science does not produce static, absolute truths but rather situated, evolving understandings.

Alongside these more technical forms, there are also **social and cultural dimensions of uncertainty**, rooted in the ways risks are experienced and interpreted within specific communities. This kind of uncertainty arises from contextual factors such as prior experiences, political orientations, and media representations, which can shape trust in institutions and influence perceptions of what counts as "risky." Even when official information is clear, detailed, and evidence-based, a community may distrust it if the source is perceived as distant or lacking transparency. From a communication standpoint, this implies that effective risk communication must address not only informational content but also the relational and trust dynamics between institutions and citizens (Markon et al., 2013).

Finally, there are **forms of uncertainty related to the presentation of information to the public**. Linguistic, graphic, and narrative choices can either clarify or amplify gray areas in communication. Terms such as "likely," "possible," or "significant," for instance, may be interpreted differently by specific audiences. This is where one of the most delicate challenges in risk communication arises: communicating uncertainty clearly requires balancing the tension between reductive simplification and alarmism.

Across all these forms, uncertainty is not merely a limitation to be overcome but a space of communicative and social negotiation in which trust in institutions and science is built—or lost. For these reasons, this section examines how uncertainty should be communicated, connecting theoretical and documentary analyses with the empirical insights developed within the RETURN project. The first part presents the results of a *systematic literature review* that identifies, within the international scholarship, the most effective tools and practices for communicating uncertainty regarding natural, environmental, and climate risks. The second part draws on interviews with stakeholders involved in risk communication to capture interpretations, concrete practices, and operational recommendations. Overall, the findings show that communicating uncertainty is a complex domain in which communicative sensitivity and trust-building mechanisms must continuously interact.

6.1. Managing Uncertainty: Insights from a Systematic Literature Review

String Design

To investigate uncertainty as a communicative problem, we designed a search string articulated across four levels. The first level, shared with a previous review (Massa & Comunello, 2024b), defines the domain of natural, environmental, and climate-related risks. These risks constitute a balanced and meaningful mix that captures phenomena across different geographical contexts, thereby ensuring representativeness within the review. Moreover, this section of the string overlaps with other reviews and meta-analyses conducted by the research group, such as Scippo et al. (2024) on immersive technologies for disaster risk reduction education, and Bonaiuto et al. (2023) on psychological factors influencing risk perception— thereby ensuring methodological continuity and dialogue within an interdisciplinary framework. The second level confines the research scope to risk communication. The third level emphasizes uncertainty. Finally, the fourth level identifies visual and narrative elements relevant to communicating uncertainty. These keywords were partially adapted from Visschers et al. (2009), excluding those primarily related to health or anthropogenic risks, and integrating others aligned with the narrative dimension of uncertainty (e.g., "framing").

Search string
("climate change" OR "natural disaster" OR "natural hazard" OR "natural threat" OR "disaster risk" OR "environmental risk" OR "extreme event" OR "natural risk" OR earthquake OR hydrogeological OR flood OR drought OR fire OR volcan* OR landslide OR tsunami OR rockslide OR hurricane OR avalanche OR "precipitation extreme" OR seismic OR storm OR multislide OR tornado OR typhoon OR "cold wave" OR "heat wave" OR "sea level rise" OR thunder OR lightning) AND ("risk communication" OR "risk

information" OR "risk message" OR "risk perception") AND uncertainty AND (percentage OR frequency OR "natural frequency" OR "mortality rate" OR "survival rate" OR numerical OR verbal OR "risk estimate" OR format OR description OR presentation OR relative OR absolute OR "number needed to treat" OR "number needed to screen" OR "odds ratio" OR "cumulative risk" OR conjunctive OR disjunctive OR graph OR "graphical display" OR "risk ladder" OR "visual tool" OR survival OR mortality OR line OR bar OR chart OR histogram OR "stick figure" OR "pie chart" OR "paling perspective scale" OR curve OR display OR storytelling OR narrat* OR "framing" OR "message framing" OR "gain frame" OR "loss frame" OR infographic OR "risk map" OR geovisualization OR frame OR color OR colour)

String Launch

The search string was launched across four databases: **Scopus**, **Web of Science**, **PubMed**, and **PsycInfo**. These databases were selected to balance generalist repositories (Scopus, Web of Science) with those better suited to collecting specialized information on the perception and communication of uncertainty (PubMed and PsycInfo).

Search results were as follows:

- **Scopus**: 873 (keywords, abstract, title)
- **Web of Science**: 176 (topic)
- **PubMed**: 27 (all fields)
- **PsycInfo**: 20 (all fields)

A total of **1,096 papers** were retrieved, of which 981 remained after removing duplicates. All records were organized in an Excel file, and duplicates were manually eliminated through cross-checking by the researchers involved in this activity.

Screening

The 981 remaining records were screened based on title, keywords, and abstract, in accordance with inclusion and exclusion criteria aligned with the review objectives. The review aimed primarily to identify **practical solutions for communicating uncertainty**, to isolate operational approaches emerging from the literature, and to evaluate the tools and practices, along with their limitations and effectiveness, in communicating uncertainty.

The inclusion criteria required that:

- Papers addressed uncertainty related to natural, environmental, or climate risks.
- The articles presented an original empirical study.
- The paper included an operational, communicative, or narrative component explicitly addressing uncertainty.

No limits were imposed on the geographical context or type of communicative tools examined. Exclusion criteria, instead, led to the removal of papers that:

- Were clearly out of scope.
- Addressed uncertainty in relation to non-environmental issues (e.g., financial or health-related uncertainty).
- Focused solely on technical or modeling approaches to uncertainty (e.g., Monte Carlo simulations) rather than communicative processes.
- Did not include relevant empirical data or case-based evidence.

Three researchers conducted this screening. Each researcher analyzed a portion of the dataset, indicating included, excluded, and uncertain papers. All decisions (especially those concerning ambiguous cases) were discussed collectively during multiple sessions until a shared consensus was reached. This collegial discussion ensured inclusiveness and methodological coherence throughout all review stages, integrating diverse perspectives and disciplinary competencies.

Given the interdisciplinary nature of the review, the research team chose an inclusive approach, avoiding premature exclusion of papers in which the centrality of uncertainty could not be clearly determined. Following this process, **89 papers** were retained for full-text reading.

Full-Text Reading and Quality Assessment

As the review focuses on the **communicative dimension of uncertainty**, the qualitative full-text reading aimed to identify two key aspects:

1. The **centrality or relevance of uncertainty** within the analysis and discussion of results.
2. The **presence of communicative elements** related to how uncertainty is represented and conveyed.

For the first dimension, the researchers conducted a qualitative evaluation. Subsequently, the papers were examined for compliance with the **communicative centrality** criterion, using an analytical grid inspired by Van der Bles et al. (2019).

The authors propose a model for communicating epistemic uncertainty—derived from a literature review and based on Lasswell's framework—that organizes communication according to the questions: who communicates what, in what *form, to whom, and with what effect*, while also considering context as part of audience characteristics.

Accordingly, information was recorded on:

- **Who communicates**: individuals or groups assessing or communicating uncertainty, including scientists, communication professionals, and journalists (often representing institutions);
- **What is communicated**: the object of uncertainty (facts, numbers, models, or hypotheses), its source, and its degree;

- **Form of communication**: how uncertainty is expressed (numerically, verbally, or visually), and the medium used (press, online content, broadcasts, or interpersonal communication);
- **Audience characteristics**: the public's relationship to the topic, to the communicator, and their perceived credibility and trust;
- **Effect**: cognitive, emotional, behavioral, and decision-making effects of uncertainty communication.

Contextual information, such as hazard type, geographical setting, and indicators of effectiveness or ineffectiveness, was also recorded. Textual excerpts were copied verbatim to minimize researcher discretion and allow for subsequent cross-validation.

Papers were retained for qualitative content analysis if they reported **effects on audiences** and provided sufficiently detailed information on at least one additional dimension of the Lasswell-inspired framework. Through this selection, **32 papers** were identified as suitable for in-depth qualitative analysis. The selected papers, which will be discussed in the subsequent sections, are listed in APPENDIX D.

Protocol Limitations

This review protocol presents several limitations. First, the boundary between technical and communicative approaches to uncertainty (e.g., between modeling techniques and discourse analysis) was not always clear-cut. Articles that combined both dimensions were discussed collectively within the research team, but borderline cases inevitably required some interpretative discretion.

Second, although the manual removal of duplicates was double-checked for accuracy, no automated software was used for either task. While this ensured complete transparency and researcher control at each stage, it may limit the workflow's replicability compared to more automated approaches.

Third, only papers reporting audience effects and at least one other Lasswell-related dimension were included in the qualitative phase. This provided a robust filter that ensured communicative centrality but imposed a restrictive threshold, potentially excluding some relevant contributions.

Finally, although the analytical grid was adapted from Van der Bles et al. (2019) and verbatim quotations were recorded to reduce subjectivity, the qualitative coding process did not achieve complete saturation across all interpretive sub-dimensions foreseen by the framework. These aspects will therefore be further explored in the subsequent qualitative inference phase.

Main Results

This section presents the main results of the review, based on the analysis of observed effects among audiences and the empirical evidence presented in the examined papers. It opens with general reflections on communicating uncertainty in the context of natural and environmental risks. Table 1 summarizes the main findings concerning the different ways of presenting uncertainty, highlighting strengths and weaknesses identified across communicative formats. The section concludes with several *key insights* that synthesize the most relevant operational indications.

- **The effects of including uncertainty in environmental risk communication** depend on the communication format (Cass et al., 2023; Marti et al., 2023) and on audience characteristics such as age, gender, location, education level, and trust in science (Bica et al., 2020; Demeritt et al., 2013; Fujimi et al., 2021; Jenkins et al., 2018).
- **Visualizations that explicitly show model variability**, such as spaghetti plots or multi-value formats, tend to increase trust and perceived transparency but may reduce perceived risk and cause confusion when not accompanied by interpretive guidance or mediation (Bica et al., 2020; Fujimi et al., 2021; Knoblauch et al., 2018; Taylor et al., 2015).
- **Clean and uncluttered graphics** foster understanding; however, excessive simplification can reduce the perceived seriousness of the hazard (Ettinger et al., 2021; Jenkins et al., 2018; Witt et al., 2023; Kübler et al., 2020).
- **The use of highly technical terminology** diminishes engagement and clarity among non-expert audiences (Ettinger et al., 2021; Jenkins et al., 2018).
- **Sensationalistic or apocalyptic framing**, as well as the omission or minimization of uncertainty, may enhance immediate media impact but undermine long-term trust and weaken the perceived scientific accuracy of the message (Rode & Fischbeck, 2021; Taylor et al., 2015).

The analysis reveals both factors that enhance the effectiveness of uncertainty communication and those that hinder understanding. Among the facilitating elements, the use of accessible and contextualized language stands out. It is advisable to employ familiar terms (e.g., "intensity," "strength," "probability") and to accompany numerical data with explanatory text (Ettinger et al., 2021; Jenkins et al., 2018). **Multimodality** and **storytelling** are also key strategies: combining text, visualizations, and narrative fosters comprehension and links uncertainty to concrete decision-making (Bica et al., 2020; Cass et al., 2023; Ettinger et al., 2021).

Conversely, several factors inhibit the effective communication of uncertainty. The absence of interpretive guidance is among the most critical: without adequate explanation, audiences tend to misinterpret specific terms and concepts, such as *range* or probability (Dieckmann et al., 2015; Johnson et al., 2023). Graphic choices also influence understanding and should therefore avoid inappropriate colors or symbols, such as imagery evoking positive emotions (e.g., a sun icon to represent heatwaves) or visuals that contradict the underlying risk message (Ettinger et al., 2021; Witt et al., 2023). The following table further details and compares the various representations of uncertainty, illustrating their communicative potential and limitations.

Table 1. Communication tools for expressing uncertainty in natural and environmental risk contexts: main advantages and limitations

Tool [Category]	Advantages (Pro)	Limitations (Contra)

Color-coded probabilistic polygons / Risk maps *[Spatial static visualizations]*	Provide immediate, intuitive communication of the spatial distribution of risk (Kause et al., 2020; Dow et al., 2009). Help represent territorial differences and enhance the perception of risk localization (Cass et al., 2023).	Color choices can elicit cognitive biases (e.g., red = alarm, green = safety) and distort perceived probability (Kause et al., 2020; Witt et al., 2023). Sharp color or shading boundaries may be interpreted as rigid thresholds, leading to *border* or *centroid bias* (Kübler et al., 2020).
Cone of Uncertainty (CoU) / Error cones *[Trajectory visualizations]*	When clearly explained, they can help visualize the direction and potential variability of a phenomenon's trajectory (Sherman-Morris & Antonelli, 2018).	May produce a "containment effect," leading users to believe that risk exists only within the cone (Outwater et al., 2024; Witt et al., 2023). The median line can induce deterministic interpretations of the trajectory (Cass et al., 2023; Bica et al., 2020).
Ensemble, heat maps, Animated Risk Trajectories (ARTs) *[Dynamic probabilistic visualizations]*	Reduce the limitations of the CoU by presenting the range of variability and the risk distribution (Witt et al., 2023; Warden et al., 2024). Improve perceptual calibration and enable dynamic, temporally sensitive representations (Witt et al., 2023; Warden et al., 2024; Outwater et al., 2024).	Require more complex design processes and risk inducing cognitive overload (Kübler et al., 2020). Need clear explanations of scale, legend, and interpretation to avoid misunderstanding (Knoblauch et al., 2018).
Verbal–numerical phrases and translation guides *[Verbal/numerical formats]*	Accessible and concise; suitable for non-technical contexts (Harris & Corner, 2011). Work best when accompanied by a numerical (range estimate) or visual translation of the risk (Dieckmann et al., 2021; Smithson et al., 2012).	High interpretive variability: people assign different meanings to the same terms (e.g., "likely," "unlikely") (Harris & Corner, 2011; Smithson et al., 2012). Negative formulations ("not likely") amplify imprecision and ambiguity (Smithson et al., 2012).

Combinations (percentage + category + map) *[Multimodal integrated formats]*	Offer a strong balance between precision, decision-making usefulness, and spatial localization by integrating multiple cognitive modalities (Shivers-Williams & Klockow-McClain, 2020; Qin et al., 2024).	Greater visual complexity and risk of inconsistency among numerical, verbal, and graphic messages (Witt et al., 2023). Often require verbal or narrative accompaniment for accurate interpretation (Bica et al., 2020).

Key Insights - *Systematic Literature Review on Uncertainty*
Frame uncertainty as a constitutive feature of the scientific method, not as an error (Bica et al., 2020; Rode & Fischbeck, 2021). **Guide data interpretation through clear captions and legends** (Dieckmann et al., 2015; Witt et al., 2023). **Simplify without oversimplifying, balancing scientific rigor and accessibility** (Ettinger et al., 2021; Taylor et al., 2015). **Combine languages and media to adapt communication to different levels of expertise** (Cass et al., 2023; Ettinger et al., 2021). **Contextualize messages locally, connecting them to specific experiences and vulnerabilities** (Cass et al., 2023; Ettinger et al., 2021). **Avoid sensationalism; prefer incremental, verifiable, and evidence-based scenarios** (Rode & Fischbeck, 2021; Jenkins et al., 2018).

6.2. Managing Uncertainty: Insights from Italian Communication Experts

As noted in Section 4, a fundamental research phase involved 32 semi-structured interviews with Italian risk communication experts to investigate the conceptualization and practices of socio-natural risk communication within the Italian institutional context. The interviewees were selected based on their documented professional experience in the field of risk communication, and were distributed as follows: 14 men, 18 women; 12 in public research bodies, 8 in local authorities, 5 in National Civil Protection System structures, and 7 in "other" categories (freelance experts, communication association representatives, private contractors, etc.). The interviews were conducted between October 2024 and September 2025. Each interview included 59 stimulus questions covering 9 areas of investigation. Interviews spanned from 40 minutes to over 2 hours, with an average duration of 1 hour and 15 minutes.

Among the numerous topics covered, the thematic analysis of the interviews revealed two important critical dimensions relating to uncertainty: 1) the difficulty of communicating uncertainty to both general public and decision makers, particularly regarding probabilistic estimates, and 2) the tendency of the general public to misinterpret or reject the uncertainty associated with risk assessment, demanding exact predictions about ongoing phenomena rather than probabilistic yet uncertain estimates.

First, almost all interviewees regard uncertainty as an unavoidable and defining dimension of risk assessment, underscoring the need to communicate it.

> *"All the measurements we make — from measuring a table to measuring a temperature, whether using any kind of instrument, from a super-sophisticated particle accelerator in Geneva to a tailor's tape measure used to shorten my trousers — every time we take a measurement like that, there is an uncertainty because we make an inherent measurement error. If we were to repeat that measurement 100 times, we would get 100 different numbers."* (Interviewee #10, F, Public Research Body)*.*

> *"Uncertainty reigns supreme — no one has certainties. I mean, if we had certainties, there would be no need for science or anything else. The problem is that there is always uncertainty, and it's a lot — it's high, it's significant, it's really great — and it's not even possible to quantify it. We know it's substantial, but we can't even say how much. The problem, in volcanology, is that uncertainty reigns supreme until we are right on the verge of an eruptive event."* (Interviewee #32, M, National System of Civil Protection).

A first relevant aspect concerns the role of weather forecasts in shaping citizens' expectations regarding communication and the management of uncertainty—not only in relation to hydraulic or hydrogeological risks, but also to other hazards, including seismic or volcanic risks. Several interviewees mention the gap between forecasts and local-level events, as if they were requesting personalized, highly precise forecasts for inherently uncertain phenomena.

> *"People react to the message they receive on their phone saying, "Look, there's an orange alert." Then, since the weather, so to speak, isn't a certainty — it's not a syllogism. There's a storm, and then suddenly it changes direction and goes somewhere else. And the citizen thinks, "You put me on alert, and then it's sunny." That's where truthfulness comes in — being able to explain that what's communicated isn't an absolute certainty, but rather a matter of possibility, of probability".* (Interviewee #11, M, Local Authorities)*.*

The demand for forecasts that are certain and reliable, modeled on weather predictions, also influences the communication styles of those who deal with earthquakes—events that differ significantly in probability and impact—potentially leading to biased communication.

> *"Many people say, 'No, we need to give numbers, give probabilities, try to explain them — that way people get used to dealing with this, right? To dealing with it the way we do with the weather'."* (Interviewee #1, M, Public Research Body).

> *"[…] Communicating uncertainty is already a lost battle, because — especially when it comes to content that is potentially anxiety-inducing — people want clear and definitive answers. So, there's an issue of ambiguity, of interpretation, that always creates background noise. For example, if I say "we can't tell whether there will be another earthquake," the optimists will think, "they don't want*

to tell us, but there will be another quake," while the others will understand the opposite" (Interviewee #14, F, National System of Civil Protection).

"Every time that after a flood, a tragedy, or even a less dramatic event, a public debate starts in the newspapers: "Was the alert justified? Was it wrong? Should it have been a red alert?" All of this harms risk communication. It gives the impression that risk communication should be 100% certain, that it's not a forecast but a guarantee that an event will occur, which is obviously impossible". (Interviewee #30, F, Public Research Body).

Although the need to communicate uncertainty is almost unanimously recognized by the interviewees as crucial, the description of specific strategies and tools to be used tends to remain in the background rather than being expressed in more general terms—such as percentage error, variability range, or value intervals. References to concrete techniques or tools are also infrequent and, as in this case, are usually limited to citing a set of well-established methods for use with journalists, who are regarded as mediators of scientific knowledge on behalf of the general public.

"Infographics, simulations, and maps — including risk maps — are extremely useful tools for both citizens and journalists, and therefore ultimately for the public. These are products that are far more accessible than written texts: they're much more immediate in terms of understanding, and also easier to remember." (Interviewee #27, F, Public Research Body).

The core issue, in effect, seems to be how to communicate uncertainty to an audience that is likely to interpret the uncertainty associated with an estimate as a kind of forecasting error.

"Risk is, by its very nature, a condition of potential danger — and therefore we cannot do without the element of uncertainty. For example, when I communicate a volcanic risk, I do so knowing that the volcano might not erupt — I mean, it will erupt sooner or later, but perhaps not within your lifetime. That doesn't mean my forecast was wrong. The issue is that the timescale we're talking about is different from the one you, as a citizen, perceive. Hence, there's this problem of "accurate" or "inaccurate" predictions — an expectation that, unfortunately, is partly fueled by things like weather apps. That's a classic problem we face. When a weather app on your phone tells you it will rain from 3:00 to 4:30 p.m., and then at 4:45 the sun comes out, it creates an expectation of precision that isn't realistic — that simply isn't true" (Interviewee #14, F, National System of Civil Protection).

Taken as a whole, the excerpts cited — as well as most of the other interviews — highlight a dual tension, both epistemological and communicative, surrounding uncertainty. On the one hand, it is recognized as an inescapable element of risk understanding and, even more so, the assessment of risks; on the other hand, it proves difficult for the general public to grasp, due both to the gap between scientific and everyday language, and to the unjustified expectation that scientists and experts should be able to provide specific predictions about how phenomena will evolve.

This analysis leads to several critical operational considerations for risk communication officers and risk managers. First, it highlights the need to consistently acknowledge the inherently uncertain nature of probabilistic estimates and, more broadly, of risk scenario definitions. Second, it underscores the importance of describing uncertainty in ways that are clear and intuitive for intended publics, employing not only verbal explanations but also visual tools such as graphs, infographics, hazard maps, and other established means and resources to communicate uncertainty, whenever possible and even when

uncertainty cannot be quantified. Finally, it is recommended that organizations develop and share documents (e.g., guidelines, best-practice collections, training manuals) that provide practical advice, strategic direction, and case studies on how to address uncertainty in risk communication effectively.

7. The value of diversity in risk communication

This section summarizes the results of a comparative analysis of international documents on inclusive communication, conducted against a benchmark of the main guidelines on risk communication. The study builds on the work presented in Deliverable 6.2a, *Identifying Best Practices in Risk Communication: Guidelines Benchmarking*, and further examines how inclusivity is addressed within institutional recommendations.

The reviewed documents were analysed using a coding matrix developed explicitly for this task, which enabled the systematic classification of key dimensions of inclusivity: gender, age, ethnic and cultural background, disability, and vulnerability. The matrix, presented in the accompanying table, was used to identify recurring elements, divergences, and varying levels of detail across the guidelines. This process enabled the reconstruction of the logics underpinning the recommended communication strategies and the extraction of elements relevant to campaign design within WP6.

