



# **MAGICA**

***Maximizing the synergy of European  
research Governance and Innovation  
for Climate Action***

## **Deliverable 5.1 Report**

**Knowledge uptake analysis among the  
target audience:**

**Exploring effective approaches, discovering  
best practices, and overcoming barriers**

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## Summary

This report emphasises the importance of enhancing knowledge acquisition and uptake in climate science communication, particularly for underserved, overlooked, and hard-to-reach audiences. The goal is to build climate resilience across all segments of society by understanding barriers to knowledge acquisition and promoting effective communication strategies.

The report presents findings from two MAGICA activities: an online workshop with science communicators within European research projects, and interviews with European citizens and groups affected by climate change. Unlike existing studies that focus on effective communication methods, this research also explores the motivations, information needs, and search strategies of the audiences themselves, aiming to better engage underserved groups.

Science communicators are encouraged to view communication from the receivers' perspective to learn from the obstacles and strategies used by audiences. Understanding the diverse characteristics and preferences of target audiences and subgroups is essential for communication success. Personal relationships, social media, as well as traditional media play vital roles in reaching citizens effectively.

Intermediary organisations, policymakers, and NGOs are vital knowledge brokers in science communication. Citizens also play a significant role in sharing climate information within their communities, acting as influential ambassadors.

Underserved groups face barriers such as limited time, language, and remote location, which require tailored approaches. The report recommends engaging with intermediary organisations and co-creating content with the target groups to build trust and relevance. Leveraging social media and visual mediums can effectively reach specific audience segments.

Communication efforts require expertise, time, and budget. Scientists should hire skilled communicators, allocate adequate time and budget for communication activities, and share insights through networks. Monitoring and adapting communication strategies based on audience effectiveness is recommended.

The MAGICA project can contribute by providing guidance, skill development opportunities, and fostering exchanges on best practices. Incorporating co-creation, building trust, and maintaining long-term contact empower audiences, ensuring meaningful and impactful science communication. Through these efforts, MAGICA aims to bridge the gap between scientific knowledge and effective implementation, promoting inclusive science communication for climate resilience.



## List of abbreviations

CDE	Communications, dissemination and engagement plan
ECMWF	European Centre for Medium-Range Weather Forecasts
EFAS	European Flood Awareness System
EM-DAT	The Emergency Database
EU	European Union
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
HPC	High performance computing
IPCC	Intergovernmental Panel on Climate Change
JPI	Joint Programming Initiative
NGO	Non-governmental organisation
WMO	World Meteorological Organisation
WP	Work package



## 1 Introduction

Uptake of the available climate science by all groups in society should further improve to ensure that society keeps up to speed to transform towards climate resilience. As the World Meteorological Organization (WMO, 2023) recently stated, the global temperature will likely increase above the 1.5 degrees target in the next five years. This alarming message is placing pressure on society to adapt to these impacts. Climate change especially affects vulnerable groups, although they might not be aware of this risk and, at the same time, are least able to respond appropriately and least likely to be heard (Preston et al. 2014). These groups are often outside the scope of climate science communication. They are, therefore, considered as underserved, overlooked or hard-to-reach. However, we cannot leave them behind. Climate justice refers to ‘ensuring, both collectively and individually, that we *all* can prepare for, respond to and recover from climate change impacts and the policies to mitigate or adapt to them by taking account of existing and projected vulnerabilities, resources and capabilities’ (Preston et al. 2014). In the next sections, we will use the term underserved when referring to the wide group of underserved, overlooked or hard to reach people.

As climate science and climate science communication professionals, we need to join forces to understand more about communication barriers and exchange effective approaches of knowledge acquisition for these groups that are socially vulnerable and/or living in regions that are vulnerable to climate change. The role of the MAGICA project, and therefore also of this report, has been to gain and share an understanding of effective communication with special attention to underserved, overlooked and hard-to-reach groups.

Through the MAGICA online workshop ‘Science communication strategies for climate change research: sharing best practices’, held on March 30, 2023, and the MAGICA Citizen Climate Action interviews, we have compiled information on knowledge uptake mechanisms, common barriers to knowledge acquisition and ways to overcome them. Additionally, we reviewed key literature on pending challenges and approaches to address them.

### What can the findings be used for, and by whom?

Various stakeholders can utilise the findings of the report to facilitate knowledge acquisition among underserved, overlooked, and hard-to-reach groups, especially socially vulnerable individuals and those living in vulnerable regions.

These findings are of interest to various stakeholders, including:

- The **climate science community**, including early career researchers and Horizon project teams, seeking to enhance their outreach to underserved audiences and citizen-led climate action groups.
- **Professional climate science communicators**, both experienced and newcomers, and intermediaries responsible for disseminating scientific climate research and its results, such as knowledge brokers. The recommendations presented in this report are intended to offer assistance and inspiration in designing highly effective communication strategies, especially for underserved audiences.





- **Individuals involved in climate policy** and communication within government departments and agencies, who must include underserved audiences to build support for and implement climate adaptation actions.
- **Private sector and private organisations** that would be interested in the produced knowledge but also to co-create new solutions by better engagement with science and private sector.
- **Knowledge brokering organisations** working with vulnerable groups that may have limited access to climate science.
- **Science funding agencies** as they can use the results to assess the proposed impact pathways in research proposals.
- **MAGICA WP leaders** can use the report to tailor their activities and ensure optimal knowledge acquisition, and dissemination.

This report aims to raise awareness about approaches to better engage underserved audiences in climate science communication efforts.

## 2 An introduction to knowledge uptake

### 2.1 Research trends in climate science communication

The rapid growth of the field of climate communication and its disciplinary diversity have generated a profusion of publications, including evidence-based techniques and theories for communicating climate science and climate change. In this paragraph, we give a brief overview of current views on the two questions we address in this report:

- What kind of information do citizens who are impacted by climate change seek, and how do they acquire that information?
- Among the audiences for climate change information, who are considered underserved, and how do climate communicators engage those audiences?

We used insights gained from academic literature and reports by governmental and non-governmental organisations to design the two activities that helped to investigate these questions:

- Interviews with citizens affected by events related to climate change.
- The online workshop with science communicators on reaching target audiences, with special attention to underserved audiences.

#### **Models in science communication**

The objective of many studies in climate science communication is to determine effective methods and tools for communication, where ‘effective’ means that an increase in awareness and engagement in the target groups can be determined, and if intended, also a change in behaviour. Effective science communication is vital to facilitate knowledge acquisition and uptake, ensuring that scientific research reaches the intended beneficiaries, including underserved communities and is successfully applied by them into practical use.

The focus on methods and tools of communication is linked to traditional approaches to science communication: recent papers emphasise that the field of (climate) science communication remains haunted by the *deficit model of science communication*. This deficit model maintains that the public is



uninformed and needs education (Pearce et al., 2015). It is a one-way communication model where information flows from experts to the public in an effort to change individuals' attitudes, beliefs, or behaviours (Suldovsky, 2017). The deficit model has been criticised for being overly simplistic and inaccurately characterising the relationship between knowledge, attitudes, beliefs and behaviours, particularly for politically polarised issues such as climate change (Suldovsky, 2017). This has resulted in new paradigms and alternative models to enhance knowledge acquisition.

These models acknowledge the importance of engagement and critical, inclusive dialogue. Examples are:

- The *dialogue model*, involving two-way communication and allows lay audiences the opportunity to engage in direct conversation with scientific experts. Dialogue models aim to increase public awareness of engagement with and participation in science (Suldovsky & Frank, 2022; van der Sanden & Meijman, 2008). Murunga et al. (2022), for instance, applied a novel “public-powered” approach to engaging the public through submitting questions of interest about climate change to climate researchers before a planned engagement activity.
- The *lay expertise model*, or *knowledge co-production*, aims to integrate scientific and lay or local knowledge to create a more holistic picture of a phenomenon (Suldovsky & Frank, 2022; van der Hel, 2016).
- The *participation model* allows the public to participate in research in every stage of the scientific process, from selecting research questions and methods, to the analysis of research findings (Shirk et al., 2012).

In all these newer approaches, the importance of understanding the target audience with whom the communication is intended is recognised, but this is considered one of the major challenges. As Holmes (2020) explains, climate change communication research currently uses a social marketing approach to understand audiences. This approach involves identifying clusters or segments of the audience where membership of those clusters is defined by a mix of variables, including knowledge, values, emotion, behaviour, belief and concern, issue involvement, and policy preferences (Hine et al., 2014). Audiences perceive the meaning of a message through the frames of their ideological values and beliefs.

However, since even within a cluster, individuals' frames may differ, messages must still be customised to fit with a more extensive mix of frames. The same applies to the preferred communication channels: these are not clearly separated between, or even within, segments. One of the examples of this segmentation approach is *Six Americas* (Yale Program on Climate Change Communication 2022). The six segments range from the “Alarmed”, the most accepting of climate change science; to the “Dismissive”, which rejects climate science.

## 2.2 Research findings on information needs and seeking behaviour

We want to highlight that in all these research approaches, the initiators of the communication are scientists or communication professionals whose aim is to increase awareness, engagement or knowledge, of a target audience. Studies in climate science that investigate the information needs of citizens from their perspective, their motives, search strategies and preferred channels, are scarce. Little attention is directed at thoroughly understanding the motivations and information-seeking behaviour of citizens who themselves initiate the search for information on climate change effects that impact their daily lives. Understanding their motivations, identifying information-searching patterns and assessing the use of the information gathered, can however lead to useful findings on designing effective communication strategies, channels and formats. Extensive studies of active information-seeking behaviour are conducted in other scientific disciplines, particularly in health communication, and findings



are relevant for facilitating knowledge acquisition in climate science (e.g. Lambert & Loisel, 2007). The authors of a review article by Lalazaryan and Zare-Farashbandi- (2014) present various models and frameworks to guide research on information-seeking behaviour. These models cover aspects such as the type and extent of information sought, factors related to information sources, and personal characteristics of seekers. The authors also explore different points of view in information-seeking studies, including problem-centred coping, involvement in medical decision-making, and behaviour change and preventative behaviour. The authors categorise health information-seekers into active seekers, passive recipients, and *information blunters* (people who tend to avoid and minimise negative information) based on their response to seeking information in stressful or health-threatening situations.