Overall, the guidelines converge on a vision of risk communication as a relational, participatory, and culturally sensitive process. The most common approach is to design accessible messages delivered through diverse channels that offer fair representation while reducing informational asymmetries, especially in crisis contexts or situations characterised by high uncertainty. However, the level of specificity is, in several cases, limited, and more detailed and operational recommendations would have been expected, particularly those supporting differentiated strategies for distinct target groups.

Gender and Age. Gender and age are identified as crucial variables for risk profiling and message reception. The guidelines frequently refer to pregnant women, older adults, and parents of young children as groups requiring specific attention. Since demographic factors influence both technology use and message interpretation, the documents highlight the importance of adopting communication strategies (digital and non-digital) that account for these differences.

Ethnic and Cultural Background. The documents emphasise the need to consider cultural factors shaping risk perception, encouraging communicators to respect and understand the beliefs, values, and languages of the target communities. Particular attention is dedicated to culturally and linguistically diverse groups, marginalised ethnic communities, and non-native speakers, with the aim of preventing misinformation and ensuring culturally appropriate communication.

Disability and Vulnerable Groups. The guidelines identify a broad range of vulnerable groups, including individuals with disabilities, socially isolated people, and those facing socioeconomic disadvantage, who require tailored communication strategies. A strong emphasis is placed on ensuring accessibility through inclusive formats and assistive technologies. The documents also highlight the risk of denial among certain vulnerable groups due to stigma or fear, reinforcing the need for adequate preparedness among both communicators and the affected populations.

Conclusions

The comparative analysis shows broad agreement on the general principles of inclusivity, though the level of specificity is sometimes limited. In several instances, more granular, operational recommendations would have been beneficial, particularly for translating inclusivity principles into concrete communication practices for different target groups.

Nevertheless, the guidelines consistently call for communication models oriented toward accessibility, equitable representation, and the meaningful participation of vulnerable and marginalised groups. These principles contribute to improving institutional communication and strengthening community preparedness and response capacity across diverse risk scenarios.

Table 2 summarizes the main findings from the guideline analysis, while the *Key Insights* section provides operational suggestions for designing genuinely inclusive communication campaigns.

Table 2. Overview of inclusivity-related recommendations across international guidelines

Report / Source	Inclusivity Dimension	Key Extract / Relevant Statement
Public Information and Warnings Handbook (Australian Institute for Disaster Resilience, 2021)	Gender / Age	"Pregnant women"; "parents of young children"; "aged care facilities"; "schools and childcare centres"
	Ethnicity / Culture	"Aboriginal and Torres Strait Islander communities"; "CALD communities"; "people who are homeless or socially isolated"; "remote communities"
	Vulnerable groups / Disability	"People with disabilities"; "aged care and supported accommodation facilities"
Enhanced Engagement and Risk Communication for Residents in Underserved Communities	Gender / Age	"Marginalized populations… due to socioeconomic status, location, gender and age, experience the worst effects of climate change."
	Ethnicity / Culture	"Cultural risk theory…"; "Risk communicators must understand culture, beliefs, norms, social networks and languages of the target community."
	Vulnerable groups / Disability	"One-third of residents are elderly, low-income, disabled or socially vulnerable…"

Get Your Science Used – Six Guidelines	Vulnerable groups / Disability	"Co-developed products and services to reach the vulnerable population."
Practical Guide for Natural Hazard Risk Communication	Gender / Age	"Elderly people."
	Ethnicity / Culture	"Experts should respect cognitive, emotional and cultural factors…"
	Vulnerable groups / Disability	"Economically disadvantaged people"; "homeless people"; "physical or mental disabilities"; "colorblind people"; identify vulnerable sub-populations.
Risk Communication and Behavior: Best Practices and Research Findings	Gender / Age	"Risk perception increases with age and for women"; "age, income, experience predict preparedness."
	Ethnicity / Culture	"Culture explains differences in risk perception… certain cultures better adapted to flood exposure."
	Vulnerable groups / Disability	"For people with developmental disabilities, fear and anxiety are barriers to action."
Risk Communication in Action: Message Mapping Tools	Gender / Age	Women overestimate lifetime breast cancer risk.
	Ethnicity / Culture	"Clear, non-technical language and sensitivity to cultural norms."
	Vulnerable groups / Disability	Examples of risk denial among vulnerable groups; stigma, fear, helplessness.
Global Assessment Report on Disaster Risk Reduction 2022	Gender / Age	Intersection of gender, race, disability, age, migration status and health in shaping vulnerability.
	Ethnicity / Culture	"Marginalized ethnic groups report more awareness of risk… reflecting disparities from exclusion."

	Vulnerable groups / Disability	"Risk strategies must cater to populations who remain offline… due to cost, availability, disability or choice."
Sendai Framework for DRR (2015–2030)	Gender / Age	Emphasis on gender, age, disability perspectives and women/youth leadership.
	Ethnicity / Culture	DRR must be "integrated and inclusive"… addressing cultural, social and economic conditions.
	Vulnerable groups / Disability	Need for disaggregated data (sex, age, disability) and accessible information.
Public Communication for DRR	Gender / Age	"Age, gender, location, income and education only give part of the story."
	Vulnerable groups / Disability	"Social media for younger, urban audiences; radio for rural listeners."
Guidelines for Communicating DRR Information	Gender / Age	Demographic variations in tech use; gender inequalities.
	Ethnicity / Culture	Communications should be adapted to "the appropriate cultural context."
	Vulnerable groups / Disability	Accessibility of mobile technologies for visually impaired users; importance of proper descriptive tags.
Trust and Consequences: Role of Community Science, Perceptions, values, and environmental justice in risk communication	Gender / Age	Examples of engaging both men and women; community-based decision processes.
	Ethnicity / Culture	Communications must be site-specific and "ethnic-preference specific."
	Vulnerable groups / Disability	Communities—including vulnerable groups—must be prepared collectively.

Key insights - *Diversity and Inclusion*

Audience   profiling
Incorporate variables such as gender, age, cultural background, and vulnerability when designing messages. Updated demographic data, including that included in local Civil Protection Plans, should inform this process.

Differentiated   messages
Adapt communication materials to the specific needs of different groups: shorter texts for older adults, empathetic messaging for parents, and accessible formats for people with disabilities.

Cultural   and   linguistic   adaptation
Messages should be culturally localised rather than simply translated. Cultural mediators and comprehension testing can support this process.

Accessible   design
Ensure accessibility through subtitling, alt-text, audio versions, and compatibility with assistive technologies.

Multichannel   approach
Combine digital, traditional, and community-based media to accommodate varying levels of media literacy and communication habits.

Preventing   stereotypes
Carefully assess texts and visuals to avoid reinforcing stereotypes or stigma. When possible, involve members of the relevant communities in the review process.

Inclusivity   throughout   the   campaign
Integrate inclusivity considerations in all phases of the communication process: needs assessment, design, production, dissemination, and evaluation.

8. What people want: discussing survey results

The survey administered to a representative sample of the Italian population aims to collect information on perceptions, knowledge, and informational behaviours related to risks. In addition, a short section dedicated to evaluating a communication product enables the capture of citizens' preferences regarding framing, formats, and source credibility. This approach provides an updated overview of the current state of risk communication in Italy. The use of a representative sample extends the findings from earlier qualitative research phases, enabling generalisation of the results and identifying significant differences across demographic groups (e.g., age, gender, education, or area of residence). Moreover, the qualitative inquiry conducted within the project relied on target groups recruited through the researchers' proximity networks. Although the selection and administration of interviews strictly adhered to the principles of qualitative research, the survey helps reduce biases that may arise from self-selected samples.

In this sense, the survey complements qualitative evidence: the quantitative estimates it provides, comparable and suitable for longitudinal analyses, are essential for designing shared, evidence-based solutions for risk communication, in which listening practices and the structured elicitation of preferences inform decision-making. This approach introduces an additional layer of participation, namely evaluative participation. As discussed, such techniques are rarely adopted by institutions due to constraints linked to expertise, resources, or time. Consequently, the RETURN project represents an opportunity both for empirical investigation and for offering guidance to institutions, supplying actionable empirical insights. The survey generates measurable indicators that can be monitored over time. The research design presented here is therefore scalable, meaning that its components can be combined or adapted depending on organisational capacities. Furthermore, this process confirms (as also highlighted in the analysis of the guidelines) the need to integrate academic knowledge and expertise into the "ordinary" management of risk communication.

In the context of its integration into the RETURN project, the survey aims to achieve several objectives. First, in line with efforts to improve knowledge and strengthen community resilience, it helps identify recurring patterns in trust and credibility, media habits and behaviours, and informational needs. Mapping these "variable centralities" of risk communication enables the design of guidelines and communication campaigns that are aligned with citizens' needs. These outputs can support policymakers, institutions, and stakeholders by providing solid, representative data. Data collection can be planned at different stages of the communication process (before activation, during implementation, or after campaign completion), and establishing a stable, shared protocol can facilitate coordination.

Finally, by linking sociodemographic variables with communication preferences, the survey supports the identification of potentially vulnerable groups and helps institutions and civil protection organisations design targeted interventions. Within the scope of this deliverable, this research activity provides empirical evidence that substantiates qualitative insights and provides a solid foundation for the operational recommendations.

8.1. Survey Design and Experimental Framework

In this section, we retrace the steps that led to the formulation of the survey. The survey was designed to record respondents' informational pathways and attitudes. In addition, a dedicated section focuses on the testing of frames and sources to identify potential informational preferences. Below, we detail the different components of the survey and the rationale behind their construction. The subsequent section of the report will focus on the findings and their operational implications.

The Organization of the Survey

The survey, administered to a representative sample of the Italian population, aims to collect information on communication habits, familiarity with risk communication, and preferences regarding informational sources, integrating these dimensions with an assessment of short communication products. The following paragraphs outline each section of the survey and the logic underpinning its formulation.

Demographics

This section gathers information about the surveyed population. Variables such as age, gender, and place of residence enable the differentiation of respondent profiles and inform inclusive risk communication strategies that are attentive to the needs of diverse target groups. Additionally, data on occupation, educational attainment, and university disciplinary background allow us to formulate hypotheses about respondents' familiarity with scientific knowledge (presumably higher among STEM graduates) and their likelihood of accessing more specialized information pathways.

Previous Experiences with Natural and Environmental Risks

This section explores respondents' prior experiences with natural and environmental risks. It assesses prior exposure to such risks and the information practices implemented when those risks occurred. Furthermore, it investigates respondents' ability to evaluate the presence and relevance of natural and environmental risks in their area of residence, their perceived personal preparedness, and the expected impact of these risks on their future lifestyle.

Media Exposure and Focus on Digital Consumption

The questions in this section aim to examine respondents' informational consumption patterns in greater depth. Part of the questions (and related response items) were adapted from the Eurobarometer survey. This section records the frequency and visibility of information on natural and environmental risks within respondents' informational pathways, asking, for example, how often such content appears in their timelines and whether they pay attention to risk communication topics. It also investigates the presence of news avoidance behaviours related to environmental risk and climate change. An additional question focuses on the role of specifically digital sources—such as influencers or content creators—in respondents' everyday information habits.

Sources

This section records respondents' preferences regarding informational sources. Specifically, respondents were asked which sources they consult for information on natural and environmental risks, which source they would turn to first in the event of an emergency related to such risks, and how much they trust each source.

Testing the Frame

The final experimental section of the survey aims to assess whether, and to what extent, framing shapes the communicative appeal and perceived effectiveness of risk communication messages, as well as the credibility attributed to the source. Four communication products were presented in a 2×2 experimental design, varying framing (gain vs. loss) and source (Mayor vs. Civil Protection).

The communication products were developed based on evidence gathered through qualitative interviews. These interview results were used to verify participants' comprehension of the nuances of framing and to identify elements perceived as relevant and distinctive. The graphic solutions (text and emoticons) were also developed in accordance with the key indications derived from the interviews.

The framing variation concerned only the claim. Two symmetrical and equivalent claims were therefore created: *"Se segui le regole, puoi salvare tutto quello che conta"* ("If you follow the rules, you can save everything that matters") (gain) and *"Se ignori le regole, puoi perdere tutto quello che conta"* ("If you ignore the rules, you can lose everything that matters") (loss). These claims activate an affective dimension ("everything that matters") without anchoring it to specific referents—such as "your loved ones" or "your children"—which had elicited ambivalent reactions during qualitative testing. They also clarify the consequential logic, appreciated by interviewees, linking it not only to loss but also to gain.

The claims were paired with texts partially adapted from the national communication campaign "Io non rischio" ("I do not take risks") promoted by the Italian Civil Protection on hydrogeological risk. This specific risk category was selected due to its widespread relevance across the Italian territory and its marked increase in recent years in events receiving national media coverage.

The communication products were formatted as graphic cards (Appendix E) and embedded in the survey. Each of the four products was shown to randomized sub-samples, followed by a battery of Likert-scale items assessing respondents' appreciation and comprehension of the frame, the perceived authority of the source, the potential for engagement, the motivational impact on action, and other relevant dimensions.

8.2 Demographics

The sample consists of 1,618 valid respondents. The survey, including the definition of the sample stratification and the data collection phase, was conducted by a specialized research agency in December 2025.

The following section outlines some socio-demographic characteristics of the respondents who participated in the survey. In addition to standard sociodemographic variables, the section provides information on respondents' educational and disciplinary backgrounds, which are considered reliable indicators of familiarity with science communication.

With regard to age stratification, the sample distribution follows the pattern shown in Figure 3. It should be noted that the upper age limit of 74 years was defined during the sampling stage, given constraints on the availability of sufficient respondents in the oldest age groups. This choice affects the representativeness of the population aged 74 and over but does not compromise the sample's validity with respect to the study's objectives.
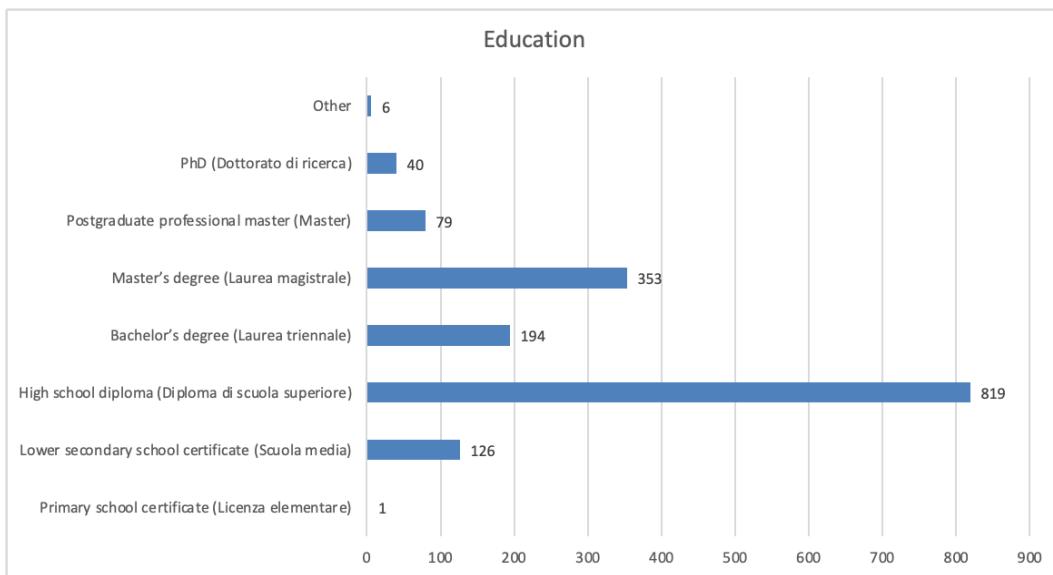
Figure 3 - Age distribution
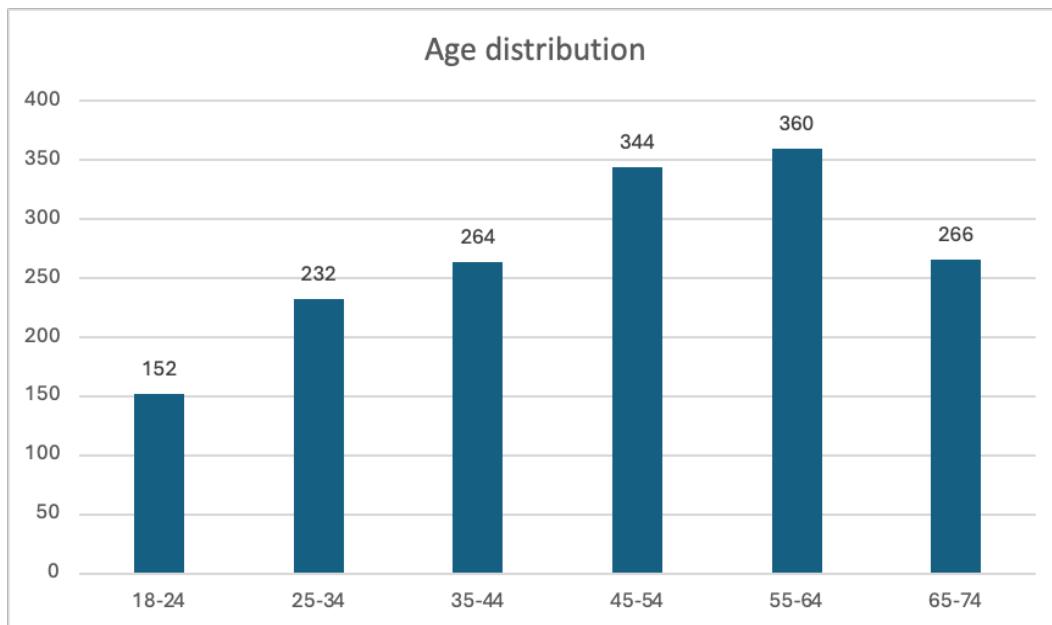
Respondents' gender is distributed as follows: 818 women and 800 men (Figure 4). The decision to adopt a binary gender categorization is based on the fact that gender was used as a stratification variable in the sampling design. For this reason, no response options were provided to allow for self-identification as non-binary or unspecified. While acknowledging the limitations of this choice, this approach ensured the sample's representativeness with respect to the reference population defined for the study.

Figure 4. Gender

Gender
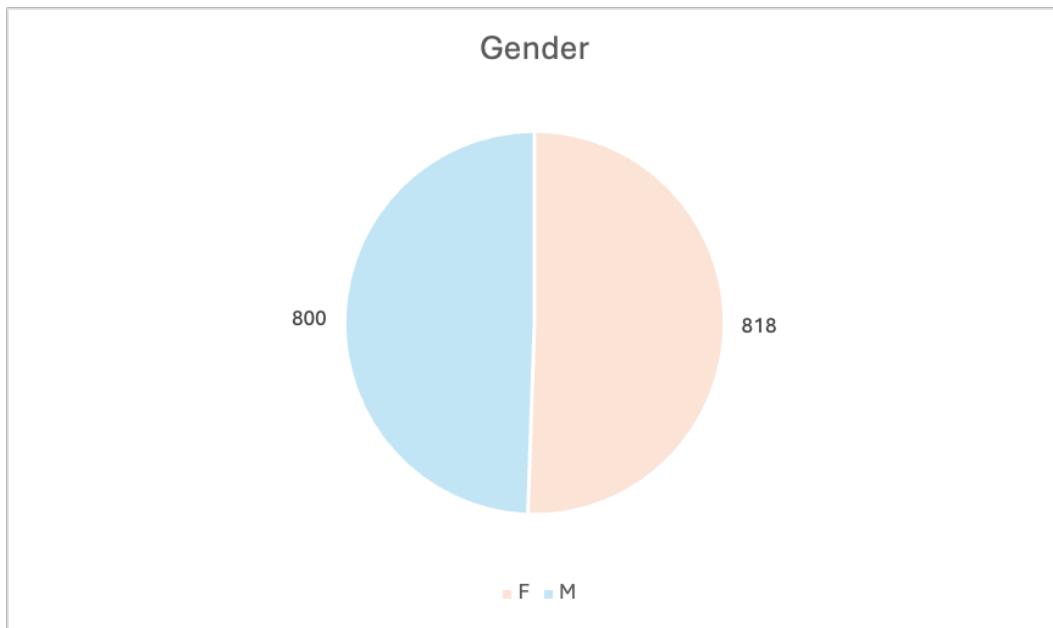
With regard to educational attainment (Figure 5), the sample is predominantly composed of respondents holding a high school diploma (n = 819). A substantial share of participants have completed tertiary education, including both bachelor's degrees (n = 194) and master's degrees (n = 353). At the same time, a smaller proportion holds a postgraduate qualification, such as a professional master's degree (n = 79) or a PhD (n = 40). The sample also includes respondents with a lower secondary school certificate (n = 126) and, to a minimal extent, with a primary school certificate (n = 1). Finally, a small number of respondents fall into the "other" category (n = 6).

Figure 5. Education

Education

The distribution of respondents across disciplinary areas varies by educational level (Figure 5). Among bachelor and master's degree holders, the largest disciplinary groups are Ancient, Philological, Literary and Art History Studies (n = 82), Economic and Statistical Sciences (n = 75), Historical, Philosophical, Pedagogical and Psychological Sciences (n = 56), Industrial and Information Engineering (n = 55), Political and Social Sciences (n = 54), and Legal Sciences (n = 50).

A similar disciplinary spread is observed among holders of postgraduate professional master's degrees, although with smaller absolute numbers. In this group, the highest concentrations are found in Medical Sciences (n = 15), Economic and Statistical Sciences (n = 11), and Political and Social Sciences (n = 10), while other disciplinary areas are represented more sparsely.

PhD holders are fewer overall and are concentrated in a limited number of disciplines, most notably Industrial and Information Engineering (n = 10). Fewer PhD holders are present in Political and Social Sciences and in humanities-related fields. In contrast, no PhD holders are reported in Agricultural and Veterinary Sciences or in Economic and Statistical Sciences. Overall, the sample combines disciplinary diversity with a differentiated distribution of educational levels across fields.