Although the models and frameworks primarily pertain to health, they can support the study of information-seeking behaviour in climate science communication. These concepts serve as valuable starting points for investigating how individuals seek information about climate change.

### 2.2.1 Underserved, overlooked and hard-to-reach audiences in climate science communication

In this chapter's discussion on climate science communication, we acknowledge its broad scope, involving diverse types of information and serving different objectives. This communication may encompass addressing imminent flooding risks, providing long-term warnings to prepare for extreme heat in the upcoming summer, or presenting plausible scenarios for future global impacts. The importance of communication on these topics is accentuated from the perspective of climate justice, which aims to ensure the collective and individual ability to prepare for, respond to, and recover from climate change impacts. Central to climate justice is the consideration of existing and projected vulnerabilities, resources, and capabilities (Preston et al., 2014). Vulnerable and disadvantaged groups are disproportionately susceptible to climate change impacts and are often hindered in their capacity to respond adequately and be heard. Communicating climate change risks is crucial for vulnerable individuals who may not recognise their own vulnerability or feel empowered to take action (Preston et al., 2014). The unjust distribution of climate impacts is influenced by various factors, as identified by Preston et al. (2014), including individual and internal factors such as physical and mental capabilities, household composition, income, age, ethnicity, gender, health, education, awareness, sense of responsibility, agency to act, attitudes, and personal values. Additionally, physical and social structural factors, such as physical location, geography, housing tenure, access to services and resources, technological systems, infrastructures, markets, social structures, power relations, societal norms, economic status and political and institutional structures, play a role.

However, science communication tends to primarily reach specific privileged segments of society, including individuals with high formal education, pre-existing knowledge, an interest in science, and higher affluence. Factors contributing to the exclusion of science communication from underserved audiences (not limited to climate science) are outlined by Humm et al. (2020):

1. Individual factors, encompassing age, fears, educational background, income, literacy, and spelling skills.
2. Social factors, including disabilities, ethnic background, gender, and regional affiliation.
3. Structural conditions, such as complexity, location, and availability of supporting services at events.

Addressing the challenge of reaching underserved audiences in science communication, Humm et al. (2020) offer seven practical recommendations based on literature, interviews, and focus groups. These recommendations focus on non-mediated forms of science communication and emphasise the



significance of listening to underserved audiences, reducing communication barriers, illustrating the relevance of science in daily life, engaging with the public in familiar spaces, collaborating with stakeholders, implementing long-term activities, and addressing the issue of excessive openness, which necessitates participant knowledge and initiative.

## 2.3 The research approaches

### 2.3.1 Concepts: science communication and knowledge uptake

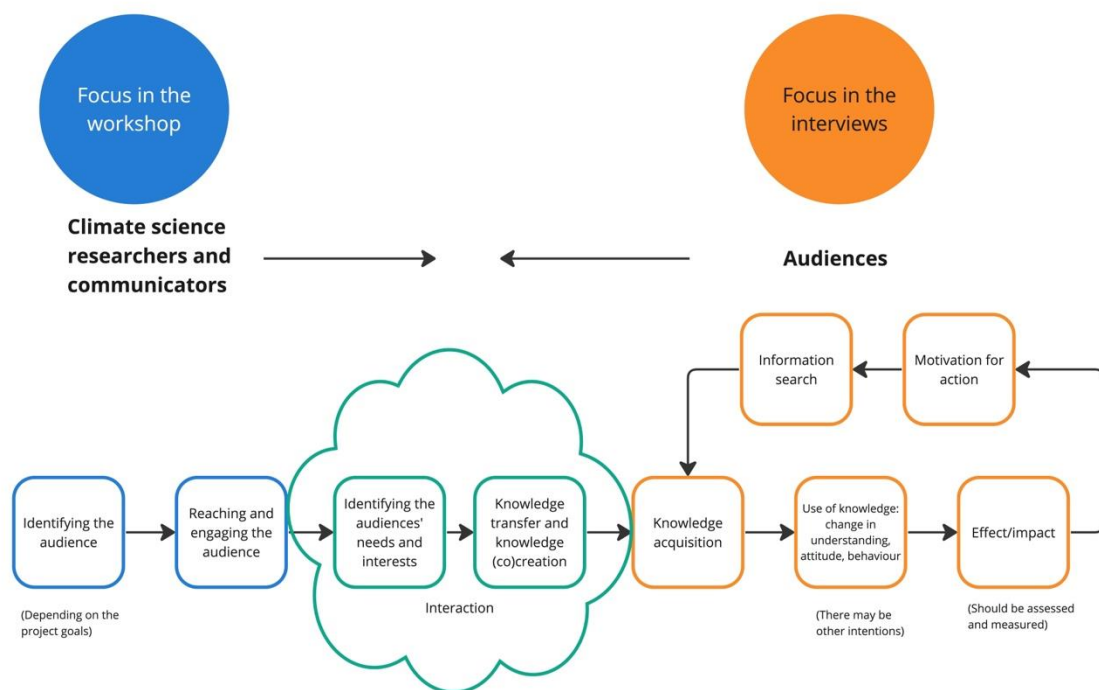
Science communication, knowledge acquisition and knowledge uptake are related concepts but have distinct differences: science communication refers to the process of conveying scientific information, research findings, and knowledge to various audiences in a clear, accessible, and engaging manner. It involves using communication techniques, such as plain language, visuals, storytelling, and media channels, to make complex scientific concepts understandable and relevant to a broader audience. Science communication promotes public understanding of science, builds trust in scientific research, and encourages informed decision-making.

Knowledge acquisition refers to the process of gaining new information, whereas uptake refers to the reception, assimilation, and application of knowledge by individuals or groups. In the context of research reports or scientific studies, knowledge uptake occurs when the intended audience understands and incorporates the presented findings into their decision-making processes, policies, or actions. Effective knowledge uptake ensures that research outputs have real-world impact and influence on relevant stakeholders. Effective science communication is vital to facilitate knowledge uptake, ensuring that scientific research reaches and is utilised by the intended beneficiaries, including underserved, communities.



### 2.3.2 Analytical model and data gathering

This study examines knowledge acquisition from two distinct perspectives: that of scientists and climate communication professionals, and that of citizens, especially those who are directly affected by climate change and likely to benefit significantly from improved knowledge acquisition. The research approach adopts an exploratory literature review to develop an analytical framework (Figure 1, below) that structures and guides the investigation, identifying points of convergence between the two perspectives.



**Figure 1.** The area of interaction between science researchers and communicators, and their audiences, used as a framework in this study.

From the scientists’ and science communicators’ perspectives, the primary objective is to communicate relevant scientific knowledge to a diverse range of audiences, whose specific interests and needs, however, are often poorly understood (Nisbet & Scheufele, 2009). One of the challenges (indicated in blue in the diagram) is to identify the target audiences, engage them in a process to understand their information needs and interests and format the message to suit their preferred communication channels, language, level of knowledge, and so forth. In the workshop with climate science communicators, we focused on these initial interactions with the target groups. In particular, we asked the participants which audiences they considered underserved, overlooked and hard-to-reach.

Conversely, from the audience’s perspective, particularly citizens affected by climate change events, the investigation focuses on understanding their information needs and motivations to expand their knowledge on specific climate change and adaptation topics. In response to their motivations, citizens proactively seek relevant knowledge, employing various search strategies individually or collectively. Successful knowledge acquisition can subsequently lead to changes in their comprehension of climate change, beliefs, attitudes, and behavioural patterns. They may adopt preventive measures, adapt to



altered circumstances, or embrace a more sustainable lifestyle. These steps are represented in orange within the analytical framework.

The framework illustrates that knowledge acquisition results from the interaction between climate science researchers and communicators (in blue) and the audience (in orange). The green section of the framework highlights the crucial zone where knowledge acquisition occurs, emphasising the importance of intensive interaction between target audiences and science communicators, as emphasised by current models of science communication. However, this interaction presents complexity, encompassing practical challenges in facilitating meetings and necessitating expertise in co-creation techniques and knowledge brokering for scientists or science communicators. Audience participation demands considerable time and effort without certainty regarding the eventual benefits.

The report delves into the two perspectives and outlines the employed data-gathering methods in the subsequent sections.

### 2.3.3 Knowledge acquisition from the perspective of climate scientists and climate science communicators – European workshop

As discussed above, the primary objective of science communicators is to disseminate relevant scientific knowledge to various audiences. To gain comprehensive insights into strategies employed by scientists and climate science communicators in European research projects to select and effectively engage their audiences, and identify and address underserved audiences, we organised a workshop to address these enquiries through the perspectives of experts.

To fulfil these objectives, we invited representatives from projects funded by the European Union (EU) and member states of JPI Climate, alongside relevant institutions, to participate in an online workshop. The workshop, titled "Science communication strategies for climate change research: Sharing best practices," was conducted on March 30th, 2023, using the online platform Teams.