Figure 6. Disciplinary background
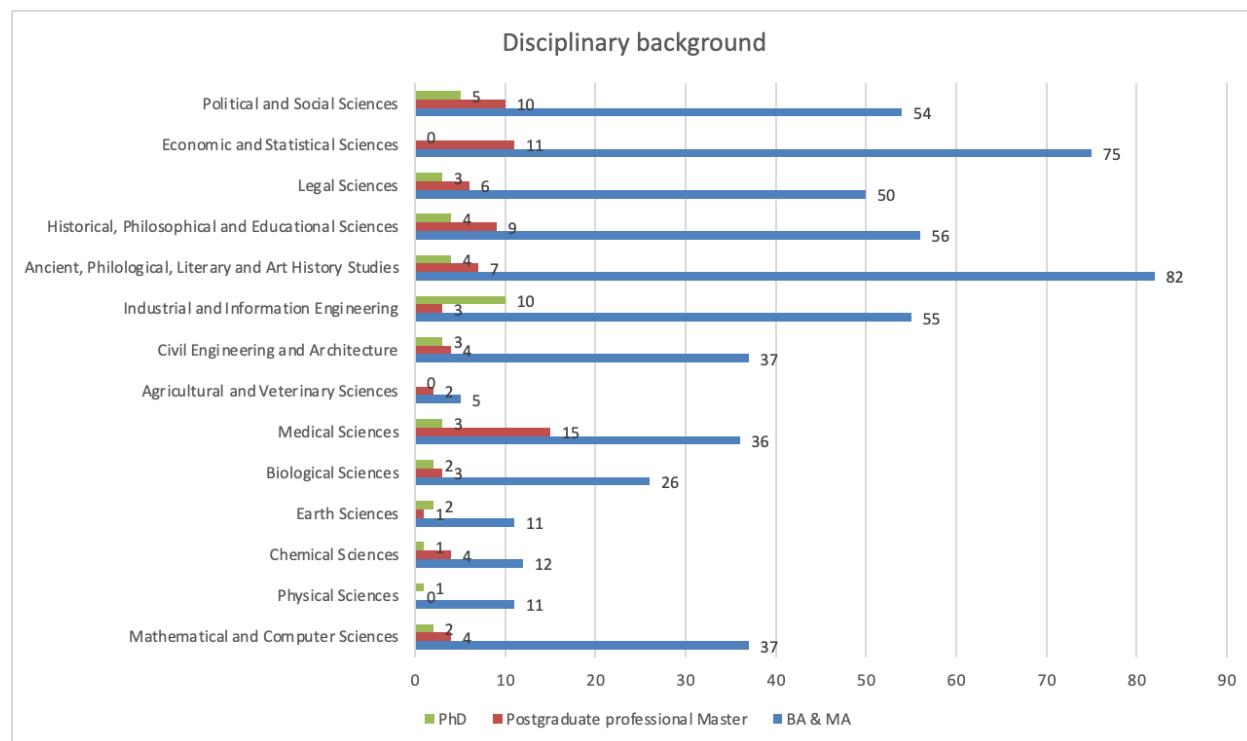

With regard to employment status (Figure 7), the sample is predominantly composed of respondents employed in the private sector (n = 576), followed by those employed in the public sector (n = 239). A substantial share of the sample comprises retired respondents (n = 253), while self-employed professionals and freelancers account for 179 cases. A total of 159 respondents are unemployed or

actively seeking employment, and 135 are students. Finally, a smaller proportion of respondents fall into the residual category "other" (n = 77). They are mainly housekeepers.

With regard to respondents' area of residence (Figure 7), the sample is geographically distributed across all major regions of Italy. The largest share of respondents resides in Southern Italy and the Islands (n = 537; 33.2%), followed by the North-West (n = 426; 26.3%), the North-East (n = 335; 20.7%), and Central Italy (n = 320; 19.8%). Overall, the distribution reflects broad territorial coverage, allowing consideration of geographical differences in interpreting the results.

Figure 7. Area of Residence
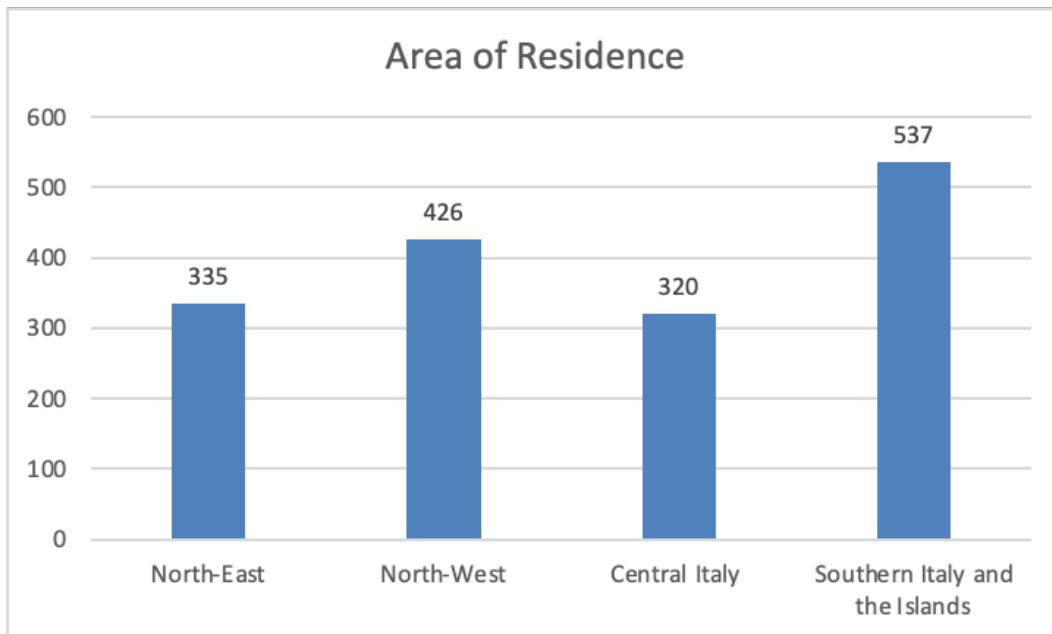
When asked whether they had previously experienced natural or environmental risks (Figure 8), a majority of respondents reported having had such experiences (n = 940; 58.1%). A substantial proportion stated that they had not experienced similar events (n = 636; 39.3%), while a small minority selected the option "Don't know" (n = 42; 2.6%). Overall, the findings indicate that direct or perceived experience with natural or environmental risks is relatively common within the sample, although a sizable share of respondents reports no prior exposure.

Figure 8. Natural and environmental risks experienced

8.3. Risk perception

Perceived risk exposure

This section addresses respondents' perceived exposure to natural and environmental risks. Most questions in this battery employed a Likert-type scale, asking respondents to rate their agreement on a scale from 0 (*not at all*) to 5 (*very much*). Respondents were therefore asked to assess their perceived exposure to risks in relation to their area of residence (*Do you think you live in an area exposed to natural or environmental risks?*)(Table 3, Figure 9).

The most frequent response category is 3 (507 respondents, 31.3%), followed by category 2 (426 respondents, 26.3%). The distribution thus concentrates around the scale's central values, indicating a predominantly moderate perception of risk. Cumulative percentages show that 49.5% of the sample falls between *not at all* and 2, while the median is exceeded at category 3. When aggregating the upper categories (3–4–very much), 50.5% of respondents report living in an area that is perceived as fairly or highly exposed to natural or environmental risks. Extreme positions are relatively limited. Only 5.9% of respondents believe they live in an area not exposed to natural or environmental risks, whereas 7.2% place themselves at the opposite extreme, perceiving their area of residence as highly exposed.

Overall, the data portray a population that acknowledges the presence of risk and demonstrates a certain degree of familiarity with it in relation to their place of residence. However, perceived risk levels predominantly cluster around intermediate values, suggesting a perception that is neither strongly reassuring nor overtly alarmist. This positioning has relevant implications for risk communication strategies: on the one hand, excessively alarmist messages may appear dissonant; on the other hand, territorially grounded communication approaches, such as those drawing on local memory and *place attachment*, may be particularly effective for respondents located in the intermediate range of the scale.

Table 3. Perceived risk exposure

Do you think you live in an area exposed to natural or environmental risks?			
		Frequency	%
Valid	0	96	5,9
	1	279	17,2
	2	426	26,3
	3	507	31,3
	4	192	11,9
	5	117	7,2
	Total	1617	99,9
Missing	-	1	,1
Total		1618	100,0

Figure 9. Perceived risk exposure
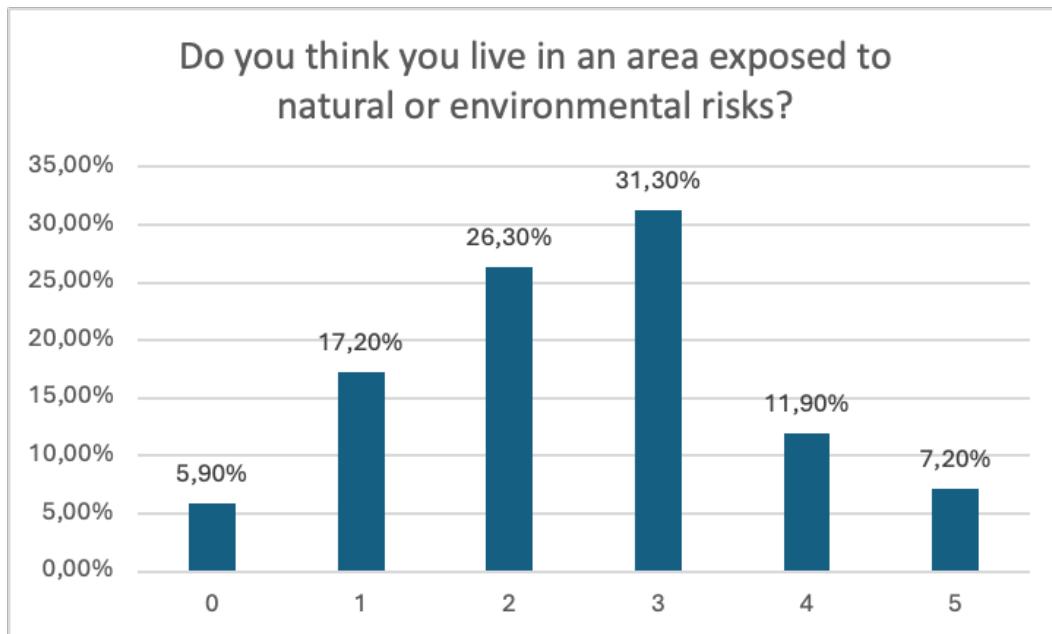
Perceived risk likelihood

Respondents were then asked to assess the plausibility of their involvement in future natural or environmental risks. In this case, the focus shifts from the territorial dimension explored in the previous item to a more personal and prospective evaluation. Nevertheless, the results (Table 4, Figure 10) are

largely consistent with those presented above. Once again, responses concentrate around the intermediate value of the scale (574 respondents, 35.5%), indicating that perceived future risk is predominantly evaluated as moderately plausible. Compared with the previous question, the central value is even more pronounced, suggesting that risk is more readily acknowledged when framed in personal, future-oriented scenarios rather than as a present territorial condition.

This shift has relevant implications for risk communication. Awareness-raising initiatives (particularly those addressing dynamic and evolving phenomena such as climate change) may be more effective when anchored in future-oriented projections and forms of personalised storytelling (for example, emphasising what may change for the individual, rather than focusing exclusively on impacts at the territorial level).
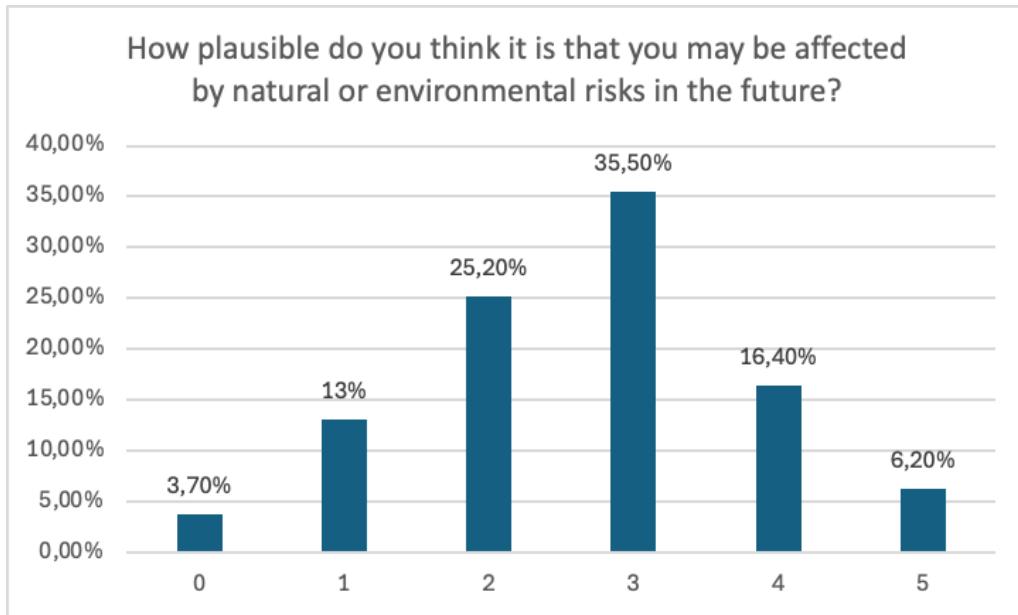
This interpretation is further supported by the aggregation of the upper categories of the scale (3–4–5), which account for 58.1% of the sample, a higher proportion than observed for the previous item. This upward skew suggests that respondents are more inclined to perceive risk as a plausible future possibility rather than as a defining feature of their current territorial context, thereby expanding the perceived domain of what is considered possible.

Extreme positions remain limited: only 3.7% of respondents consider it not at all plausible that they will be affected by natural or environmental risks in the future, while 6.2% regard such involvement as very plausible.

Table 4. Perceived likelihood

How plausible is it that you may be affected by natural or environmental risks in the future?		
	Frequency	%
0	60	3,7
1	210	13,0
2	408	25,2
3	574	35,5
4	266	16,4
5	100	6,2
Total	1618	100,0

Figure 10. Perceived likelihood

Perceived risks concern

Successively, we examined respondents' level of concern regarding potential involvement in natural and environmental risks (*How concerned are you about the possibility of being affected by natural or environmental risks in the future?*) (Table 5, Figure 11). While broadly consistent with the previous interpretations, these responses highlight the central role played by the emotional dimension, namely *concern*, in shaping risk appraisal.

Once again, the modal category corresponds to the scale's central value (3; 482 respondents, 29.8%). However, unlike the previous items, the higher categories are particularly populated: 22.9% of respondents selected category 4 (370 respondents), and 20.2% selected the highest value of the scale (5; 327 respondents). As a result, although the distribution remains centred, it is clearly skewed towards the upper end of the scale. This pattern suggests that when risk is framed in more intimate and personal terms—such as concern—it elicits a more intense evaluation than when assessed in terms of territorial exposure or future plausibility. This shift becomes especially evident when considering the aggregation of the upper categories of the scale (3–5), which account for 72.2% of respondents. This proportion is substantially higher than that observed for perceived territorial exposure (50.5%) and for the perceived plausibility of future involvement (58.1%). The contrast is also evident at the extremes of the distribution:
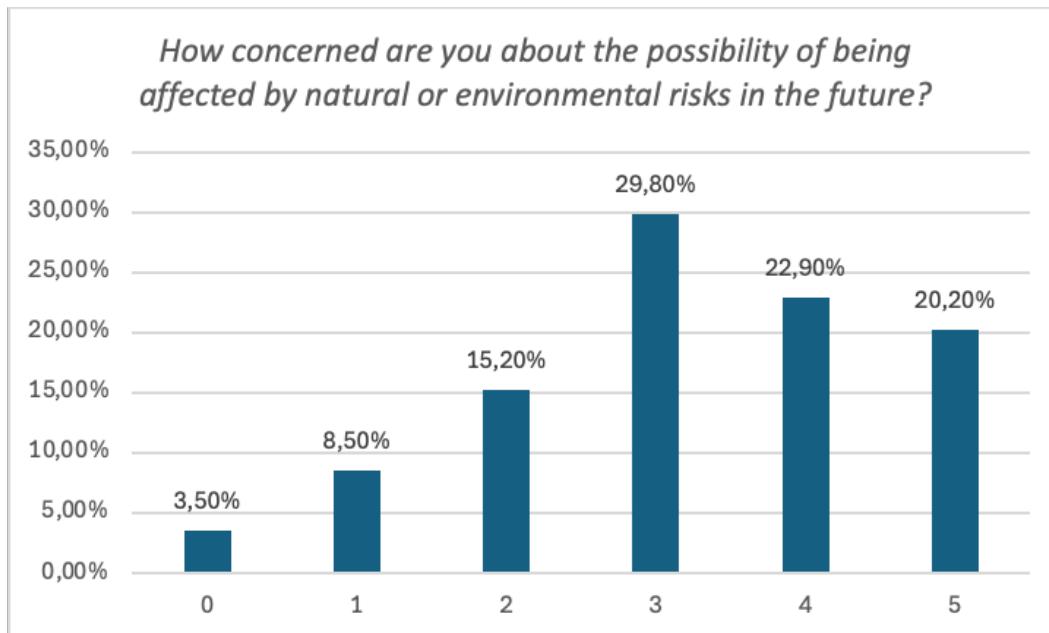
while only 3.5% of respondents report being not at all concerned, as previously reported, as many as 20.2% report being very concerned.

From a communication perspective, these findings have several implications. On the one hand, they underscore the need to carefully address those personal and emotional dynamics that may amplify risk perceptions and potentially generate anxiety or inhibiting responses, as can occur with excessively alarmist messages. On the other hand, they confirm that risk becomes particularly salient when framed through an emotional and personal lens. For this reason, narrative strategies grounded in empathy or in the representation of behaviours and experiences of "people like me" may prove especially effective in fostering risk socialisation and promoting preventive behaviours.

Table 5. Risk concern

How concerned are you about the possibility of being affected by natural or environmental risks in the future?		
	Frequency	%
0	56	3,5
1	137	8,5
2	246	15,2
3	482	29,8
4	370	22,9
5	327	20,2
Total	1618	100,0

Figure 11. Risk concern

Perceived future lifestyle impact

Subsequently, we further explored the individual dimension by focusing on perceived impacts on lifestyle (Table 6, Figure 12). Once again, the most frequent response corresponds to the scale's central value (3), selected by 551 respondents (34.1%). Compared with the previous items, however, this central tendency is accompanied by a stronger tendency toward the upper end of the scale. Indeed, only 30% of the sample falls between *not at all* (0) and 2; consequently, more than two-thirds of respondents consider the impact of natural or environmental risks on their future lifestyle to be at least moderate.

Perceived impact on lifestyle thus emerges as a particularly salient and widely shared dimension of risk perception. As in the previous items, extreme positions remain marginal: 3.8% of respondents (61 individuals) believe that their lifestyle will not be affected at all, whereas a larger share positions itself at the opposite end of the scale. Specifically, 215 respondents (13.3%) expect natural and environmental risks to have a strong impact on their lifestyle.

These findings have important implications for risk communication. Respondents' positioning suggests that risk becomes especially credible when it is translated into everyday life. Messages centred on lifestyle dimensions (such as mobility, health, or consumption practices) may therefore prove particularly effective. In continuity, communication strategies that link environmental phenomena to concrete, everyday situations are likely to resonate with a widespread sensitivity to changes in daily life. This type of communication may serve as a bridge between more rational forms of alert, grounded in knowledge of territorial characteristics, and more emotional dimensions centred on individual concern.

Table 6. Perceived future lifestyle impact

Do you think that natural or environmental phenomena may have a significant impact on your future lifestyle?		
	Frequency	%
0	61	3,8
1	146	9,0
2	279	17,2
3	551	34,1
4	366	22,6
5	215	13,3
Total	1618	100,0

Figure 12. Perceived future lifestyle impact
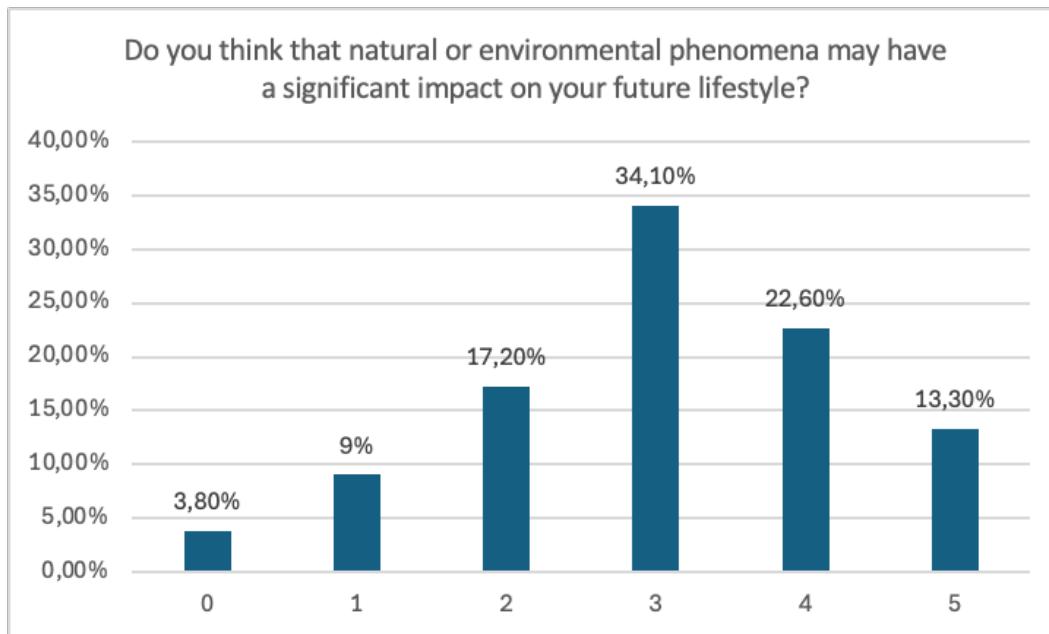
Perceived risk preparedness

With regard to perceived preparedness to cope with natural and environmental risks, the data outline a particularly interesting scenario (Table 7, Figure 13). Once again, the central value of the scale receives the largest share of responses (41.5%; 672 respondents), with a more pronounced concentration than in the previous items. This pattern indicates a predominantly moderate level of perceived preparedness, particularly given that the distribution is less skewed towards the upper end of the scale than for the other dimensions analysed.

Only 25.9% of respondents fall within the highest categories of the scale (values 4 and 5). This suggests that, despite widespread concern and a strong perception of the impact of risks on everyday life, respondents feel less confident in their ability to cope effectively with them. This interpretation is further supported by the limited presence of the upper extreme: only 4.3% of respondents report feeling very prepared to address natural or environmental risks, whereas 3.7% report being not at all prepared.

The concentration around the central values can therefore be interpreted as reflecting a perception of partial preparedness: incomplete information, uncertainty about appropriate actions, or a lack of adequate tools to respond effectively in the event of risk. Consequently, risk communication strategies should necessarily be anchored in an operational dimension. Generating concern or tension alone, particularly through alarmist framing, is insufficient; rather, providing clear and actionable guidance on what to do appears crucial.

These findings point to a critical misalignment between perceived exposure to risks (even when not considered immediate) and perceived capacity to cope with them. Emotional activation without agency may therefore result in ineffective communication, as also suggested by the qualitative evidence collected in the earlier phase of the research. Potentially effective formats may instead focus on actionable guidance (such as *how-to* content or short tutorials), concrete examples, and small, everyday actions.