We established the following workshop objectives:

1. Develop a comprehensive overview of communication and engagement objectives, including target audiences, employed in European research projects focusing on climate neutrality and resilience. Additionally, explore these projects' communication and engagement strategies and methods.
2. Identify and address audiences that have not received sufficient attention or inclusivity in communication efforts while investigating the challenges hindering their inclusion.
3. Acquire insights into effective practices that can be further developed and implemented within the MAGICA project to improve knowledge acquisition among underserved audiences.
4. Explore how monitoring knowledge acquisition has been conducted in the context of climate science communication and its impact on engagement strategies.

The workshop was specifically aimed at engaging the following participants:

1. Representatives responsible for communication and engagement in Horizon Europe projects, as well as researchers actively involved in communication and engagement strategies.
2. Representatives responsible for communication in projects funded by JPI Climate Member States, along with researchers working on communication and engagement strategies (a list of possible projects is provided below).



3. Representatives from organisations such as the Belmont Forum, Future Earth, and the Adaptation Research Alliance.
4. Other experts, including those specialising in knowledge brokering, as well as representatives of citizens' initiatives.

The selection and invitation procedures are explained in the MAGICA project Milestone Report M5.1.

Sixty individuals accepted the invitation to participate in the workshop, underscoring the evident demand for knowledge exchange in science communication. These participants were affiliated with various organisations, predominantly research institutes, and included network organisations such as JPI Oceans and Climate KIC, as well as consultancy companies such as LGI Sustainable Innovation. Additionally, representatives from regions, such as the Capital Region of Denmark, also attended. The geographical distribution of participants indicated a substantial representation of Northern, Western, and Southern Europe, whereas Eastern Europe was notably absent, likely attributed to the prevalent observation that European-funded research projects are predominantly led by organisations from non-Eastern European countries. Notably, one participant attended the workshop from Ghana, while three others joined from Australia. These global representations contributed to the diverse and international nature of the workshop's participant cohort.

In chapter 3 of this report, we present the event's outcomes and give only a short overview of the workshop programme and interactions with the participants. For a comprehensive overview of the workshop programme, we direct readers to the Milestone Report 5.1.

The primary component of the workshop consisted of keynote speeches delivered by Roger Street (University of Oxford and CMCC) and Johanna Nalau (Griffith University, Australia). These speeches effectively set the context and framework for the subsequent main component of the workshop, which involved group discussions in breakout sessions and a plenary discussion of the outcomes.

Roger Street spoke about '**Communications to enhance reach and impacts of climate change research and innovation**'. The goal of climate science communicators is to enhance the reach and thereby the impact of climate change research and innovation (R&I), whoever the target beneficiaries are, through communication and dissemination strategies. The mechanism is to have a communications and dissemination strategy and content that is credible, legitimate, relevant, usable and accessible - communications that translate science. Moreover, that strategy will not be the same for each group of beneficiaries, often not even for those within the same group.

Johanna Nalau presented about '**Social Media & Climate Adaptation**'. She said that it is essential to have a strategy for social media communications campaigns, not just a scattergun approach and that communicators should have a learning and reflective attitude to learn what works. She also stated that we need to recognise scientists' communication limitations on the use of social media. Thus, knowledge brokers can help to simplify climate science messages. Researching and understanding the audience's needs and preferences is crucial for effective communication.

Approximately 30 participants attended the breakout group discussions. Each of the seven groups was managed by a facilitator and rapporteur from the MAGICA team. A virtual whiteboard in Miro was used to present the main discussion questions, participants' notes, and real-world examples. The discussions centred around two primary themes: successful practices in climate science communication and strategies



for engaging underserved audiences. To ensure alignment with participants' experiences and queries, the boards were prepared with the outcomes of a pre-workshop questionnaire that had been distributed to registered attendees.

During the latter part of the workshop, the gathered insights were consolidated to draw conclusions and determine ways forward. This phase involved a plenary discussion, where each break-out group was allotted time to present three key highlights. The session was facilitated by Roger Street, with in-depth and fruitful discussions among the participants.

### 2.3.4 Knowledge acquisition from the perspective of citizens: interviews

From the vantage point of information recipients, our objective was to gain insights into how climate change impacts influence their information needs and the strategies they employ to seek relevant information. Within this sampled population, our interviews centred on citizens who demonstrated a solid motivation to acquire pertinent information due to their direct experiences of climate change events.

Our aim was to determine the most effective means of disseminating knowledge and information about climate adaptation and mitigation initiatives, as well as the underlying climate science, to elicit behaviour change among citizens, ultimately contributing to net-zero efforts. To achieve this, we investigated various aspects, including:

- Relevance, utility, and credibility of the information.
- The format in which it is presented.
- Platforms utilised for communication.
- Delivery channels and timing.
- Barriers citizens encountered in their search.
- Citizens' receptiveness to acquiring more knowledge and their preferences for such acquisition.
- The language employed, particularly terminology.
- The impact of acquired knowledge on their actions and how they monitored this impact.