Table 7. Perceived risk preparedness

If you were exposed to a natural or environmental risk, do you think you would be able to adopt appropriate behaviours to protect yourself?		
	Frequency	%
0	60	3,7
1	106	6,6
2	362	22,4
3	672	41,5
4	349	21,6
5	69	4,3
Total	1618	100,0

*Figure 13. Perceived risk preparedness*
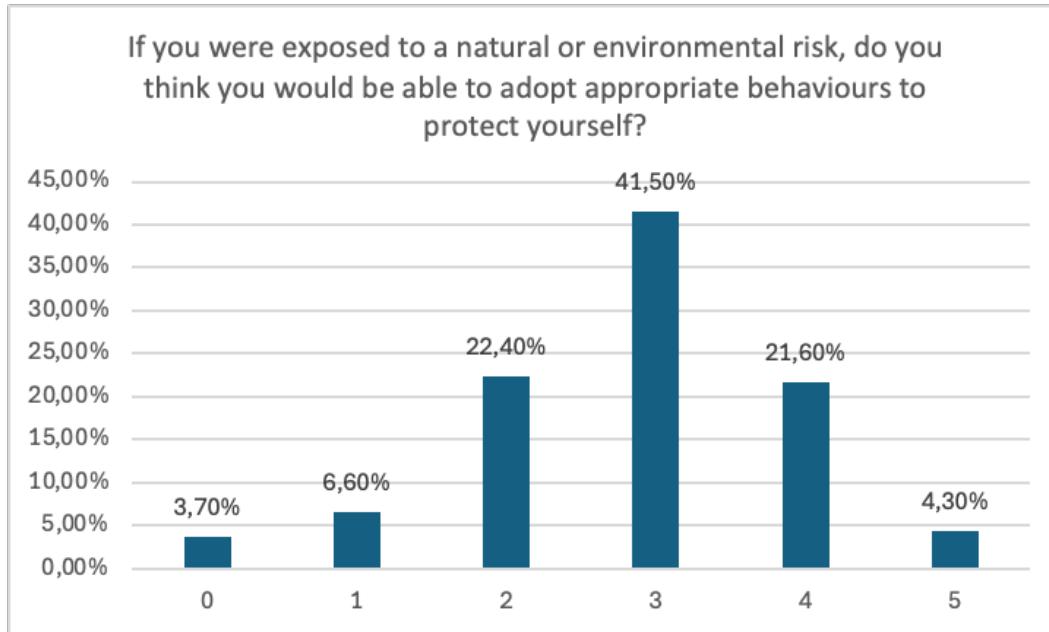
Below, we present a summary table (Table 8) and a summary figure (Figure 14) for the entire section.

Table 8. Risk perception summary

	Perceived risk exposure	Perceived risk likelihood	Perceived risks concern	Perceived future lifestyle impact	Perceived risk preparedness
0	96	60	56	61	60
1	279	210	137	146	106
2	426	408	246	279	362
3	507	574	482	551	672
4	192	266	370	366	349
5	117	100	327	215	69
T	1617	1618	1618	1618	1618

Figure 14. Risk perception summary
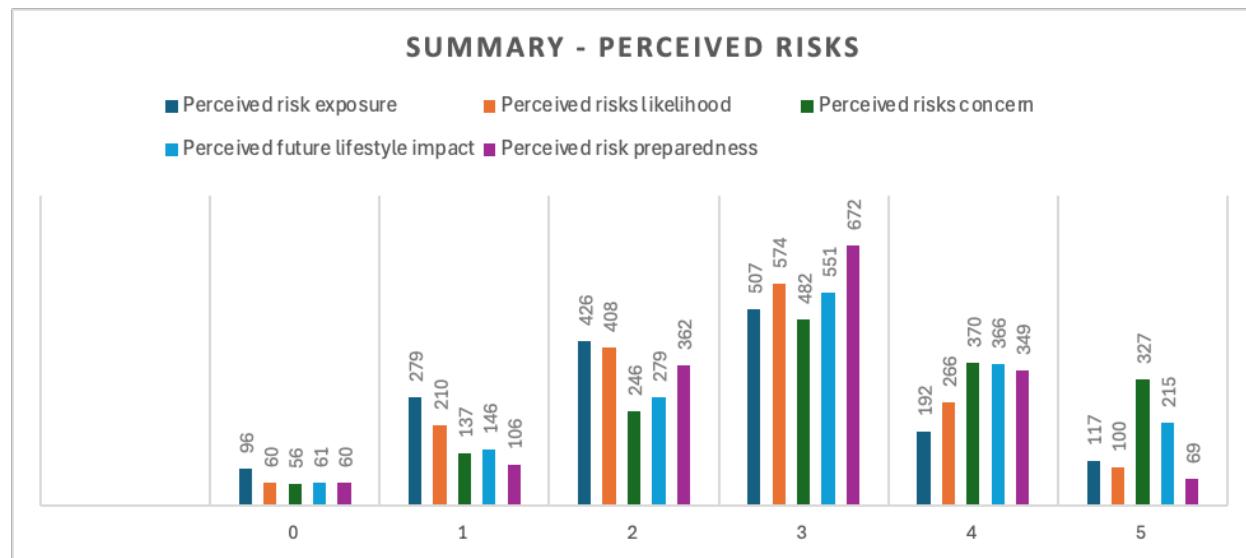
8.4 Information patterns

This section presents findings on the presence of natural and environmental risk communication within citizens' information networks. First, respondents were asked whether they had recently read about, seen online or on television, or heard on the radio information concerning natural and environmental risks.

Overall, 781 respondents (48.3% of the sample) reported having encountered such information. By contrast, 561 respondents (34.7%) reported not receiving any news on the topic, while 276 (17.1%) did not recall encountering information on natural or environmental risks (Figure 15). These results suggest that, outside of emergency situations, risk communication may have limited visibility in mainstream media or may struggle to effectively capture public attention.

Figure 15. Risks visibility
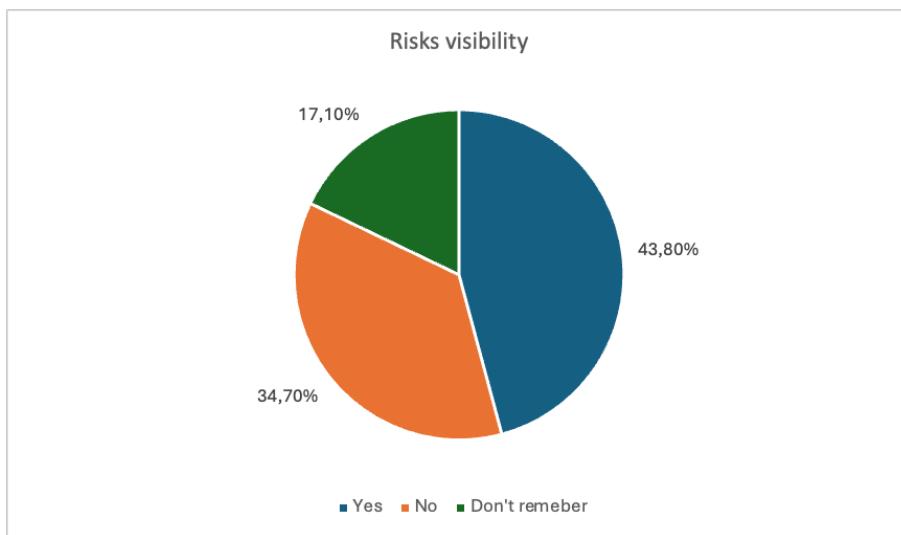
Respondents were then asked to indicate which types of risks had been the subject of the information they had been exposed to during the previous week. In this case, multiple answers were allowed. The risks reported by the highest number of respondents are those related to climate and climate change (N = 782), followed by health-related risks (N = 625) and political and geopolitical risks (N = 590). Natural and environmental risks rank only afterwards, with 561 respondents. All responses are summarized in Table 9 and Figure 16.

These results suggest that public attention is primarily focused on highly mediatized or macro-level issues. Informational exposure, therefore, appears to be driven by the national or international media agenda rather than by territorial or sectoral risks, such as natural and environmental risks, which do not dominate public attention. Only about one-third of the sample reports having received information on these topics; similarly, more structural environmental issues, such as the environment and ecosystems, remain below the 20% threshold.

This limited presence within citizens' information networks, consistent with what emerged from the qualitative analyses, poses additional challenges for risk communication. It should be noted that approximately one respondent out of five reports not recalling having received information on any of the listed topics. This finding can be interpreted as either an expression of informational inattention or disconnection in a context characterized by information overload, or as an indicator of increasingly selective and individualized information consumption, which may also involve a failure to recognize certain content as risk-related information.

Finally, it is worth noting that some risks, such as anthropogenic risks, risks related to cultural heritage, and those affecting infrastructure, are underrepresented in the reconstruction of informational coverage, despite their potential relevance in contexts such as the Italian one. These cumulative absences from informational pathways may indicate a gap between actual risks and those communicated or perceived by the public. Overall, the data indicate that risk communication tends to follow the logic of media visibility

rather than that of systematic prevention, focusing on a limited number of major issues driven by current events and their mediatization, while leaving a significant share of citizens insufficiently reached in their everyday informational experience.

Table 9. Exposure to risk-related information

Risk topic	N (respondents)
Climate and climate change	782
Health-related risks	625
Political and geopolitical risks	590
Natural and/or environmental risks	561
Environment and ecosystems	322
Risks to individual or collective safety	307
None of the above	279
Infrastructure-related risks	190
Anthropogenic risks (e.g., industrial accidents, nuclear incidents)	186
Risks to cultural heritage	110
Other natural risks	2

Note: Multiple responses allowed.

Figure 16. Exposure to risk-related information
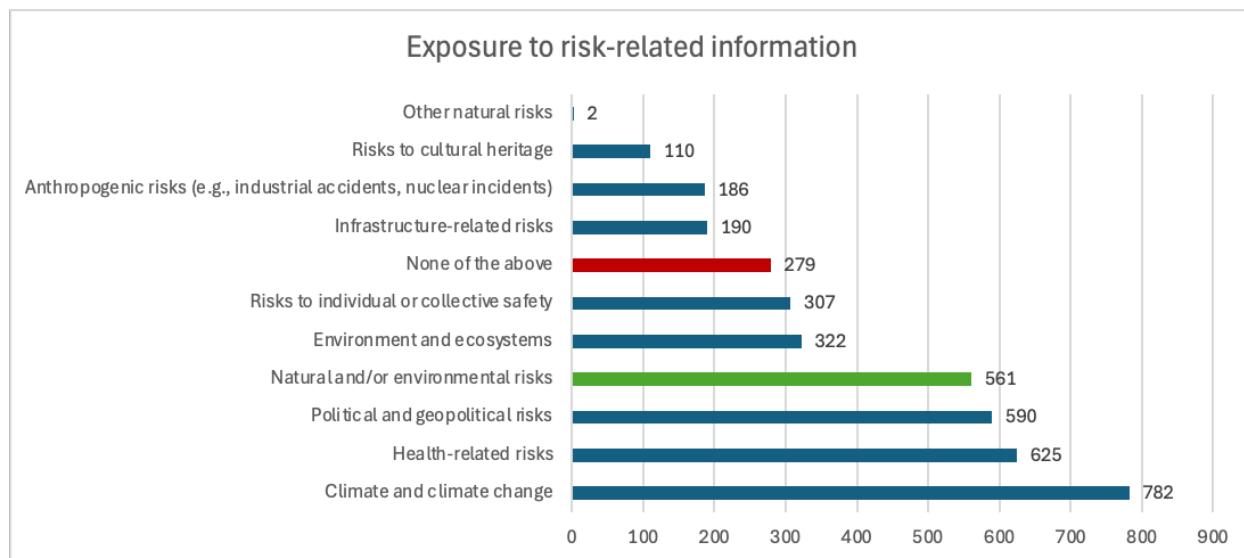
Drawing on the model of Eurobarometer questions aimed at investigating the phenomenon of *news avoidance* and exposure, respondents were asked whether they actively seek information on natural and environmental risks and how frequently this occurs (*Which of the following statements best describes how you approach information on natural and environmental risks?*). The results are summarized in Table 10

and Figure 17. The responses indicate limited centrality of risk communication: overall, they depict a predominantly intermittent pattern of engagement, characterized by low proactivity in actively seeking information about risks. These findings are consistent with the statements collected from qualitative interviews with students.

More specifically, 969 respondents (59.9%) report seeking information on risks only occasionally. This suggests an episodic form of information consumption, possibly triggered by external events, rather than a routinized practice. More intense or regular forms of attention remain limited. Only 4.1% of respondents report seeking information on risks several times a day, whereas 17% consult such information daily.

A further group consists of respondents who distance themselves from risk-related information or explicitly avoid it. In particular, 10.6% of respondents report being not particularly interested in risk communication, 2.3% report trying to avoid information about risks, and 1.1% report actively avoiding news related to risk communication. Although this group is relatively small, it highlights the presence of different forms of informational disengagement. On the one hand, especially among those who actively avoid such information, this may reflect information fatigue related to topics perceived as potentially anxiety-inducing. On the other hand, avoidance may stem from a low perceived personal relevance of natural or environmental risks.

Overall, the findings indicate that exposure to risk communication is largely reactive, if not intentionally frequent. Information tends to emerge primarily when it enters the media agenda, rather than through respondents' active engagement. This implies that risk communication remains closely tied to emergencies or moments of heightened attention. Once again, actors involved in disseminating risk-related information are required to envision opportunities for everyday encounters and practical forms of translation, such as informational panels placed outside supermarkets, as noted by one of the interviewed stakeholders.

Table 10. News exposure or avoidance (natural and environmental risks)

Statement	Frequency	Percentage	Cumulative percentage
I actively seek information on natural and environmental risks several times a day	66	4.1	4.1
I follow news about natural and environmental risks every day	275	17.0	21.1
I follow news about natural and environmental risks from time to time	969	59.9	81.0
I am not particularly interested in news about natural and environmental risks	172	10.6	91.6

I try to avoid news about natural and environmental risks	37	2.3	93.9
I actively avoid all news about natural and environmental risks	17	1.1	94.9
I don't know	82	5.1	100.0
Total	1,618	100.0	

Figure 27. News exposure or avoidance (natural and environmental risks)
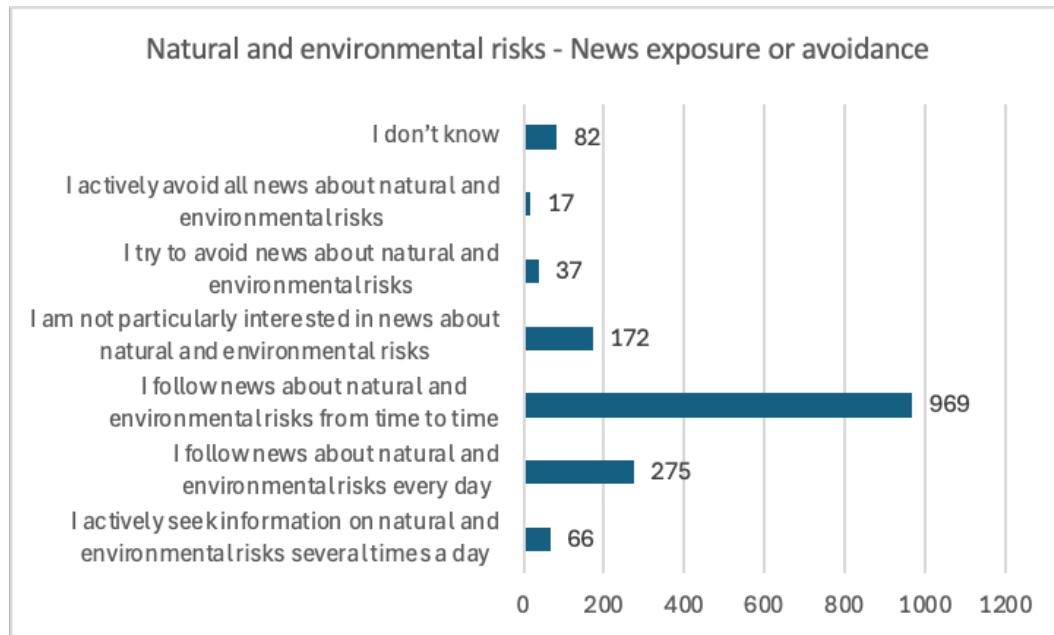
Similarly, respondents were asked about the frequency of, or avoidance of, exposure to news about climate change (Table 11, Figure 18) (*Which of the following statements best describes how you approach information on climate change?*). Overall, the results are almost identical to those observed for the previous question: also in the case of climate change, an "from time to time" approach clearly prevails, selected by 63% of respondents. More intensive or regular forms of consultation remain marginal: 3.5% of the sample report being active several times a day in following climate-related news, while 16.3% report paying attention to such information daily. Overall, this confirms a predominantly intermittent and reactive pattern of attention.

Compared to responses concerning natural risks, a small but potentially relevant difference emerges. The proportion of respondents who report not being particularly interested in climate change is slightly lower (9.7%) than that observed for natural risks (10.6%). At the same time, the share of respondents who actively avoid news about climate change is slightly higher (4% of the sample, compared to 3.4% for natural risks). This suggests that climate change may more readily trigger avoidance dynamics, potentially linked to perceptions of saturation or rejection.
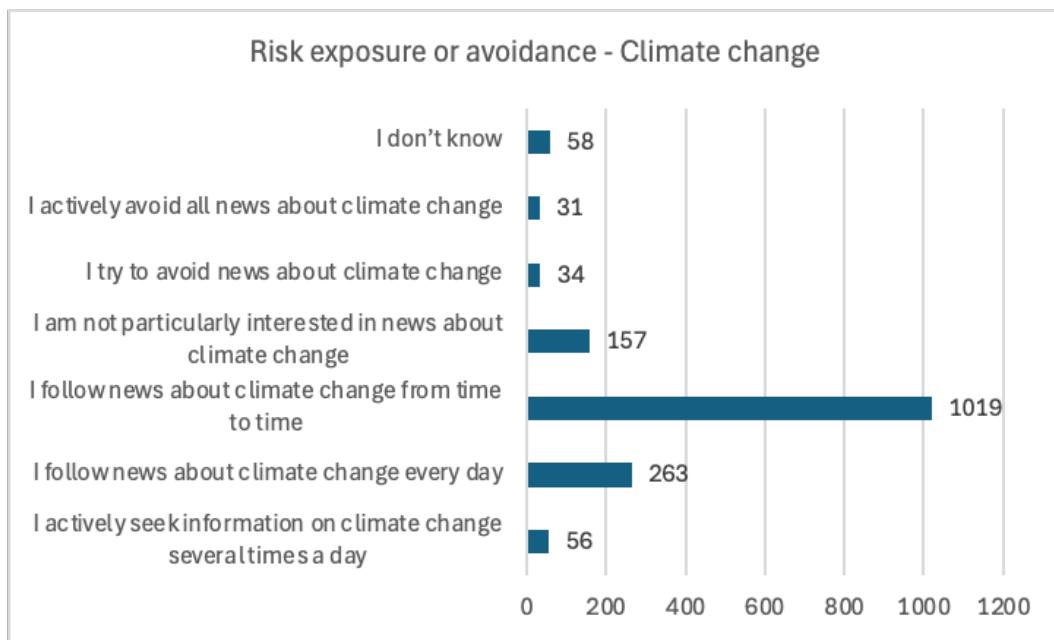
Moreover, climate change is increasingly recognized as an issue. Compared with the same question on natural and environmental risks, the proportion of respondents who report being unable to answer decreases (3.6% for climate change, compared with 5.1% for natural risks). This may indicate greater recognition of the issue or a higher capacity to identify the "climate change" frame in news content.

In conclusion, climate change reinforces a pattern of intermittent engagement among respondents. Compared to natural risks, the topic seems to attract a slightly higher level of attention, but, at the same time, appears more exposed to mechanisms of news avoidance. As in the previous case, the circulation of information about climate change remains strongly tied to the media agenda and is rarely incorporated into everyday information practices.

Table 11. News exposure or avoidance (climate change)

Statement	Frequency	Percentage	Cumulative percentage
I actively seek information on climate change several times a day	56	3.5	3.5
I follow news about climate change every day	263	16.3	19.7
I follow news about climate change from time to time	1,019	63.0	82.7
I am not particularly interested in news about climate change	157	9.7	92.4
I try to avoid news about climate change	34	2.1	94.5
I actively avoid all news about climate change	31	1.9	96.4
I don't know	58	3.6	100.0
Total	**1,618**	**100.0**	

Figure 18. Risk exposure or avoidance (climate change)

Risk exposure or avoidance - Climate change

- I don't know: 58
- I actively avoid all news about climate change: 31
- I try to avoid news about climate change: 34
- I am not particularly interested in news about climate change: 157
- I follow news about climate change from time to time: 1019
- I follow news about climate change every day: 263
- I actively seek information on climate change several times a day: 56

In preparation for the section on sources, we investigated whether respondents relied on "non-traditional" sources, such as influencers and content creators. Consistent with findings from the qualitative interviews with students, these actors do not appear to play a central role in respondents' information pathways.

A substantial share of respondents report not following any sources, such as content creators and influencers (445 respondents, 27.5% of the total). An additional 893 respondents (55.2% of the sample) report not following influencers or content creators who specialize in risk communication. A smaller but noteworthy group of respondents, 56 individuals, corresponding to 3.5% of the sample, are unable to provide an answer to this question, indicating areas of uncertainty surrounding these figures. Finally, 224 respondents (13.8% of the total) report following this type of source.

Among the most frequently mentioned names are the science communication platform *Geopop*, the geologist Mario Tozzi, and Greta Thunberg.

Table 12. Use of non traditional sources for risk communication

Use of influencers/content creators	Frequency (N)	Percentage (%)
Does not follow influencers or content creators at all	445	27.5
Does not follow influencers or content creators focused on risk communication	893	55.2
Follows influencers or content creators dealing with risk communication	224	13.8
Does not know / cannot answer	56	3.5
Total	**1,618**	**100.0**

8.5 Searching for trustworthy sources

In this section, we further explore the role of sources in risk communication. As a first step, respondents were asked which sources they would consult to obtain information on natural and environmental risks. Respondents could indicate up to three ranked choices. The results, presented in Table 13, are significant and, as discussed, reinforce the findings from the experimental design.

Looking at sources indicated as first preferences, a rather clear hierarchy emerges. Scientific institutions, universities, and research centers represent the dominant source (38.9%). They are followed, at a considerable distance, by friends and family (12.5%), highlighting the importance of personal networks for immediate alerting; Civil Protection (8.8%); journalists and media professionals (6.8%); and national and local public institutions (approximately 6% each). This pattern indicates that, when approaching natural and environmental risks, respondents prioritize sources perceived as competent and non-political, as also suggested by the positioning of institutional sources in the strict sense.

Civil Protection, however, becomes more prominent in secondary and tertiary positions: 11.9% of respondents indicate it as their second preference, and 18.0% as their third preference, corresponding to 292 respondents—the highest absolute value for that rank. This suggests that Civil Protection is not always the first choice or the most "top-of-mind" source in risk communication, but it is consistently present within respondents' information repertoires as an institutional reference to be consulted in combination with other sources. As will be further discussed in the analysis of the survey design, this pattern is coherent with the experimental results: Civil Protection is perceived as a credible and competent source, but not necessarily the primary trigger for information seeking.

Journalistic information plays a complementary rather than a central role. Journalists and media professionals are the first preference for 6.8% of respondents, and their share increases to 14.8% when second preferences are considered. Online information sources, such as blogs and podcasts, account for 5.8% of first preferences and 9.8% of second preferences. Media—and the professionals who produce them—do not disappear from respondents' information practices; rather, they function as nodes for further elaboration or confirmation of information obtained from other sources. This reinforces the idea of a composite information need, in which multiple sources are required to assess the validity of content. This aspect may also indicate a search for trusted sources, particularly given the relatively marginal role of institutional sources as primary references.

Public institutions, especially at the local level, have a significant presence, although their percentages are not always high. Local institutions are the first preference for 6.2% of respondents, the second preference for 11.7%, and the third preference for 10.8%. National institutions are selected as the first choice by 6.1% of respondents, as the second choice by 11.4%, and as the third choice by 9.6%. Institutions, therefore, are not always the primary source, but become increasingly relevant in subsequent choices, with a slight preference for territorially embedded sources. In this sense, informational localization matters more as a form of confirmation and potential coordination than as a primary activator of information seeking.

Finally, the data confirm what has already emerged elsewhere in the study: influencers and content creators, as well as individuals followed on social media, play a marginal role. This suggests that respondents prioritize sources based on perceived competence rather than visibility or popularity, consistent with evidence from the qualitative interviews.

Table 13. Sources consulted for information on natural and environmental risks. (Respondents could select up to three sources, ranked by preference)

Source	First preference (N)	First preference (%)	Second preference (N)	Second preference (%)	Third preference (N)	Third preference (%)
Friends and family	202	12.5	50	3.1	36	2.2
Voluntary associations	67	4.1	46	2.8	26	1.6
Scientific institutions, universities and research centers	629	38.9	195	12.1	75	4.6
Online information sources (including blogs and podcasts)	90	5.6	159	9.8	57	3.5
Journalists and media professionals	110	6.8	240	14.8	98	6.1
Influencers or content creators	2	0.1	20	1.2	36	2.2
National public institutions and authorities (Prime Minister's Office, Ministries)	98	6.1	184	11.4	155	9.6

Local public institutions and authorities (Prefecture, Region, Municipality)	100	6.2	190	11.7	175	10.8
People, groups, or friends followed on social media	8	0.5	17	1.1	20	1.2
Civil Protection	143	8.8	192	11.9	292	18.0
Scientists and science communicators	66	4.1	96	5.9	123	7.6
Press (including online press)	14	0.9	39	2.4	55	3.4
National TV and radio	57	3.5	50	3.1	104	6.4
Local TV and radio	11	0.7	40	2.5	47	2.9
Firefighters and/or police forces	14	0.9	22	1.4	56	3.5
YouTube or other video platforms	7	0.4	6	0.4	17	1.1
Total	**1,618**	**100.0**	**1,546**	**95.6**	**1,372**	**84.8**

Note: Percentages are calculated on the total sample (N = 1,618). Respondents could select up to three sources.

These findings are further corroborated by the in-depth analysis of trust, presented in Table 14. Respondents were asked to indicate the extent of their trust in different sources using a scale from 0 (not at all) to 5 (very much). The results confirm the patterns observed earlier and partially inform the findings of the experimental design.

Scientific and technical expertise attracts high levels of trust among a substantial share of respondents. Scientific institutions, universities, and research centers account for 74.9% of respondents in categories 4 and 5, and similarly high levels of trust are attributed to scientists and science communicators, Civil Protection, and firefighters and/or police forces. These sources generate trust in a widespread and relatively unambiguous manner, with a strong concentration around the highest values (5). This reinforces the idea of competence as the primary driver of trust in risk-related information.

Despite their fluctuating centrality within information pathways, public institutions are generally trusted, particularly at the local level. Local public institutions record slightly more than half of respondents clustered around values 4 and 5 (58%), whereas national institutions record 50% of respondents at the same levels. Public institutions, therefore, are not rejected; however, they elicit lower levels of trust than technical sources. These results also confirm a slight advantage for locally embedded institutions.

Media sources occupy an intermediate position, pointing to an ambivalent role that aligns with broader evidence of potential distrust in the information system. Both traditional journalism and online information sources show more dispersed distributions around intermediate values, indicating a form of conditional trust. Social media, influencers, and content creators, by contrast, exhibit structurally low levels of trust, suggesting a potential rejection of visibility-driven logics within risk communication.

Table 14. Trust in information provided by different sources (0 = Not at all; 5 = Very much), N = 1,618

Source	0	1	2	3	4	5	Total
Friends and family	95	214	404	542	273	90	1,618
Voluntary associations	59	135	365	638	337	84	1,618
Scientific institutions, universities and research centers	22	21	103	261	593	618	1,618
Online information sources (including blogs and podcasts)	93	172	404	592	287	70	1,618
Journalists and media professionals	86	108	256	581	470	117	1,618
Influencers or content creators	535	324	364	267	102	26	1,618
National public institutions and authorities	71	75	214	450	525	283	1,618
Local public institutions and authorities	41	57	164	392	592	372	1,618
People, groups, or friends followed on social media	281	314	436	414	140	33	1,618
Civil Protection	15	31	108	305	580	579	1,618
Scientists and science communicators	30	35	101	299	584	569	1,618
Press (including online press)	102	115	303	615	388	95	1,618
National TV and radio	78	114	240	568	475	143	1,618
Local TV and radio	80	118	264	577	432	147	1,618
Firefighters and/or police forces	21	23	84	286	603	601	1,618
YouTube or other video platforms	251	275	438	453	165	36	1,618

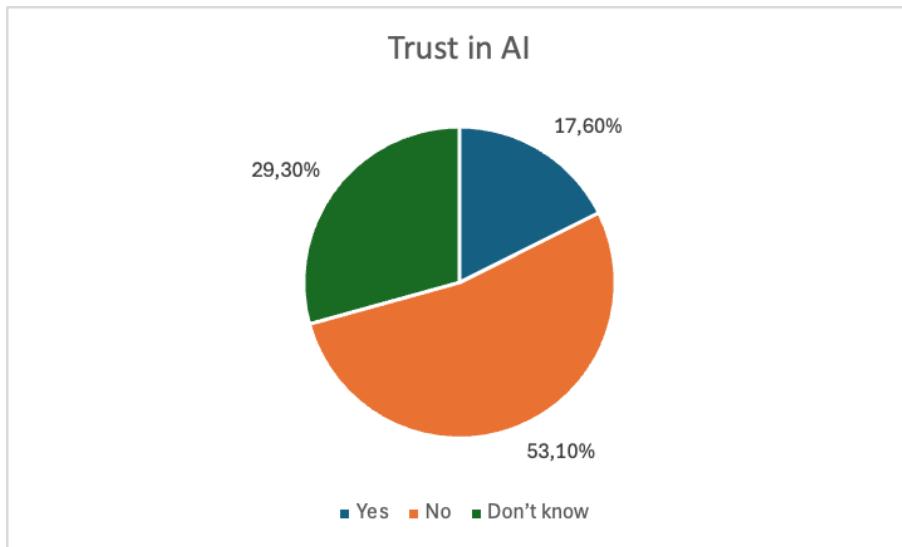## 8.6 Artificial intelligence in risk communication

Respondents were asked whether they would use generative artificial intelligence to re-modulate risk communication messages. Specifically, they were asked whether they would trust a risk communication

content that had been reworked by an artificial intelligence system. More than half of the respondents (53.1%) stated that they would not trust such content. A smaller share (17.6%) reported that they would trust such an intervention, whereas a substantial proportion (29.3%) indicated that they did not know how to respond. This latter finding points to a marked ambivalence toward artificial intelligence, which appears to be an object not yet clearly defined in terms of public understanding or its practical implications for risk communication.

Table 15. Trust in AI

Would you trust a risk communication content that had been reworked by an artificial intelligence system?		
Options	Frequency	%
Yes	285	17,6
No	859	53,1
Don't know	474	29,3
Total	1618	100,0

Figure 19. Trust in AI

In line with these findings, respondents express a strong expectation of transparency regarding the use of artificial intelligence in risk communication. A large majority (1,150 respondents, 71.1%) believe that the use of AI should always be disclosed, regardless of the actor employing it. In addition, a substantial share of respondents (240, 15.2%) consider disclosure to be necessary whenever AI is used by agencies or institutions responsible for risk communication.

Also in this case, a portion of respondents (9.6%) report that they do not know how to answer the question. This uncertainty appears to reflect a still underdeveloped understanding of artificial intelligence

rather than an evaluative stance. Finally, only a small minority (67 respondents, 4.1% of the sample) state that they would not require any disclosure of AI use.

8.7 Framing and sources: experimental results

In this section, we summarize the main findings of the experimental study. The table below presents the distribution of respondents across the different experimental stimuli. Participants were asked to carefully examine the stimulus and then answer a set of questions. As anticipated, the question battery was identical across all stimuli, allowing us to assess potential variations in responses attributable to differences in the experimental conditions.

Table 16. Respondents and stimuli

Group	Stimulus	N
A	Civil Protection – Loss	405
B	Mayor – Loss	406
C	Civil Protection – Gain	409
D	Mayor – Gain	398

First, respondents were asked to evaluate the credibility of the proposed message (Table 17, Figure 20). Across all four conditions, the lowest response categories, corresponding to a complete lack of credibility, were rarely selected. Most responses cluster between three and five, with a clear peak at value four across all groups. This indicates that, overall, the messages are perceived as credible regardless of source or framing. No message configuration appears to be rejected by the public.

With regard to the effect of the source, Civil Protection enjoys a high and relatively stable level of credibility, with similar proportions of high-credibility ratings under both loss and gain framing. By contrast, the Mayor is consistently perceived as less credible than Civil Protection across both framing conditions. This finding reinforces an interpretation that had already partially emerged from the qualitative interviews, namely, that message credibility is also linked to the source's perceived competence. In this respect, the difference between gain and loss framing is narrower than the difference between the two sources, suggesting that who speaks matters more than how the message is framed, at least with respect to perceived credibility. Accordingly, framing effects can be considered secondary to source effects.

The zone of neutrality, corresponding to the midpoint of the scale (value 3), is particularly informative, as it displays distinct patterns: Mayor/Loss (112 respondents); Mayor/Gain (97 respondents); Civil Protection/Loss (85 respondents); Civil Protection/Gain (90 respondents). This suggests that messages attributed to the Mayor tend to elicit greater indecision or neutrality, whereas messages attributed to Civil Protection are more likely to shift evaluations toward more positive credibility assessments.

In sum, the messages are generally regarded as credible, but not to the same extent. The source emerges as the primary discriminating factor, with Civil Protection being systematically perceived as more credible than the Mayor. Framing (gain vs. loss) slightly modulates credibility, but to a much lesser extent than the source does. Messages attributed to the Mayor thus appear to have a less consolidated credibility profile, resulting in a greater concentration of neutral evaluations.

Table 17. Credibility score

Credibility score	Civil Protection – Loss	Mayor – Loss	Civil Protection – Gain	Mayor – Gain
0	1.7%	3.9%	2.0%	5.3%
1	4.4%	3.7%	2.7%	6.5%
2	8.9%	13.1%	6.1%	8.5%
3	21.0%	27.6%	22.0%	24.4%
4	35.1%	30.5%	40.1%	32.4%
5	28.9%	21.2%	27.1%	22.9%
Total	**100%**	**100%**	**100%**	**100%**

Figure 20. Credibility score
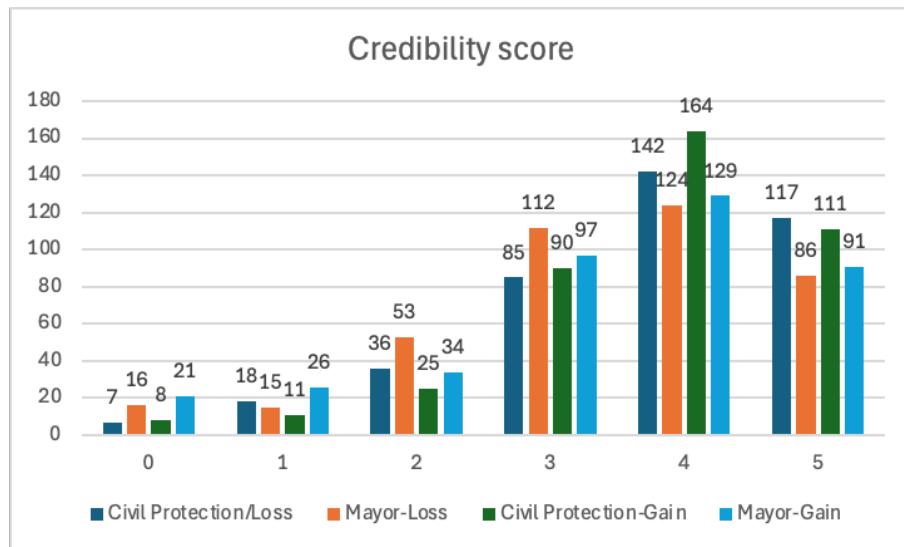
Within the domain of emotional responses, respondents were asked to indicate how concerned they felt after reading the message (*concern score*). The overall pattern indicates a moderate, non-polarized level of concern (Table 18, Figure 21). On the 0–5 scale, the general distribution of responses indicates that values indicating little or no concern—such as 0 and 1—are not marginal. Responses also cluster around the mid-point of the scale. Scores expressing maximum concern are present but not dominant. Taken together, these patterns indicate that the messages do elicit concern, but not in an excessive or alarmist manner.

115

Unlike previously discussed dimensions, such as credibility, message framing appears to play a more substantial role in shaping concern. In the Civil Protection/Loss condition, the higher levels of concern—corresponding to scores of four and five—were selected by 162 respondents, compared to 171 respondents in the Mayor/Loss condition. Across both sources, loss-framed messages are associated with higher levels of concern, whereas gain-framed messages tend to reduce concern, particularly when the source is Civil Protection. Indeed, scores of 4 and 5 in the Civil Protection/Gain condition were selected by 115 respondents, whereas the same levels in the Mayor/Gain condition were selected by 156 respondents.

The effect of the source, therefore, remains nuanced but cannot be considered negligible. Messages attributed to the Mayor generate relatively few responses at the lowest levels of concern, but also a substantial share at the highest levels. By contrast, Civil Protection appears to exert a more "reassuring" effect, with a sizeable proportion of respondents clustering around the intermediate value. In particular, the Civil Protection/Gain condition tends to foster moderate levels of concern.

From a risk communication perspective, this finding suggests a potentially effective practice: combining a technical source with a reassuring message, as shown. Consistent with the traditional literature on emotional responses in risk communication, loss framing tends to increase concern, whereas gain framing, particularly when conveyed by Civil Protection, is associated with a more moderate emotional response.

Table 18. Concern score

Concern score	Civil Protection – Loss	Mayor – Loss	Civil Protection – Gain	Mayor – Gain
0	10.1%	6.2%	9.8%	9.0%
1	8.1%	8.1%	5.9%	10.1%
2	14.8%	16.5%	19.3%	14.8%
3	26.9%	27.1%	36.9%	26.9%
4	24.7%	25.6%	17.4%	24.9%
5	15.3%	16.5%	10.8%	14.3%
Total	**100%**	**100%**	**100%**	**100%**

Figure 21. Concern score

Figure 22. Concern score
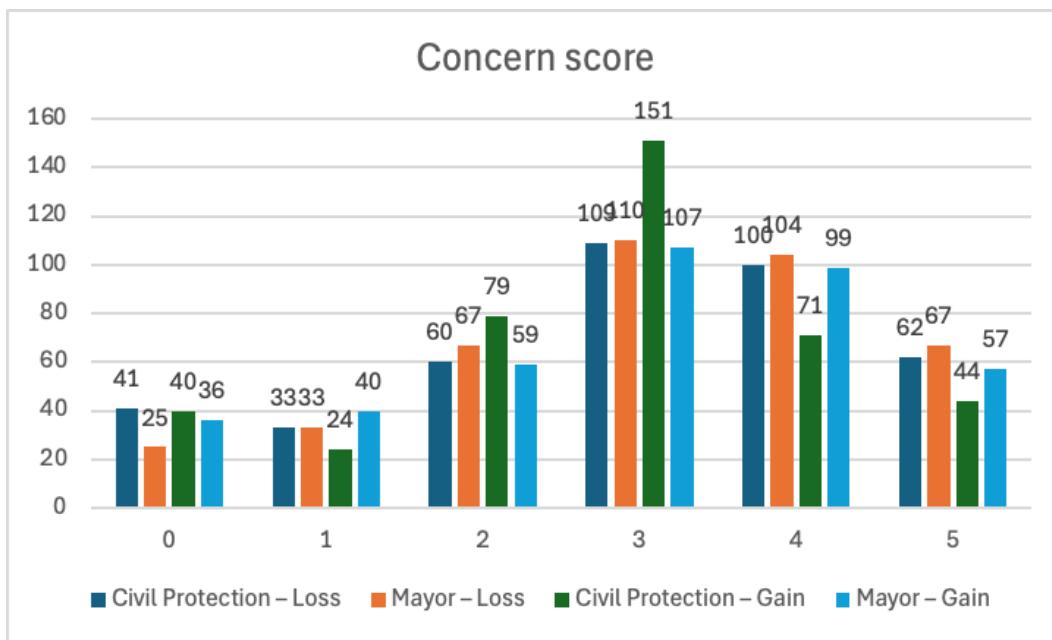
To further explore emotional responses, we also examined anxiety elicited by the message, a more intense affective reaction that is often associated with risk overload or alarmist communication. As shown in Table 19 and Figure 22, anxiety levels are overall lower and more regulated than concern. Scores of 0 and 1, indicating no or minimal anxiety, are well represented across all experimental conditions. The distribution is primarily concentrated in the lower–middle range of the scale (2–3), whereas the highest values (4–5) are present but not dominant.

When compared with concern-related results, these findings suggest that the messages activate an emotional dimension without eliciting elevated or excessive anxiety. In this case, loss framing also tends to increase emotional activation, although to a lesser extent than concern framing.

With regard to source effects, a pattern consistent with previous findings emerges: Civil Protection appears to mitigate emotional intensity, whereas messages attributed to the Mayor tend to elicit a higher proportion of elevated anxiety responses and, more generally, a more dispersed distribution.

Taken cumulatively, credibility is primarily driven by the source, concern is more sensitive to framing, and anxiety remains overall contained and is further mitigated when the source is technical. These insights offer implications for risk communication, suggesting that effective messages should attract attention while avoiding excessive anxiety.

Table 19. Anxiety score

Anxiety score	Civil Protection – Loss	Mayor – Loss	Civil Protection – Gain	Mayor – Gain
0	13.8%	11.3%	13.2%	13.8%
1	10.9%	9.4%	11.7%	10.8%

2	17.8%	19.0%	20.8%	17.6%
3	24.4%	23.2%	27.6%	25.1%
4	20.0%	22.4%	18.1%	20.1%
5	13.1%	14.8%	8.6%	12.6%
Total	**100%**	**100%**	**100%**	**100%**

Figure 22. Anxiety score
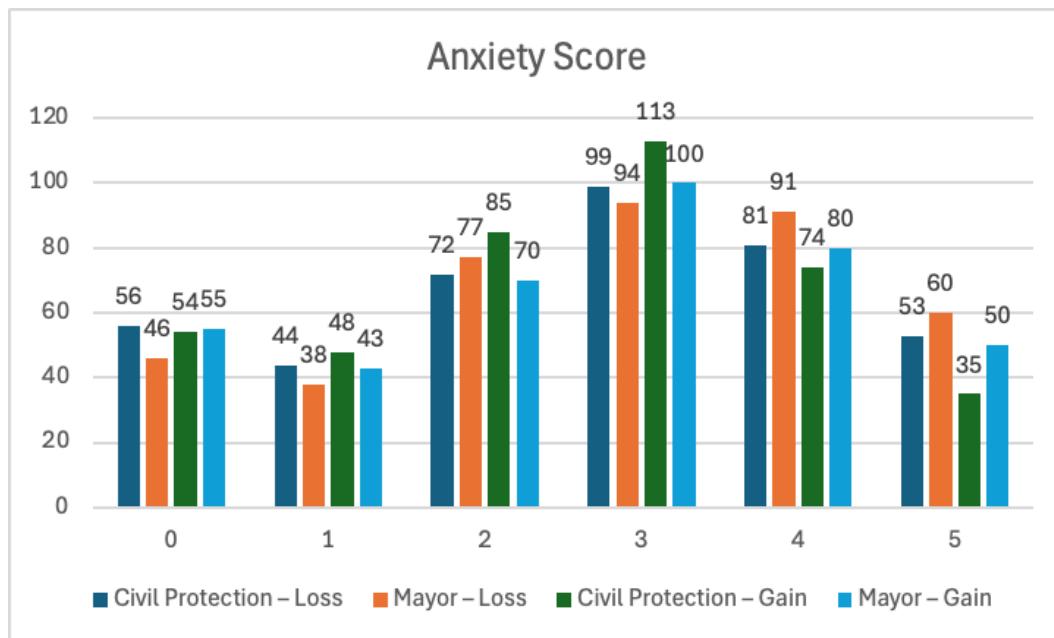
More clearly defined patterns emerge when respondents are asked about the trust elicited by the messages. Table 20 and Figure 23 make these patterns visually explicit.

Overall, trust levels are high, though not uniform. High scores (from 3 upward) are dominant across conditions, while low scores (0–1) are generally marginal, with one notable and meaningful exception: the Mayor–Gain condition. This suggests that the messages can potentially generate trust, but that this effect is strongly shaped by the interaction between source and framing. Unlike previously analyzed variables, the effect of the source is particularly evident in this case.

Messages attributed to Civil Protection display a very high concentration of trust scores between 3 and 5, regardless of the framing adopted (346 respondents out of 409 in the gain frame; 313 out of 405 in the loss frame). This confirms a generally high level of trust in Civil Protection, which is further reinforced, consistent with earlier findings, by gain framing.