We intended to provide a valid and meaningful resource to the climate research community and policymakers, facilitating increased uptake of climate research and climate adaptation and mitigation services. In formulating the interview questions, we strategically focused on the perspective of citizens, their distinct information needs, and their approaches to seeking information. While climate science communication has generated numerous high-quality studies and guidebooks on effective communication strategies and methods, these generally adopt the viewpoint of information producers or communication experts, presuming specific information to be relevant and requiring communication. In contrast, our interviews sought to ascertain how citizens themselves perceive this need, their expectations from authorities, and how they fulfil their informational requirements. The interview questions are detailed in Annex 5.

To gather insights from the perspective of citizens, a series of 16 interviews was conducted in 12 cases involving 22 interviewees. The countries selected were those that had experienced extreme weather events between 2019 and September 2022, as documented in the EM-DAT database. It is important to acknowledge that these interviewees do not constitute a representative sample due to various factors, including the limited number of respondents, their active engagement in climate change and adaptation matters, and variations in their social status and education levels. Despite these limitations, their responses shed light on certain patterns and habits that other citizens likely share. Semi-structured





interviews were employed, with an informal and amicable tone, while adhering to the key research objectives mentioned above.

The interviews were predominantly conducted online, except in one instance, and were held either on an individual or group basis. The duration of each interview ranged from 60 to 90 minutes. Most interviews were attended by two members of the MAGICA team: one to facilitate the interview and another to take notes. Whenever possible, the interviews were conducted in the interviewees' native language. In cases where this was not feasible, English was used with the interviewee's consent. From the notes and recorded meetings, anonymised transcripts were meticulously developed and structured according to a specific outline to facilitate structured and comparative analysis across different types of extreme events and various countries/regions. The transcripts were then shared with the interviewees for verification and to obtain confirmation of the accuracy of the information provided. Any requested modifications were promptly incorporated.

Establishing connections and inviting citizen groups in specific regions proved to be a challenging task. Nevertheless, feedback from the interviewees regarding the interview process was overwhelmingly positive. They appreciated the opportunity to share their perspectives and were genuinely interested in engaging with the research team.

### 3 Insights from climate scientists and climate science communicators: Workshop results

In the subsequent sections, we analyse the results derived from the workshop sessions, delineating the viewpoints of the participating scientists and climate science communicators. The findings are categorised into three primary themes:

- Audiences primarily targeted within European climate science projects.
- Established and emerging strategies for engaging with these target audiences.
- Barriers encountered in the uptake of knowledge and potential strategies to overcome them, with special attention to underserved, overlooked and hard-to-reach audiences.

As this section pays special attention to underserved audiences, we describe the audiences focused on and how they had been identified. More specifically, we had asked participants in the pre-workshop questionnaire who, according to them, are deemed vulnerable to the impacts of climate change but are facing barriers in acquiring relevant knowledge. The input from the questionnaire was characterised and categorised as follows:

- People in rural and remote areas who are economically disadvantaged and lack adequate awareness, particularly regarding EU climate action.
- Citizens who display disinterest in climate issues or adhere to climate denial perspectives, showing insensitivity towards the topic.
- Local decision-makers, including politicians, who may not receive sufficient attention in current science communication efforts.
- Young people, who may pose challenges in terms of appropriate channels, timing, and skills for effective engagement.



- Individuals who are not proficient in English or the local language, along with older generations, presenting difficulties in reaching them through modern communication channels.

Other groups were mentioned by only one or two participants: companies and businesses, regions heavily reliant on fossil fuels, and extreme right-wing movements/populist groups.

Our primary objective was to gain insights into effectively engaging with these underserved groups and establish a path forward in this endeavour. Therefore, during the second part of the workshop, we identified barriers and devised strategies to engage with so-called "underserved, overlooked and hard-to-reach" groups.

### 3.1 Audiences primarily targeted in European climate science projects

Data collection through pre-workshop and initial workshop questionnaires revealed the prevalent target audiences among the European climate science projects sampled for the workshop. It became evident that most research projects engage mainly with three target audiences: policymakers at various levels, science organisations and citizens. Other target groups that were engaged in less than half of the sampled science projects are non-governmental organisations (NGOs) at different levels, research-funding organisations, media/content writers and the private sector. These broad target audiences were not further specified or diversified by the participants.

### 3.2 Established and emerging strategies for engaging with these target audiences

Workshop participants shared communication methods they currently use to reach out to prevalent and emerging audiences and communicate climate knowledge. These are organised by channel and target audience in Table 1.