By contrast, messages attributed to the Mayor tend to cluster around more central positions, with a large share of responses concentrated at value 3. At the same time, the Mayor–Gain condition represents a critical outlier: low trust scores (0–1) are particularly prominent (98 respondents out of 398), while high

trust evaluations are less frequent than in the other conditions. In this case, unlike in Civil Protection, gain framing does not enhance trust in the source; rather, it appears to erode it.

Consequently, the effect of framing on trust is closely linked to the source. Whereas framing played a secondary role in shaping credibility, a more substantial role in driving concern, and a mitigated role in the case of anxiety, in the case of trust, the impact of framing operates in conjunction with the source. Gain framing strengthens trust when the source is perceived as legitimate—for instance, because it is endowed with technical expertise or is not politicized, as in the case of Civil Protection—while it undermines trust when the source is political or perceived as insufficiently competent, as plausibly occurs in the case of the Mayor.

These dynamics will be further explored in the following sections. Overall, the findings indicate that the source is the primary driver of trust and that framing is not neutral: it is effective when it aligns with the source's role, but it can be counterproductive when perceived as inauthentic.

Table 20. Trust score

Trust score	Civil Protection – Loss	Mayor – Loss	Civil Protection – Gain	Mayor – Gain
0	5.2%	7.6%	2.0%	13.8%
1	6.2%	4.9%	3.4%	10.8%
2	11.4%	15.8%	10.0%	17.6%
3	30.4%	31.5%	35.9%	25.1%
4	30.9%	26.8%	32.8%	20.1%
5	16.0%	13.3%	15.9%	12.6%
Total	**100%**	**100%**	**100%**	**100%**

Figure 23. Trust score
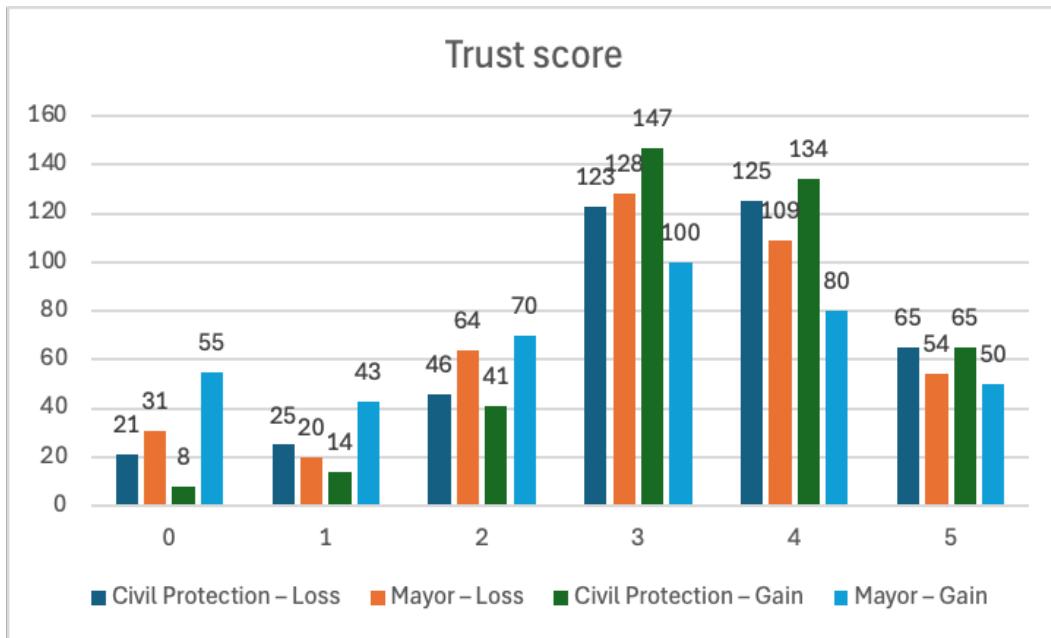
The data emerging from the direct question on how reliable respondents consider the source of the message confirm the previously outlined scenario, highlighting a strong source effect (Table 21, Figure 24). Overall, perceived reliability is high, although there is some variation across sources. Across all experimental conditions, medium-to-high evaluations (3–5) predominate, whereas low scores (0–1) remain marginal, with notable exceptions for the figure of the Mayor. The reliability of institutional sources is therefore broadly recognized, although not evenly distributed. Table X and Figure Y illustrate this distribution.

A clear confirmation of the source effect thus emerges. Civil Protection displays a very high reliability profile, with scores between 3 and 5 accounting for 79.2% of responses under loss framing and 87.5% under gain framing. This indicates a level of reliability that is not only high but also structurally grounded. When considered alongside the findings discussed above, these results suggest that Civil Protection is particularly well-suited to disseminating instructional messages that can also be interpreted as reassuring, particularly under gain framing.

By contrast, the Mayor's reliability remains at medium-to-high levels but is consistently lower than that of Civil Protection. Scores between 3 and 5 account for 74.9% of responses under loss framing and 76.4% under gain framing. The effect of framing, therefore, appears secondary but remains visible: gain framing markedly reinforces the perceived reliability of Civil Protection, whereas it produces a more limited effect for the Mayor. No discrepancies emerge with respect to earlier findings: framing does not modify or polarize judgments about the source; rather, it amplifies existing tendencies. In other words, perceptions of the source exert a stronger influence than the message itself.

Table 21. Perceived reliability of the source

Reliability score	Civil Protection – Loss	Mayor – Loss	Civil Protection – Gain	Mayor – Gain
0	4.0%	7.9%	2.2%	6.3%
1	5.7%	5.4%	3.4%	6.8%
2	11.1%	11.8%	6.8%	10.6%
3	26.4%	27.1%	30.3%	26.4%
4	26.9%	30.3%	31.3%	29.6%
5	25.9%	17.5%	25.9%	20.4%
Total	**100%**	**100%**	**100%**	**100%**

Figure 24. Reliability score
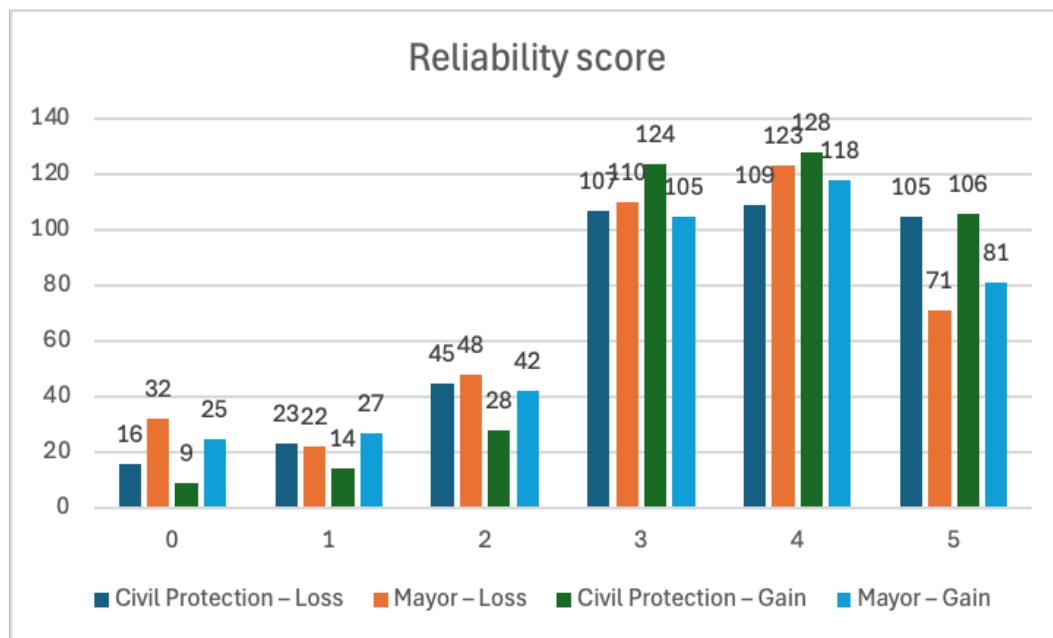
These findings are further reinforced by responses regarding the source's perceived competence. In this case, evaluations are predominantly in the medium-to-high range, whereas low evaluations remain marginal, albeit more frequent for the Mayor. Perceived competence, therefore, tends to generate clearer and less ambiguous attributions, fostering more sharply defined positions compared to other dimensions examined.

Here, the effect of the source is maximized. Aggregated medium-to-high scores (3–5), reported in detail in Table 22 and Figure 25, point to a very high perception of competence for Civil Protection, which accounts for 77.0% of responses under loss framing and 84.6% under gain framing. Civil Protection thus displays a particularly high level of perceived competence, with a slight reinforcement under gain framing.

Competence appears to be "fully" recognized, as the majority of evaluations cluster around the highest scores (4 and 5), rather than the intermediate value of 3.

With regard to the Mayor, although evaluations also predominantly fall within the medium-to-high range, the percentages indicate a lower overall level of perceived competence than for Civil Protection. Under loss framing, 72.4% of respondents report scores between 3 and 5, whereas under gain framing, this share rises to 72.6%, indicating only a minimal shift attributable to message presentation. In this case, a more positive and reassuring frame does not strengthen a competence perceived as fragile.

Particularly noteworthy is the distribution of low scores (0–1), which indicates a perception of null or low competence. For Civil Protection, these values remain marginal (8.7% under loss framing; 5.4% under gain framing), suggesting that the source retains technical legitimacy even when adopting more negative frames. A different pattern emerges for the Mayor, who records higher percentages in the 0–1 range (13.1% under gain framing; 12.8% under loss framing), confirming the doubts observed across all dimensions regarding perceived competence.

Once again, the role of framing appears secondary. Gain framing reinforces perceived competence when applied by Civil Protection, whereas it has a negligible effect on the Mayor and may even be detrimental when associated with a source perceived as political or driven by personal visibility. Overall, message effectiveness, also in terms of trust, appears to be more strongly anchored in perceptions of source competence than in the framing strategies adopted.

Table 22. Competence score

Competence score	Civil Protection – Loss	Mayor – Loss	Civil Protection – Gain	Mayor – Gain
0	3.0%	6.9%	2.2%	5.8%
1	5.7%	5.9%	3.2%	7.3%
2	14.3%	14.8%	10.0%	14.3%
3	21.0%	29.8%	25.4%	29.6%
4	28.1%	27.3%	33.5%	26.4%
5	27.9%	15.3%	25.7%	16.6%
Total	**100%**	**100%**	**100%**	**100%**

Figure 25. Competence score
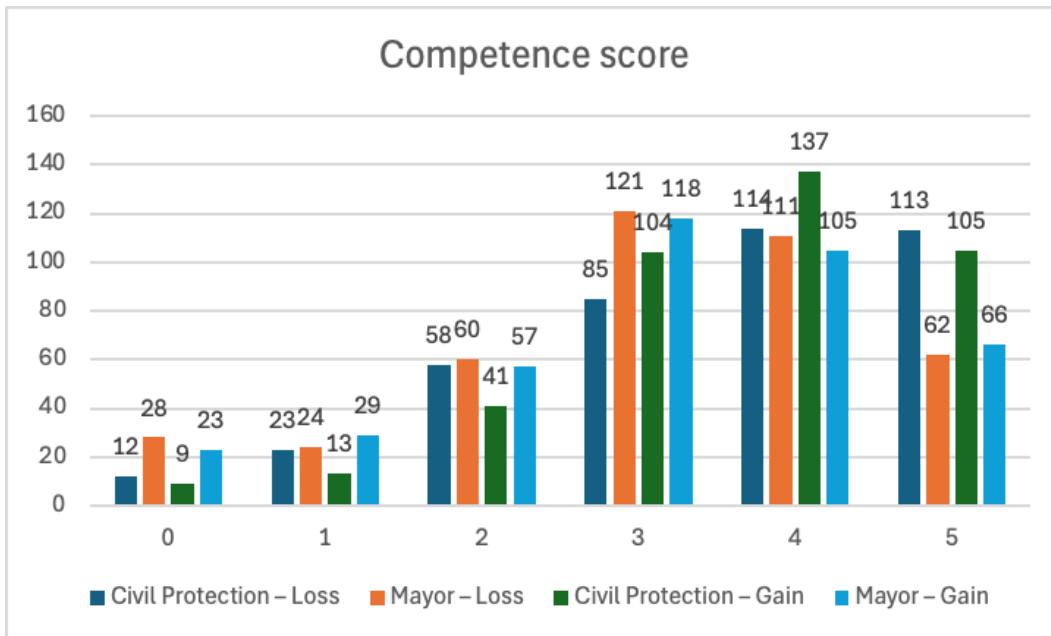
Finally, we conclude the discussion of this selected set of results by examining protective behaviors, focusing on the motivation to act elicited by the disseminated messages.

Overall, the findings indicate a stable, non-polarized motivation to act. As shown in Table 23 and Figure 26, across all conditions, scores between 3 and 5 are prevalent, while scores between 0 and 1 remain marginal. The distribution, however, is more strongly concentrated around scores 3 and 4 rather than at the maximum value of 5. This pattern can be partially explained by the broader survey results, which indicate relatively low concern about territorial risks and moderate exposure to risk-related information. Under these conditions, risk does not emerge as a highly salient issue, limiting the extent to which respondents envision concrete actions. Nonetheless, the messages do activate motivation to act, albeit in a contained and non-extreme manner: the "coercive" power of risk communication remains marginal.

Civil Protection is effective without generating either peaks of motivation or disengagement. Under both framing conditions, responses cluster primarily around scores 3 and 4, with a slightly higher concentration at score 5 in the loss frame. These findings confirm that Civil Protection motivates action in a stable and coherent way. Messages disseminated by this institution are generally not rejected by audiences, maintaining an activating yet regulated profile, without triggering anxious or avoidant emotional dispositions.

By contrast, responses related to the Mayor show greater dispersion across both framing conditions. A larger share of respondents position themselves at score 2 and at the intermediate value of 3, while fewer responses are concentrated at the highest scores. The Mayor does, undeniably, motivate action; however, this motivation appears more uncertain, less structurally grounded, and characterized by greater oscillation across frames.

In sum, no single "winning" frame can be identified in this case. Framing does not overturn motivation to act and, once again, proves effective only when supported by a credible source. It is worth noting that, when focusing on maximum motivation to act in combination with loss framing, the Civil Protection–loss condition records the highest percentage (22.2%), whereas the gain frame for Civil Protection is mainly associated with scores 3 and 4. This suggests that loss framing may, in some circumstances, push individuals toward action, but only when anxiety remains contained and the source is perceived as competent. Motivation to act, therefore, appears to be most effective when a source perceived as reliable is combined with a moderate level of emotional activation.

Table 23. Motivation to act

Motivation score	Civil Protection – Loss	Mayor – Loss	Civil Protection – Gain	Mayor – Gain
0	4.0%	5.9%	3.2%	4.5%
1	6.4%	4.7%	3.4%	5.5%
2	11.1%	15.5%	13.7%	14.3%
3	27.7%	23.2%	31.1%	27.9%
4	28.6%	32.8%	32.0%	28.9%
5	22.2%	18.0%	16.6%	18.8%
Total	**100%**	**100%**	**100%**	**100%**

Figure 26. Motivation to act
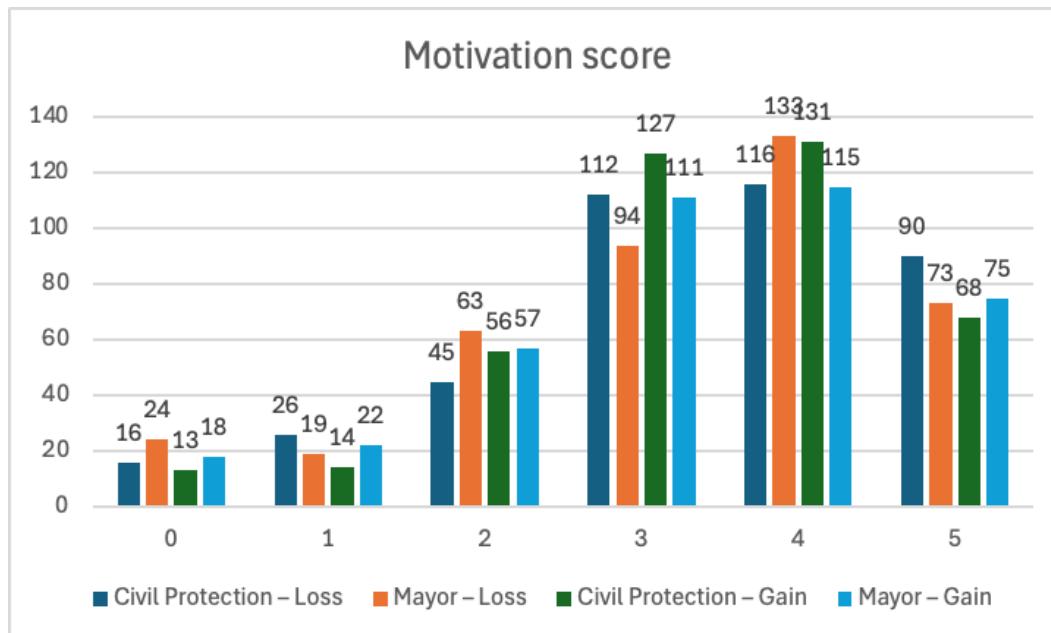
9. Take-home messages - Guidelines

Community-centred risk communication: priorities and operational directions for Italian institutions

The RETURN project aims to enhance knowledge of natural and environmental risks through an interdisciplinary and multi-risk approach. This knowledge must be communicated to citizens and stakeholders to strengthen community resilience. In a heterogeneous context such as Italy, characterised by fragmented institutional voices and by the coexistence of multiple risks affecting territories with varying intensity, communication plays a central role. Building trust is essential, especially in an era marked by informational cacophony, scepticism, and growing complexity.

In Italy, the value of risk communication is often undermined by the difficulty of imagining and implementing a multi-level strategy. Transparency and lack of information are not the core problem: on the contrary, in recent years, as also reported by the stakeholders involved in this research, an increasing number of public initiatives aimed at disseminating scientific and risk-related knowledge have emerged, signalling noteworthy forms of institutional openness.

However, risk communication is very often activated only in conjunction with emergencies. This limits its effectiveness and contributes to the construction of a weak and inconsistent imaginary, reducing expectations regarding the necessary continuity of risk communication during so-called "peacetime." Both the literature and the research conducted within the RETURN project highlight that, to improve preparedness and reduce social vulnerabilities, authorities should avoid transmissive, top-down approaches based solely on the transfer of information. Instead, it is preferable to cultivate relational trust in institutions, invest in participatory practices, and coordinate institutional voices, making communication an active component of governance processes.

Why redefining communication strategies matters

Risk communication takes place within a complex media system characterised by a growing number of information sources, online platforms that operate through algorithmic selection and shape visibility, and publics influenced by their understanding of uncertainty and by uneven levels of scientific literacy. Moreover, different communities display diverse informational habits and needs, which institutions are not always able to address adequately. In this context:

- **Trust** is not an outcome of risk communication, but an infrastructure necessary for its success.
- **Participation** is not an optional add-on, but a structural element in the creation of legitimacy and in fostering increasingly engaged and informed publics, aware of the transparency of decision-making processes.
- **Uncertainty** is not a condition to be concealed, but an element to be communicated clearly in order to enhance awareness and trust.

If these requirements are ignored, risk communication (and the sources that disseminate it) may be misinterpreted. Resistance and minimisation can jeopardise the credibility of risk communication, particularly in multi-risk contexts characterised by social and territorial fragilities and unequal access to information.

What could be improved?

The findings emerging from the qualitative research involving institutional actors, stakeholders, and citizens point to recurring critical issues:

- *Fragmented communicative roles*. Even during crises, citizens often risk being exposed to too many voices or failing to identify who is providing reliable and official information.
- *The assumption that technical language is sufficient*. "Scientific" messages are accurate but often remain difficult for non-expert audiences to understand.
- *Episodic communication*. Institutions and media tend to intensify communication when risks materialise or during emergencies, while failing to ensure a constant presence of natural and environmental risks in ordinary times.
- *Limited attention to heterogeneity and differences*. Age, education, linguistic background, and the multiple vulnerabilities that may intersect within a community are rarely taken into account. These aspects often disappear from official documents (such as Civil Protection Plans) in favour of necessary technical details.
- *Insufficient integration of participatory practices*. Citizen involvement is often envisaged only in the final stages, positioning people as recipients rather than active co-creators of risk communication.

What works

Interviews with experts and young university students highlight several aspects of risk communication that can be effectively leveraged:

- **Clear, concise, and repeated messages**. Familiarity with both the language and the codes of risk communication facilitates message retention.
- **Recognisable and accountable sources**. Qualitative data underline the importance of institutional sources, such as mayors and Civil Protection authorities.
- **Territorial adaptation**. Risk communication must be tailored to the profound territorial differences characterising Italy, reflecting local conditions, relying on existing communication infrastructures, and addressing diverse socio-cultural configurations, such as insularity.
- **Transparent management of uncertainty**. Explaining what is known about risks and what remains uncertain can increase trust.
- **An ethical approach to digital tools**. Some instruments, such as generative artificial intelligence, can facilitate message production, but they require contextualisation and human supervision.

Understanding risk perceptions

Survey data on risk perception provide actionable insights that can be directly incorporated into communication strategies:

- **Strengthen risk awareness**, including future risks, by leveraging territorial memory and *place-based narratives* that make risk tangible and locally grounded.
- **Adopt future-oriented narratives** that integrate the personal dimension, as these are particularly effective in enhancing awareness and perceived relevance of risks.
- **Acknowledge the role of emotions without generating anxiety**: concern can be a valuable lever when channelled into empathetic, action-oriented narratives rather than alarmist messaging.
- **Link risk to everyday lifestyles**: long-term processes such as climate change generate concern when translated into concrete impacts on daily life. Highlighting what can be done today and how individual actions shape future risks helps transform concern into preparedness.
- **Prioritise action over emotion**: practical content, such as short tutorials, *how-to* formats, and concrete actions, supports citizens in managing risks and strengthens their perceived preparedness.

Experimenting with Risk Communication

The results of the experimental section of the survey, which combined message source and framing, suggest several practical implications for risk communication:

- **The source matters—sometimes more than the message itself.** Across all the dimensions investigated (credibility, trust, reliability, competence), Civil Protection consistently outperforms the Mayor in respondents' evaluations. Risk communication should therefore rely on technical sources perceived as legitimate, especially when providing operational guidance.
- **Framing is not neutral, but it does not work on its own.** The findings show that framing must always be supported by the source and aligned with audience expectations. Gain framing tends to strengthen trust, reliability, and perceived competence when used by Civil Protection, whereas for the Mayor, it may, in some cases, undermine these evaluations. This indicates that there is no one-size-fits-all frame: framing choices should be made based on who is speaking, not only on what is being said.
- **Use with caution: the case of loss framing.** Loss framing increases concern and, in some cases, can enhance motivation to act. It does not generate excessive anxiety when the source is perceived as competent. This suggests that, in emergency contexts, loss framing may be useful, but only if conveyed by technical and credible sources and without drifting into alarmism.
- **Activate without frightening: what "good" risk communication looks like.** Exposure to the messages generated moderate but widespread concern, contained levels of anxiety across all conditions, and a distributed, non-polarized motivation to act. Effective risk communication should not generate fear, but rather foster a regulated and empathetic emotional activation that supports understanding and action.

- **The right formula.** The data show that motivation to act is higher when the source is perceived as competent, trust is high, and emotional activation remains moderate. To promote protective behaviors, communicators can follow the formula "credible sources + clarity + controlled emotionality," avoiding excessive or overstated messages.
- **Be cautious with political sources.** The Mayor may be perceived as a politicized source or as less competent when addressing natural or environmental risks. Compared with Civil Protection, the Mayor receives systematically lower evaluations of trust and competence, exhibits greater response dispersion, and is more adversely affected by framing. Political sources should therefore be accompanied by technical sources and avoid overly reassuring messages that may be perceived as self-referential or as downplaying risks. Rather than leading risk communication, political actors may more effectively amplify messages delivered by sources perceived as more credible.
- **Competence makes the difference.** Perceived competence reduces ambiguity, neutrality in evaluations, and distrust, and is less sensitive to framing-related fluctuations. Emphasizing competence—by clarifying roles, highlighting field experience, and maintaining a consistent communicative presence—is more effective than focusing on tone or framing alone.
- **Each actor in their proper role.** Separating roles and visibility can contribute to more effective risk communication. Technical sources should provide guidance, instructions, and reassurance, while political sources should signal support, coordination, and institutional legitimacy.

For institutions: key priorities

The empirical evidence supports the formulation of priorities for scalable and multi-level approaches to risk communication that can be adopted by institutions and by those responsible for communicating risks:

1. Coordinate institutional voices, investing in a central coordination unit that includes communication experts.
2. Normalise risk communication in ordinary times, through repeated messages and dedicated initiatives, and not only during crises or emergencies.
3. Segment the publics in order to disseminate messages aligned with generational, cultural, and territorial needs.
4. Translate technical content into messages with communicative appeal, including through narratives and infographics.
5. Educate about uncertainty through clear and transparent explanations.
6. Rethink participatory practices as continuous and structurally embedded in risk communication.
7. Supervise communication activities supported by digital tools.

Key takeaways

Risk communication is central to the development of responsive and informed communities. It should not be conceived as the final step in risk or emergency management, but rather as a shared-governance element involving citizens, institutions, and the scientific community. Investing in coordinated yet locally adapted, continuous, transparent, and diversity-aware communication constitutes a strategic asset in building strong communities and fostering collective resilience.

What to further explore (and borrow from RETURN)

The logic of survey-based research can support institutions in quantifying elusive dimensions such as trust, source preferences, and message evaluation. Evidence-based risk communication provides institutions with tools to design messages and campaigns that are genuinely community-centred. Communicating with citizens implies building relationships of trust: listening to them, involving them, and integrating their feedback can enhance transparency and institutional credibility.

References

Babič, A., Sinković, N. L., & Dolšek, M. (2023). A model for communication and management support of natural hazards risk. *International Journal of Disaster Risk Reduction*, *90*, 103672. doi.org/10.1016/j.ijdrr.2023.103672.

Barkemeyer, R., Figge, F., Hoepner, A., Holt, D., Kraak, J. M., & Yu, P. S. (2017). Media coverage of climate change: An international comparison. *Environment and Planning C: Politics and Space*, *35*(6), 1029-1054.

Bedford, T. (2013). Decision making for group risk reduction: Dealing with epistemic uncertainty. *Risk Analysis*, *33*(10), 1884-1898.

Bonaiuto, M. et al. (2023). Deliverable 7.5.1. Report on variables, processes and biases. https://www.fondazionereturn.it/wp-content/uploads/2025/05/Deliverable-7.5.1-Report-on-variables-processes-and-biases.pdf.

Brüggemann, M., & Engesser, S. (2017). Beyond false balance: How interpretive journalism shapes media coverage of climate change. *Global Environmental Change*, *42*, 58-67.

Buzzanell, P. M. (2010). Resilience: Talking, resisting, and imagining new normalcies into being. *Journal of Communication*, *60*(1), 1-14. doi.org/10.1111/j.1460-2466.2009.01469.x.

Canel, M., & Luoma-aho, V. (2019). *Public sector communication. Closing gaps between public sector organizations and citizens*. Hoboken, NJ: Wiley-Blackwell.

Camarda, I. (2021). Il fuoco, i boschi, gli olivi e l'oleastro del Montiferru. Introduzione a un disastro ambientale annunciato. In Camarda, I., & Vacca, S. (eds). *L'incendio del 2021 nel Montiferru, Planargia e oltre*. Sassari: Carlo Delfino Editore, 11-15.

Caporale, D., & Rinaldi, A. (2025). The application of analytical hierarchy process to assess adaptation strategies for flood and landslides risks: A case study of a multi-risk area community. *Environmental Science & Policy*, *163*, 103959.

Cerase, A. (2015). Quale idea della comunicazione del rischio? Tra teoria, prassi e assunti impliciti. In Armato, A., Cerase, A & Galatini, F. (eds), *Terremoti, comunicazione, diritto. Riflessioni sul processo alla "commissione grandi rischi".* Milano, FrancoAngeli, pp. 145-168.

Cerase, A. (2016) La comunicazione dei rischi in contesti di incertezza interpretativa. In Borsari, R. (ed.), *Processo alla Scienza*, PUP - PAdua University Press, Padua, 105-134.

Cerase, A. (2017). *Rischio e comunicazione. Teorie, modelli e problemi*. Milano: Egea.Castellano, S. (2023). Social media e culture (mediali) giovanili: le pratiche della Generazione Z tra narrazioni, rimediazioni e consumi mediali. *Immaginari e culture giovanili: percorsi di analisi e ricerca.-(Interstizi; 3)*, 107-122.

Cassell, J. (1988). The Relationship of Observer to Observed when Studying Up. *Studies in Qualitative Methodology,* 1: 89-108.Ciampi, M., & Finco, M. (2024). La generazione Z fra incertezza e contingenza. Una ricerca teorico-empirica. *Metis*, 1, 259-281.

Cisternas, P. C., Cifuentes, L. A., Bronfman, N. C., & Repetto, P. B. (2024). The influence of risk awareness and government trust on risk perception and preparedness for natural hazards. *Risk analysis*, *44*(2), 333-348. doi.org/10.1111/risa.14151.

Coombs, W. T. (2015). *Ongoing crisis communication: Planning, managing, and responding* (4th ed.). Thousand Oaks, CA: Sage.

Cole, J. M., & Murphy, B. L. (2014). Rural hazard risk communication and public education: Strategic and tactical best practices. *International journal of disaster risk reduction*, *10*, 292-304. doi.org/10.1016/j.ijdrr.2014.10.001.

Comunello, F. (ed) (2014). *Social media e comunicazione d'emergenz*a. Milano: Guerini & Associati.

Comunello, F., Rosales, A., Mulargia, S., Ieracitano, F., Belotti, F., & Fernández-Ardèvol, M. (2022). Youngsplaining and moralistic judgements: exploring ageism through the lens of digital media ideologies. *Ageing & Society*, *42*(4), 938-961.

Covello, V. T., Slovic, P., & Von Winterfeldt, D. (1986). Risk communication: A review of the literature. *Risk Abstract*, 3, 171-182.

Covello, V., & Sandman P.M. (2001). Risk communication: Evolution and Revolution. Solutions to an Environment in Peril. A. Wolbarst. Baltimore, John Hopkins University Press: 164-178.

D'Ambrosi, L., Radano, G., & Brescia, P. (2025). Una Capitale digitale. Ibridazioni e innovazioni nella comunicazione del Comune di Roma. *Comunicazione politica*, 1-24.

Davies, S. R. (2008). Constructing communication: Talking to scientists about talking to the public. *Science Communication*, 29(4), 413-434.

Delitala, A. (2021). Gli incendi in Sardegna e il legame col clima. In Camarda, I., Vacca, S. (eds), *L'incendio del 2021 nel Montiferru, Planargia e oltre*. Sassari: Carlo Delfino Editore, 48-54.

Diers-Lawson, A., & Meißner, F. (2021). Editor's Essay: Moving beyond Western Corporate Perspectives: On the Need to Increase the Diversity of Risk and Crisis Communication Research. J*ournal of International Crisis and Risk Communication Research*, 4(10), 165-176. https://doi.org/10.30658/jicrcr.4.1.6

Engdahl, E., & Lidskog, R. (2014). Risk, communication and trust: Towards an emotional understanding of trust. *Public understanding of science*, *23*(6), 703-717.

Fischhoff, B., & Davis, A. L. (2014). Communicating scientific uncertainty. *Proceedings of the National Academy of Sciences*, *111*(supplement_4), 13664-13671.

Friedman, S. M., Dunwoody, S., & Rogers, C. L. (2012). *Communicating uncertainty: Media coverage of new and controversial science*. Routledge.

Gaysynsky, A., Heley, K., & Chou, W. Y. S. (2022). An overview of innovative approaches to support timely and agile health communication research and practice. In*ternational Journal of Environmental Research and Public Health*, 19(22), 15073.

Gershon, I. (2010). Media ideologies: An introduction. *Journal of Linguistic Anthropology*, 20(2), 283-293.

Giritly Nygren, K., Fahlgren, S., & Giritly, S. (2024). Gender, intersectionality and disaster risk reduction. *Disasters*, 48(1), e12589.

Haer, T., Botzen, W. W., & Aerts, J. C. (2016). The effectiveness of flood risk communication strategies and the influence of social networks—Insights from an agent-based model. *Environmental Science & Policy*, *60*, 44-52.

Han, Z., Liu, J., & Wu, W. N. (2022). Trust and confidence in authorities, responsibility attribution, and natural hazards risk perception. *Risk, Hazards & Crisis in Public Policy*, *13*(3), 221-237.

Jamieson, D. (1996). Scientific uncertainty and the political process. *The Annals of the American Academy of Political and Social Science*, *545*(1), 35-43.

Khan, S., Mishra, J. L., Lin, K. H. E., & Doyle, E. E. (2017). Rethinking communication in risk interpretation and action. *Natural Hazards*, *88*(3), 1709-1726.

Knott, E., Rao, A.H., Summers, K., & Teeger C. (2022), Interviews in the social sciences. *Natural Reviews Methods Primers* 2, 73.doi.org/10.1038/s43586-022-00150-6.

La Rocca, G., & Lovari, A. (eds) (2024). *Comunicazione del rischio insulare. Prospettive in comunicazione, politiche pubbliche e analisi dei contesti*. Milano:FrancoAngeli.

Leiss, W. (1996). Three phases in the evolution of risk communication practice. *AAPSS Annals*, 545, 85-94

Markon, M. P. L., Crowe, J., & Lemyre, L. (2013). Examining uncertainties in government risk communication: citizens' expectations. *Health, Risk & Society*, *15*(4), 313-332.

Marrie, H. (2024). Ageism and Digital Media. *Journal of Media and Interdisciplinary Studies*, *3*(8), 75-99.

Massa, A., & Comunello, F. (2024a). La comunicazione del rischio "Made in Italy". Riflessioni a partire da una literature review, *Rivista trimestrale di Scienza dell'Amministrazione* 3(2024), 1-30, https://doi.org/10.32049/RTSA.2024.3.09.

Massa, A., & Comunello, F. (2024b). Natural and Environmental Risk Communication: A Scoping Review of Campaign Experiences, Applications and Tools, *International Journal of Disaster Risk Reduction*, 114, 104936, https://doi.org/10.1016/j.ijdrr.2024.104936.

Meloni, B., & Podda, A. (2014). Percezione e rappresentazione dei rischi da incendio boschivo. Valutazione delle pratiche locali sostenibili di prevenzione in un contesto mediterraneo. *Culture della sostenibilità*, 253-263.

Ogie, R. I., Rho, J. C., & Clarke, R. J. (2018, December). Artificial intelligence in disaster risk communication: A systematic literature review. In *2018 5th international conference on information and communication technologies for disaster management (ICT-DM)*, 1-8.

Palenchar, M. J. (2005). Risk communication. In R. L. Heath (Ed.), *Encyclopedia of Public Relations*. Thousand Oaks: Sage.

Paton, D. (2007). Preparing for natural hazards: the role of community trust. *Disaster Prevention and Management: An International Journal*, *16*(3), 370-379. doi.org/10.1108/09653560710758323

Paton, D. (2008). Risk communication and natural hazard mitigation: How trust influences its effectiveness. *International Journal of Global Environmental Issues*, *8*(1-2), 2-16.Putnam, R. D. (1994). Social capital and public affairs. *Bulletin of the American Academy of Arts and Sciences*, 5-19.

Peters, R. G., Covello, V. T., & McCallum, D. B. (1997). The determinants of trust and credibility in environmental risk communication. *Risk analysis*, 17(1), 43-54.

Plowright, D. (2010). *Using Mixed Methods: Frameworks for an Integrated Methodology*. London: Sage.

Renn, O. and D. Levine (1991). Trust and credibility in risk communication. Communicating risks to the public. R. E. Kasperson and P. J. Stallen. Dordrecht, Kluwer.

Prensky, M. (2001). Digital Natives, Digital Immigrants. On the Horizon, MCB University Press, 9 (5).

Renn, O. (2008). Concepts of risk: An interdisciplinary review part 1: Disciplinary risk concepts. *GAIA-Ecological Perspectives for Science and Society*, *17*(1), 50-66.

Rougier, J., Hill, L. J., & Sparks, R. S. J. (2013). *Risk and uncertainty assessment for natural hazards*. Cambridge University Press.

Seebauer, S., & Babcicky, P. (2018). Trust and the communication of flood risks: comparing the roles of local governments, volunteers in emergency services, and neighbours. *Journal of flood risk management*, *11*(3), 305-316.

Sellnow, T. L., & Seeger, M. W. (2021). *Theorizing crisis communication*. John Wiley & Sons.

Siddi, M., & D'Andrea, S.A. (2024). Monitoraggio del rischio e governance dei disastri naturali in Sardegna. In La Rocca, G., & Lovari A., (eds). *Comunicazione del rischio insulare. Prospettive in comunicazione, politiche pubbliche e analisi dei contesti*. Milano: FrancoAngeli, 79-96.

Scippo, S., Luzzi, D., Cuomo, S., & Ranieri, M. (2024). Innovative Methodologies Based on Extended Reality and Immersive Digital Environments in Natural Risk Education: A Scoping Review. *Education Sciences*, *14*, 1-33.

Steelman, T.A., McCaffrey, S. Best practices in risk and crisis communication: Implications for natural hazards management. *Nat Hazards* 65, 683–705 (2013). https://doi.org/10.1007/s11069-012-0386-z.

Sturloni, G. (2018). *La comunicazione del rischio per la salute e per l'ambiente*. Milano: Mondadori Università.

Van Belle, D. A. (2015). Media's role in disaster risk reduction: The third-person effect. *International journal of disaster risk reduction*, *13*, 390-399.

Van Der Bles, A. M., Van Der Linden, S., Freeman, A. L., Mitchell, J., Galvao, A. B., Zaval, L., & Spiegelhalter, D. J. (2019). Communicating uncertainty about facts, numbers, and science. *Royal Society Open Science*, *6*(5), 181870.

Visschers, V. H., Meertens, R. M., Passchier, W. W., & De Vries, N. N. (2009). Probability information in risk communication: a review of the research literature. *Risk Analysis: An International Journal*, *29*(2), 267-287.

Vittadini, N. (2018). *Social media studies. I social media alla soglia della maturità: storia, teorie e temi*. Milano: FrancoAngeli.

Weiss, C. (2003). Expressing scientific uncertainty. *Law, Probability and Risk*, *2*(1), 25-46.

Zajac, M., Kulawiak, C., Li, S., Erickson, C., Hubbell, N., & Gong, J. (2025). Unifying flood-risk communication: Empowering community leaders through AI-enhanced, contextualized storytelling. *Hydrology*, *12*(8), 204.

List of Deliverables

- Deliverable 6.1.1, Identifying Best Practices in Risk Communication: A State-of-the-Art Review of International Literature
- Deliverable 6.2a, Identifying Best Practices in Risk Communication: Guidelines Benchmarking.
- Deliverable 7.6.2b, Communication plans for multi-hazard risks: An analysis of Civil Protection plans
- Deliverable 7.6.3, Communication campaigns to be tested in T.6.3. A qualitative study on risk communication campaigns in Italy
- Deliverable 7.6.4., Research report on communication tools and strategies' effectiveness (among different target groups, and considering different risks).

Appendix A - Risk Communication Stakeholders

Code	Gender	Institution
#1	M	Public Research body
#2	M	Local Authorities
#3	F	Freelance/Private Sector Communicator/Communication Expert
#4	F	Public Research body
#5	F	Local Authorities
#6	F	Public Research body
#7	F	National System of Civil Protection
#8	F	Public Research body
#9	M	Freelance/Private Sector Communicator/Communication Expert
#10	F	Public Research body
#11	M	Freelance/Private Sector Communicator/Communication Expert
#12	M	Local Authorities
#13	M	Local Authorities
#14	F	National System of Civil Protection
#15	F	Freelance/Private Sector Communicator/Communication Expert
#16	F	Public Research body
#17	M	Freelance/Private Sector Communicator/Communication Expert
#18	M	Local Authorities
#19	M	National System of Civil Protection
#20	M	Public Research body
#21	M	Local Authorities
#22	F	Public Research body
#23	F	Local Authorities
#24	M	Freelance/Private Sector Communicator/Communication Expert
#25	F	Local Authorities
#26	F	Local Authorities
#27	F	Public Research body
#28	F	Freelance/Private Sector Communicator/Communication Expert
#29	M	National System of Civil Protection
#30	F	Public Research body
#31	F	Public Research body
#32	M	National System of Civil Protection

Appendix B - AI-Generated Posts

Post 1 - Mayor/Gain frame (Hydrogeological risk)

Post 2 - Mayor/Loss Frame (Hydrogeological risk)

⚠️ ALLERTA IDROGEOLOGICA: UN ERRORE PUÒ COSTARTI TUTTO
⚠️

Dormire in un seminterrato può significare non svegliarsi più.

Cercare di salvare un'auto può farti perdere la vita.

Percorrere una strada allagata può intrappolarti senza via d'uscita.

Ignorare l'allerta può mettere a rischio i tuoi figli.

👉 Chiudi cantine e garage solo se è sicuro.
👉 Scegli percorsi sicuri.
👉 Condividi subito queste informazioni.
👉 Assicurati che la scuola sia pronta.

Non sottovalutare il pericolo. Agisci ora, o potresti pentirtene.

#AllertaMeteo #AgisciOra #Sicurezza

⚠️ **ALLERTA** ⚠️
IDROGEOLOGICA
Se ignori le regole,
puoi perdere tutto.

**SEMINTERRATI =
PERICOLO DI MORTE**
→ Non dormire né soggiornare
nei piani bassi

**NON METTERE A RISCHIO
LA TUA VITA PER UN'AUTO**
→ Salva te stesso, non i beni

**STRADE ALLAGATE =
TRAPPOLE MORTALI**
→ Evita zone a rischio

**LE INFORMAZIONI
SALVANO VITE**
→ Condividi subito l'allerta

**PROTEGGI ANCHE I PIÙ PIC-
COLI**
→ Verifica che la scuola sia pronta

#AllertaMeteo #Sicurezza #ProteggiChiAmi

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Post 3 - Civil Protection/Gain Frame (Seismic Risk)

🔵 PRIMA DEL TERREMOTO: OGNI GESTO CHE FAI OGGI PUÒ PROTEGGERE CHI AMI DOMANI 🔵
📣 Messaggio della Protezione Civile

Investire pochi minuti nella prevenzione significa vivere in una casa più sicura, con più serenità per te e la tua famiglia.

✅ Con il consiglio di un tecnico
Rinforzare i muri portanti o migliorare i collegamenti fra pareti e solai può fare la differenza. Con l'aiuto di un tecnico esperto, puoi valorizzare la tua abitazione, aumentare la sua resistenza ai terremoti e proteggere ciò che hai di più caro.

✅ Da solo puoi fare ancora molto
Metti in pratica queste semplici azioni e guadagna tranquillità, sicurezza e tempo prezioso in caso di emergenza:

• Allontana mobili pesanti da letti o divani: rendi più sicuri gli spazi in cui vivi ogni giorno.
• Fissa alle pareti scaffali, librerie e mobili alti: evita cadute pericolose durante la scossa.
• Appendi quadri e specchi con ganci chiusi: proteggi chi si trova nelle stanze più frequentate.
• Sistema gli oggetti pesanti sui ripiani bassi e fissa quelli alti con biadesivo: previeni rotture e disordine.
• In cucina, blocca l'apertura degli sportelli: salvaguarda piatti e bicchieri, rendendo più facile il rientro alla normalità.
• Impara dove sono e come si chiudono gas, acqua e corrente: agisci in sicurezza e senza panico.
• Prepara un kit di emergenza: avrai tutto il necessario anche in caso di black-out o evacuazione.
• Individua i punti sicuri in casa: saprai subito dove ripararti al momento giusto.
• Informati sul Piano di protezione civile del tuo Comune: saprai cosa fare, dove andare e come proteggerti.

🙆 Ogni azione preventiva è un passo verso una vita più sicura, consapevole e resiliente.
Agisci oggi, per guadagnare serenità domani.

PIÙ PREPARAZIONE OGGI, PIÙ SICUREZZA DOMANI

ALLONTANA MOBILI PESANTI DA LETTI E DIVANI

FISSA MOBILI ALTI E OGGETTI INSTABILI

APPENDI QUADRI E SPECCHI CON GANCI CHIUSI

PREPARA UN KIT DI EMERGENZA

IMPARA A CHIUDERE GAS, ACQUA E INTERRUTTORE GENERALE

INFORMATI SUL PIANO DI PROTEZIONE CIVILE DEL TUO COMUNE

Post 4 - Civil Protection/Loss Frame (Seismic Risk)

🔴 PRIMA DEL TERREMOTO: NON RISCHIARE CIÒ CHE CONTA DI
PIÙ 🔴
Messaggio della Protezione Civile

Ignorare le azioni di prevenzione può costarti caro.
Molti danni, ferite e tragedie si verificano non durante il terremoto, ma a
causa di scelte sbagliate fatte prima.