**Table 1. Overview of communication methods used for prevalent and emerging audiences in European climate research projects, based on the workshop results.**

Communication methods	Target audiences					
	Policymakers	Researchers & experts	Citizens/gen. public	Investors & funders	Private sector/industry	NGO
<b>Text</b>						
Scientific reports and articles						
Weekly outlooks/ bulletins						
(Policy) briefs and explainers						
<b>Meetings &amp; events</b>						
Workshops						
Small informal meetings, person to person						
Presentations to peers						
Conferences/symposia						
Ambassadors within a community or sector who tell about the research						
Public events or exhibitions						
Dinner with high level people						
Visits to a research centre, to the field						
<b>Traditional media</b>						
Video						
Press releases						
Interviews on radio and newspaper						
<b>Online and social media</b>						
Project website						
Google group						
Online awareness campaign						
Audio books						
Blog						
Podcast						
Databases						
Social media						
<b>Visuals &amp; maps</b>						
Visualisations, infographics and figures						
Maps						
Art, comics						
<b>Other</b>						
Capacity building/training						
Collaborative projects						
Educational material						



Some of these communication methods are closely related; for instance, a report can be published on the project website and the link shared via social media, or a short movie about the research results can be shown at an event and then shared online.

We conclude that five main communication approaches are used to engage target audiences in science communication: textual (online or offline), meetings/events, traditional media, social media, and visuals/maps (online or offline). Classical scientific reports are shared with policymakers, academics, and even citizens. Workshops/presentations are organised for a wide range of audiences, while conferences/symposia focus on scientists and policymakers. Citizen engagement is achieved through many different approaches, of which events close to their lives (public events, exhibitions, field visits, podcasts, interviews on radio) were mentioned in particular. Communication approaches for emerging target groups are relatively underexplored, indicating potential for improvement.

**Some of the more eye-catching and innovative approaches to reaching audiences include:**

- Audiobooks
- Comic books
- An artist and a researcher collaborating to partner with a gallery to hold events
- Generating publicity and awareness through a VIP visit, like a minister
- Being interviewed on a popular podcast
- Looking for 'boundary riders' who move with ease between different audiences and sectors
- 'Kitchen table' meetings to build relationships and trust
- Joining social and networking events within the target audience
- Co-writing a high-level white paper with professionals and sharing it with peers during network events (such as an informal dinner)
- [Young] trainees have opened unexpected audiences; they are connected to other young people using different platforms.

### 3.3 Barriers encountered in the uptake of knowledge and strategies to overcome, with special attention to underserved audiences

Underserved audiences face various barriers that impede their knowledge acquisition. Some of these barriers are shared with targeted audiences in general. Others require specific strategies that match the unique needs of these underserved groups. During the workshop, participants actively contributed their experiential insights and perspectives on strategies for effectively communicating science to both target audiences in general and more specifically underserved groups. The identified barriers and recommendations are interconnected, providing valuable insights for improving science communication efforts.

**Lack of both time and of specialist communication skills to prepare relevant and useful information.**

Workshop participants acknowledged that the general public and other target audiences often need help in understanding climate science jargon and have limited time and motivation to read scientific reports. Additionally, the communication teams may need more skills to popularise scientific findings for non-scientific audiences while maintaining the integrity of the science. Time constraints further limit the effectiveness of engaging each audience. Moreover, ensuring sustained support beyond the completion



of the project was identified as another critical aspect that demands attention to foster continued impact and success.

**Strategies to deal with these barriers:**

- **Involve individuals with specialist skills** in the project team and allocate resources in the budget for creating high-quality content tailored to the target audience.
- **Collaborate with boundary organisations** acting as knowledge brokers, as they already have trusted relationships with the target groups. By engaging boundary organisations in co-creating communication materials, science messages can reach the target audiences more effectively.

**Lack of guidance on what is relevant, or the most appropriate communication channel to reach, for mixed groups of target audiences.**

Workshop participants needed help to identify subgroups among the target audiences, particularly non-traditional audiences, and faced difficulties understanding the communication channels preferred by these groups. Science communicators experience this barrier in general for all types of target audiences, but in particular for underserved and overlooked audiences. They are unsure how to identify the people who would be interested in the scientific results and could act as champions who would help to make sense of the scientific results for these specific groups. This challenge is particularly pronounced for underserved and overlooked audiences who may be isolated geographically and rely on online communication, posing challenges in establishing relationships. At the same time, scientists and climate science communicators **should not assume** underserved, overlooked and hard-to-reach audiences **do not know enough to act upon**. This is a form of top-down communication, based on the ‘information deficit’ communication model.

Workshop participants also indicated that they **are unsure about the best communication channel** to engage a mixed group of target audiences, including underserved people. This barrier was particularly mentioned in relation to youth, who are perceived to use other communication channels such as TikTok videos and are using different online platforms than adults. Project constraints were also raised, including the challenge of reaching multiple diverse audiences within the scope of a single project. Time constraints may limit how much each audience can be effectively engaged. Moreover, ensuring sustained support beyond the completion of the project was identified as another critical aspect that demands attention to foster continued impact and success.