👷 Senza il consiglio di un tecnico, la tua casa potrebbe non reggere:
Se non rinforzi i muri portanti o non sistemi i collegamenti fra pareti e
solai, potresti mettere a rischio la vita di chi ami.

🏚 Se trascuri queste azioni, metti in pericolo te stesso e la tua famiglia:
• Mobili pesanti possono cadere su letti e divani, causando ferite gravi.
• Scaffali, librerie, quadri e specchi possono ribaltarsi o staccarsi dalle
pareti.
• Oggetti pesanti in alto possono precipitare durante la scossa.
• Sportelli dei mobili possono aprirsi e frantumare piatti e bicchieri,
creando un pericolo aggiuntivo nel caos.
• Senza sapere dove chiudere gas, acqua o corrente, rischi incendi o
fughe pericolose.
• Senza un kit di emergenza pronto, potresti restare senza luce, cure o
comunicazioni.
• Senza sapere dove ripararti in casa, potresti esporti al crollo di oggetti o
strutture.
• Senza conoscere il Piano di Protezione Civile del tuo Comune, potresti
non sapere cosa fare o dove andare.

👉 Non aspettare la scossa per agire. Il rischio maggiore è non
prepararsi.

❗ **TERREMOTO:**
NON ASPETTARE LA
SCOSSA PER AGIRE
Ignorare le regole può costarti tutto.

⚠ Muri non rinforzati = rischio crollo	⚠ Oggetti pesanti in alto = pericolo durante la scossa
⚠ Piatti frantumati = ostacoli e tagli	⚠ Gas e luce attivi = incendi e fughe
⚠ Nessun kit pronto = niente luce, niente aiuto	⚠ Non sai dove rifugiarti = più esposto
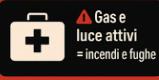
⚠ Non conosci il Piano comunale
= agisci nel panico

Preparati ora. Proteggi chi ami.
Chiedi il parere di un tecnico.

PROTEZIONE CIVILE
Informati. Previeni. Agisci.

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Post 5 - Mayor/Gain frame (Wildfire risk - Insular Context)

Sindaco Comune di Cuglieri
📅 **Cuglieri, 6 Giugno 2023** 🌐

🔥 **ALLERTA INCENDI – INSIEME POSSIAMO PROTEGGERE CUGLIERI** 🔥

Cari concittadini,

seguendo le indicazioni di sicurezza, **proteggiamo la nostra terra, le nostre case e le persone che amiamo**.
Ogni gesto responsabile è un contributo concreto per mantenere **Cuglieri sicura, verde e viva**.

👉 Ecco cosa possiamo fare per preservare il nostro territorio:

- 🚫 Non accendere fuochi o barbecue all'aperto.
- 🚒 Evita di parcheggiare l'auto sull'erba secca.
- 🚜 Mantieni puliti i terreni da sterpaglie e residui secchi.
- 🚭 Non gettare mozziconi di sigaretta o rifiuti nei boschi.
- 💚 Se ricevi un ordine di evacuazione, collabora
- ☎️ In caso di avvistamento di fumo o fiamme, **chiama subito il 1515 o il 112**.

🌿 **Guadagno per tutti:** Seguire le indicazioni della Protezione Civile oggi può evitare danni irreparabili domani 💚

#CuglieriSicura #AllertaIncendi #ProteggiamoIlNostroTerritorio #Sardegna#Sindaco

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Post 6 - Mayor/Loss frame (Wildfire risk - Insular Context)

Sindaco Comune di Cuglieri
📅 **Cuglieri, 21 giugno 2024** 🌐

🔥 **CUGLIERI, NON POSSIAMO PERMETTERCI DI PERDERE ANCORA** 🔥

Cari concittadini,

Cuglieri sa cosa significa guardare le fiamme scendere dalle colline, sentire il vento cambiare direzione e temere per la propria casa.
Sa cosa significa perdere un bosco, un ulivo, un ricordo.
E chi ha vissuto quell'estate terribile non l'ha mai dimenticata.

Oggi il rischio incendio è **altissimo**.
E basta poco — pochissimo — per rivivere tutto ciò che abbiamo già sofferto.
Un mozzicone, un fuoco acceso per distrazione, un attrezzo usato nelle ore più calde… e potremmo perdere di nuovo la nostra terra, i nostri animali, le nostre radici.

👉 Per non arrivare a questo punto:
✅ Non accendete fuochi all'aperto, nemmeno per cucinare.
✅ Non usate mezzi o attrezzi che possono provocare scintille.
✅ Non gettate mozziconi o rifiuti nei campi o lungo le strade.
✅ Se vedete anche solo un filo di fumo, **chiamate subito il 1515 o il 112.**

Ricordiamoci che ogni disattenzione può costare **una casa, una vita, un pezzo della nostra storia.**
Ma ogni gesto responsabile può **salvare tutto ciò che amiamo.**

💚 Cuglieri è forte, ma non può sopravvivere a un altro incendio.
Proteggiamola insieme, prima che sia troppo tardi.

#Cuglieri #AllertaIncendi #SardegnaSicura #ProteggiamoLaNostraTerra#Sindaco

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Post 7 - Civil Protection /Gain frame

📍 **Protezione Civile Regione Sardegna**
🗓️ **6 Luglio 2023** 🌐

🚨 **Allerta Incendi – Proteggi la tua terra**

🌿 **Seguendo poche semplici regole possiamo salvare ciò che conta davvero: i nostri boschi, le nostre case e il nostro futuro.**

💚 **Cosa puoi fare:**

- 🚭 **Non gettare mozziconi di sigaretta:** mantieni verdi i nostri boschi

- 🔥 **Evita di accendere fuochi o barbecue all'aperto:** goditi l'estate in sicurezza

- 📞 **Chiama subito il 112 se vedi fumo o fiamme:** ogni minuto può salvare ettari di natura

- ♻️ **Ripulisci i terreni da sterpaglie:** proteggi la tua casa e i tuoi cari

🔔 **Il tuo gesto protegge tutti.**
La Sardegna è più sicura grazie a te.

#SardegnaSicura #AllertaIncendi #ProtezioneCivile

"Se segui queste regole, contribuisci a salvare paesaggi, case, animali e persone. Insieme possiamo garantire un'estate serena."

142

Post 8 - Civil Protection/Loss frame

📍 Protezione Civile Regione Sardegna
📅 2 Agosto 2024 🌐

🚨 Allerta Incendi: un attimo di distrazione può bruciare tutto.

⚠️ Se non rispetti le regole, potremmo perdere:

- 🌳 **I nostri boschi secolari**, habitat per animali e fonte di ossigeno
- 🏠 **Le case e i ricordi di intere famiglie**, distrutti dalle fiamme
- 🐑 **La nostra economia rurale e gli allevamenti**, ridotti in cenere
- 😷 **La salute di tutti**, minacciata da fumo e aria irrespirabile

🔥 Ogni gesto irresponsabile può accendere un incendio.

📋 Cosa NON fare:

- 🚭 Non gettare mozziconi accesi a terra o dal finestrino
- 🔥 Non accendere fuochi, barbecue o fornelli all'aperto
- ♻️ Non lasciare sterpaglie e rifiuti secchi nei campi
- 📞 Se vedi fumo o fiamme, **non perdere tempo: chiama subito il 112**

💔 Un piccolo gesto può distruggere ciò che amiamo.
Proteggiamo la nostra terra, prima che sia troppo tardi.

#SardegnaSicura #AllertaIncendi #ProtezioneCivile

⚠️ **ALLERTA INCENDI**
UN ATTIMO DI DISTRAZIONE PUÒ BRUCIARE TUTTO

SE NON RISPETTI LE REGOLE, POTREMMO PERDERE:

🌳 I NOSTRI BOSCHI SECOLARI, habitat per animali e fonte di ossigeno
🏠 LE CASE E I RICORDI DI INTERE FAMIGLIE, distrutti dalle fiamme
🐑 LA NOSTRA ECONOMIA RURALE E GLI ALLEVAMENTI ridotti in cenere
😷 LA SALUTE DI TUTTI, minacciata da fumo e aria irrespirabile

Ogni gesto irresponsabile può accendere un incendio.

COSA NON FARE:

🚫 Non gettare mozziconi accesi a terra o dal finestrino
🚫 Non accendere fuochi, barbecue o fornelli all'aperto
🚫 Non lasciare sterpaglie e rifiuti secchi nei campi
🚫 Se vedi fumo o fiamme, non perdere tempo: chiama subito il 112
UN PICCOLO GESTO PUÒ DISTRUGGERE CIÒ CHE AMIAMO.
Proteggiamo la nostra terra, prima che sia troppo tardi
❤️ 3,1 K   #SardegnaSicura #AllertaIncendi #ProtezioneCivile

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Appendix C - Students' Sample

Sapienza University of Rome

Code	Field of study	Age	Gender	City	Natural risks experiences
F_01_LM_S_RM	Marketing	23	F	Roma	Yes
F_02_LM_M_RM	Marketing	28	F	Roma	Yes
M_03_LM_M_RM	Marketing	24	M	Cerveteri	Yes
F_04_LM_S_RM	Marketing	26	F	Roma	Yes
F_05_LM_S_RM	Media and Journalism	22	F	Roma	Yes
M_06_LT_M_RM	Public sector and corporate communication	22	M	Amelia	No
F_07_LT_M_RM	Public sector and corporate communication	23	F	San Marzano di San Giuseppe	No
M_08_LT_S_RM	Media studies	22	M	Potenza	No
F_09_LM_S_RM	Marketing	22	F	Roma	Yes
M_10_LM_M_RM	Marketing	23	M	Anzio	Yes
M_11_LM_M_RM	Marketing Psychology	23	M	Genova	Yes
M_12_LM_S_RM	Marketing	25	M	Firenze	No
F_13_LM_S_RM	Marketing	25	F	Zagarolo	No
M_14_LM_M_RM	Media and Journalism	24	M	Roma	No
M_15_LT_M_RM	Political Science	22	M	Roma	Yes
F_16_LM_S_RM	Marketing	26	F	Zagarolo	No
F_17_LM_S_RM	Marketing	23	F	Roma	Yes
F_18_LM_M_RM	Marketing	25	F	Castel Madama	No
F_19_LM_M_RM	Marketing	24	F	Anzio	No
F_20_LM_S_RM	Marketing	23	F	Latina	No

Code	Field of study	Age	Gender	City	Natural risk experiences
M_21_LM_S_RM	Media and Journalism	25	M	Roma	Yes
F_22_LM_M_RM	Marketing	25	F	Torino di Sangro	No
F_23_LM_M_RM	Marketing	23	F	Roma	No
M_24_LM_S_RM	Media and Journalism	24	M	Roma	No
F_25_LM_S_RM	Marketing	23	F	Alcamo	Yes
F_26_LM_M_RM	Marketing	25	F	Auletta	No
F_27_LM_M_RM	Media and Journalism	26	F	Cavasso Nuovo	No
F_28_LM_S_RM	Media and Journalism	25	F	Colonna	Yes
M_29_LM_S_RM	Marketing	24	M	Pavona	No
M_30_LM_M_RM	Media and Journalism	26	M	Roma	Yes
F_31_LT_M_RM	International Cooperation	21	F	Roma	No
M_32_LM_S_RM	Media and Journalism	23	M	Fonte Nuova	Yes

University of Cagliari

Code	Field of study	Age	Gender	City	Natural risk experiences
F_01_LT_S_CA	Communication Science	28	F	Sorso	Yes
M_02_LT_M_CA	Communication Science	24	M	Cagliari	No
F_03_LM_M_CA	Social Innovation and Communication	31	F	Sardara	Yes
F_04_LT_S_CA	Communication Science	28	F	Cagliari	No
F_05_LT_S_CA	Communication Science	24	F	Villa San Pietro	No
F_06_LT_M_CA	Political Science and International Relations	23	F	Paulilatino	No
M_07_LT_M_CA	Communication Science	24	M	Santu Lussurgiu	Yes
F_08_LT_S_CA	Political Science	30	F	Cagliari	No
F_09_LT_S_CA	Communication and contemporary media for the creative industry	23	F	Fluminimaggiore	Yes
F_10_LT_M_CA	Languages and Communication	24	F	Nuoro	Yes
F_11_LT_M_CA	Political Science	23	F	Cagliari	Yes

M_12_LT_S_CA	Administration and Organization Sciences	24	M	San Sperate	Yes
F_13_LT_S_CA	Languages and Communication	24	F	Oliena	No
F_14_LT_M_CA	Communication Science	25	F	Orgosolo	No
F_15_LT_M_CA	Communication Science	24	F	Cagliari	No

Appendix D - Systematic Literature Review: Included Papers

1. Bica, M., Weinberg, J., & Palen, L. (2020). Achieving accuracy through ambiguity: The interactivity of risk communication in severe weather events. *Computer Supported Cooperative Work, 29*, 587–623. https://doi.org/10.1007/s10606-020-09380-2

2. Cass, E., Shao, W. Y., Hao, F., Moradkhani, H., & Yeates, E. (2023). Identifying trends in interpretation and responses to hurricane and climate change communication tools. *Coastal Engineering Proceedings, 37*, https://doi.org/10.9753/icce.v37.management.107

3. Demeritt, D., Nobert, S., Cloke, H. L., & Pappenberger, F. (2013). The European Flood Alert System and the communication, perception, and use of ensemble predictions for operational flood risk management. *Hydrological Processes, 27*(1), Special Issue: Hydrological Ensemble Prediction Systems (HEPS).

4. Dieckmann, N. F., Peters, E., & Gregory, R. (2015). At home on the range? Lay interpretations of numerical uncertainty ranges. *Risk Analysis, 35*(7), 1281–1295. https://doi.org/10.1111/risa.12358

5. Dow, K., Murphy, R. L., & Carbone, G. J. (2009). Consideration of user needs and spatial accuracy in drought mapping 1. *JAWRA Journal of the American Water Resources Association*, *45*(1), 187-197.

6. Ettinger, J., Walton, P., Painter, J., Osaka, S., & Otto, F. E. L. (2021). What's up with the weather? Public engagement with extreme event attribution in the United Kingdom. *Weather, Climate, and Society, 13*(2), 285–299.

7. Fujimi, T., Watanabe, M., & Tatano, H. (2021). Public trust, perceived accuracy, perceived likelihood, and concern on multi-model climate projections communicated with different formats. *Mitigation and Adaptation Strategies for Global Change, 26*, 20. https://doi.org/10.1007/s11027-021-09950-9

8. Harris, A. J. L., & Corner, A. (2011). Communicating environmental risks: Clarifying the severity effect in interpretations of verbal probability expressions. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 37*(6), 1571–1578. https://doi.org/10.1037/a0024195

9. Jenkins, S. C., Harris, A. J. L., & Lark, R. M. (2018). Understanding "unlikely (20% likelihood)" or "20% likelihood (unlikely)" outcomes: The robustness of the extremity effect. *Journal of Behavioral Decision Making, 31*(4), 572–586.

10. Johnson, B. B., Mayorga, M., & Dieckmann, N. F. (2023). How people decide who is correct when groups of scientists disagree. *Risk Analysis, 44*(4), 722–738.

11. Kause, A., Bruine de Bruin, W., Fung, F., Taylor, A., & Lowe, J. (2020). Visualizations of projected rainfall change in the United Kingdom: An interview study about user perceptions. *Sustainability, 12*(7), 2955. https://doi.org/10.3390/su12072955

12. Knoblauch, T. A. K., Stauffacher, M., & Trutnevyte, E. (2018). Communicating low-probability, high-consequence risk, uncertainty, and expert confidence: Induced seismicity of deep geothermal energy and shale gas. *Risk Analysis, 38*(4), 694–709. https://doi.org/10.1111/risa.12872

13. Kübler, I., Richter, K. F., & Fabrikant, S. I. (2019). Against all odds: Multicriteria decision making with hazard prediction maps depicting uncertainty. *Annals of the American Association of Geographers, 110*(3), 661–683. https://doi.org/10.1080/24694452.2019.1644992

14. Marti, M., Dallo, I., Roth, P., Papadopoulos, A. N., & Zaugg, S. (2023). Illustrating the impact of earthquakes: Evidence-based and user-centered recommendations on how to design earthquake scenarios and rapid impact assessments. *International Journal of Disaster Risk Reduction, 90*, 103674. https://doi.org/10.1016/j.ijdrr.2023.103674

15. Matzen, L. E., Howell, B. C., Tuft, M., & Divis, K. M. (2024). Transparent risks: The impact of the specificity and visual encoding of uncertainty on decision making. *Computer Graphics Forum, 43*(3), 405–417.

16. Miran, S. M., Ling, C., Gerard, A., & Rothfusz, L. (2019). Effect of providing uncertainty information about a tornado occurrence on cognition and protective action: Probabilistic hazard information versus deterministic warnings. *Risk Analysis, 39*(7), 1533–1545. https://doi.org/10.1111/risa.13289

17. Nakayachi, K., Johnson, B. B., & Koketsu, K. (2018). Effects of acknowledging uncertainty about earthquake risk estimates on San Francisco Bay Area residents' beliefs, attitudes, and intentions. *Risk Analysis, 38*(4), 666–679. https://doi.org/10.1111/risa.12883

18. Outwater, J., Woodruff, M., Hill, A., & Schober, M. (2024). Risk-based visualization of hurricane forecasts. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 68*(1), 768–772. https://doi.org/10.1177/10711813241260678

19. Poortvliet, P. M., Knotters, M., Bergsma, P., Verstoep, J., & van Wijk, J. (2019). On the communication of statistical information about uncertainty in flood risk management. *Safety Science, 118*, 194–204. https://doi.org/10.1016/j.ssci.2019.05.024

20. Qin, C., Joslyn, S., Savelli, S., Demuth, J., Morss, R., & Ash, K. (2024). The impact of probabilistic tornado warnings on risk perceptions and responses. *Journal of Experimental Psychology: Applied, 30*(1), 206–239. https://doi.org/10.1037/xap0000486

21. Rabinovich, A., & Morton, T. A. (2012). Unquestioned answers or unanswered questions: Beliefs about science guide responses to uncertainty in climate change risk communication. *Risk Analysis, 32*(6), 992–1006.

22. Rode, D., & Fischbeck, P. (2021). Apocalypse now: Communicating extreme forecasts. *International Journal of Global Warming, 23*(2), 191–208. https://doi.org/10.1504/IJGW.2021.112896

23. Sherman-Morris, K., & Antonelli, K. B. (2018). Hurricane knowledge and interpretation of forecasted error cone and wind potential graphics. *Journal of Emergency Management, 16*(3), 137–148. https://doi.org/10.5055/jem.2018.0363

24. Shivers-Williams, C. A., & Klockow-McClain, K. E. (2021). Geographic scale and probabilistic forecasts: A trade-off for protective decisions? *Natural Hazards, 105*(1), 345–362. https://doi.org/10.1007/s11069-020-04400-2

25. Singh, A. S., Eanes, F., & Prokopy, L. S. (2020). Climate change uncertainty among American farmers: An examination of multi-dimensional uncertainty and attitudes towards agricultural adaptation. *Climatic Change, 162*(3), 1047–1064. https://doi.org/10.1007/s10584-020-02845-y

26. Smithson, M., Budescu, D., Broomell, S., & Por, H. H. (2011). Never say "not:" Impact of negative wording in probability phrases on imprecise probability judgments. *International Journal of Approximate Reasoning, 53*(3), 126–140. https://doi.org/10.1016/j.ijar.2012.06.019

27. Sutton, J., & Fischer, L. M. (2020). Understanding visual risk communication messages: An analysis of visual attention allocation and think-aloud responses to tornado graphics. *Weather, Climate, and Society, 13*(1), 45–58.

28. Taylor, A., Dessai, S., & Bruine de Bruin, W. (2015). Communicating uncertainty in seasonal and interannual climate forecasts in Europe. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 373*(2055), 20140454. https://doi.org/10.1098/rsta.2014.0454

29. Warden, A. C., Witt, J. K., & Clegg, B. A. (2024). Beyond the cone of uncertainty: Exploring the flexibility of animated risk trajectories for improving hurricane risk communication. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 68*(1), 768–772. https://doi.org/10.1177/10711813241275077

30. Wernstedt, K., Roberts, P., Arvai, J., & Redmond, K. (2018). How emergency managers (mis?)interpret forecasts. *Disasters, 43*(4), 876–896. https://doi.org/10.1111/disa.12293

31. Witt, J. K., Labe, Z. M., Warden, A. C., & Clegg, B. A. (2023). Visualizing uncertainty in hurricane forecasts with animated risk trajectories. *Weather, Climate, and Society, 15*(2), 203–215.

32. Wu, H. C., Lindell, M. K., Prater, C. S., & Samuelson, C. D. (2014). Effects of track and threat information on judgments of hurricane strike probability. *Risk Analysis, 34*(6), 1025–1039. https://doi.org/10.1111/risa.1212

Appendix E - Survey Materials

Messaggio dalla Protezione Civile

ALLERTA IDROGEOLOGICA

**Se ignori le regole,
puoi perdere tutto quello che conta**

Resta informato sulle situazioni di pericolo previste sul territorio e sulle misure adottate dal tuo Comune

Non dormire nei piani seminterrati ed evita di soggiornarvi

Se devi spostarti, pianifica il percorso ed evita le aree soggette ad allagamento

Messaggio dal Sindaco

ALLERTA IDROGEOLOGICA

**Se ignori le regole,
puoi perdere tutto quello che conta**

Resta informato sulle situazioni di pericolo previste sul territorio e sulle misure adottate dal tuo Comune

Non dormire nei piani seminterrati ed evita di soggiornarvi

Se devi spostarti, pianifica il percorso ed evita le aree soggette ad allagamento

Messaggio dalla Protezione Civile

ALLERTA IDROGEOLOGICA

**Se segui le regole,
puoi salvare tutto quello che conta**

Resta informato sulle situazioni di pericolo previste sul territorio e sulle misure adottate dal tuo Comune

Non dormire nei piani seminterrati ed evita di soggiornarvi

Se devi spostarti, pianifica il percorso ed evita le aree soggette ad allagamento

Messaggio dal Sindaco

ALLERTA IDROGEOLOGICA

**Se segui le regole,
puoi salvare tutto quello che conta**

Resta informato sulle situazioni di pericolo previste sul territorio e sulle misure adottate dal tuo Comune

Non dormire nei piani seminterrati ed evita di soggiornarvi

Se devi spostarti, pianifica il percorso ed evita le aree soggette ad allagamento