**Strategies to deal with these barriers:**

- **Establishing connections through networks and intermediaries to establish trust:** This strategy includes cultivating personal connections, maintaining a local presence, and effectively leveraging networks, community ties, and intermediaries. Tried and tested suggestions included social events, webinars, attending fairs, or organising multi-day intensive campaigns. These activities help to meet people and to build a trusted relationship.
- **Co-create a message that matches the audience:** Getting people to share their views and experiences and establishing connections with the topics discussed in a meeting is considered a clear indicator of success. It enables the adoption of demand-driven strategies, rather than just offering information. Moreover, workshop participants emphasised the use of a persuasive tone in addition to factual information.
- **Diverse communication channels:** Encompassing traditional and newer techniques such as webinars, social media, infographics, and videos was considered essential. **Regarding youth audiences**, the strategy could be to identify the appropriate tools, required skills (e.g., for TikTok videos), and adequate resources to apply these effectively to engage a fast-moving audience with rapidly changing tastes in preferred communication channels.



- **Exchange and evidence sharing on successful communication approaches to specific groups of target audiences:** Through the selection of target audiences, scientists and other actors can gather evidence of best practices (and best failures), employing case studies, workshops, and online resources. Maintaining a collaborative platform involving experts and communities, can help to ensure adaptable strategies that share knowledge, raise awareness and foster action.

### **Other priorities affecting information-seeking behaviour to deal with on a daily basis**

Workshop participants expressed difficulties generating and sustaining interest among audiences over an extended period. Competing and divergent day-to-day priorities, such as financial hardship, may diminish their inclination to seek information about climate change. Workshop participants also struggle with groups who mistrust science and policy messages. They may be transient, and the scientists and climate science communicators often lack project resources or longevity to establish and maintain long-term relationships.

Another group of underserved audiences with diverging priorities were **local decision-makers and politicians**. While not necessarily obviously underserved, this group experience the barrier of having other pressing matters competing for attention and resources, coupled with the turnover of actors that occurs after each legislative period. Within this subgroup, there exists further diversity, with senior members of the organisation presenting notable difficulty, as they may adhere to traditional mindsets and working habits employed over the past two to three decades.

### **Strategies to deal with these barriers:**

- **Establishing relevance to audiences already challenged by hardships:** co-creating the message with the help of intermediary organisations and people is recommended, to ensure that the messages resonate with people who experience financial hardship. It is recommended even to ask these trusted intermediaries to communicate the information to this group, to ensure more impact.
- **Local decision-makers:** targeting these stakeholders with pertinent, persuasive messages and articulated in an appropriate tone and language to ensure effective communication.

### **Challenges to tune into the correct language for target audiences**

**Language barriers** can hinder effective engagement with audiences of all types. This language barrier includes both literacy issues and linguistic differences. Many people struggle to understand scientific jargon. Some people within underserved, overlooked and hard-to-reach groups may be **low literate and** have difficulty comprehending the local language or English, leading to challenges in contextualising and understanding climate information, so it needs to be presented in a manner that aligns with their cognitive framework. In international contexts, climate science communicators may deal not only with language barriers, but also cultural barriers that require translation services and a nuanced understanding of cultural sensitivities. Some countries or regions may have complex political or social dynamics that could impact the willingness of individuals and communities, to participate in meetings or engage in science communication efforts. Language differences and cultural context can lead to logistical challenges, for instance, by potentially causing misunderstandings, misinterpretations, and reduced effectiveness of messages across diverse audiences. |

While engaging with audiences in their local language holds significance for various reasons, such as fostering trust, enhancing information accessibility and participation, and acknowledging local contexts and knowledge, this was mentioned as partly feasible or impossible. Climate scientists and climate science communicators face heightened complexity when attempting to involve audiences who are non-English



speakers in a co-design process. Simultaneous translation is not deemed viable, particularly concerning scientific discourse, which possesses its own distinct lexicon.

Lastly, workshop participants indicated that when working with underserved audiences, discriminatory language might be used unintentionally, such as 'poorly educated' and 'low economic class'.

#### Strategies to deal with these barriers:

- **Make available the specialist skill** to effectively distil complex scientific information into understandable and relevant messages by co-creating with intermediary organisations or specialist communication staff.
- The language used should also **respect the audience's existing knowledge and literacy levels**. This advice is not limited to underserved audiences; it is also a requirement for communicating with time-poor policymakers who may have limited technical or scientific literacy. One of the solutions could be to explain key scientific concepts in a way that is easily understood by the target audience.
- **Use local language - either referring to de-jargonising communications or adapting to locally spoken language or dialects:** Many recommendations were put forward to surmount language barriers, including using automatic translation services, establishing or sharing a helpdesk of individuals proficient in multiple languages, having taken into account the potential benefits for the target audience and the broader issue of adaptation.
- Use a common language like **visual storytelling** through visualisations, animations, and infographics.
- **Tone of communication - a respectful and inclusive approach:** There was a notable emphasis on avoiding the use of discriminatory language and refraining from underestimating the level of knowledge possessed by the audience. These cautionary points underscored the importance of cultivating a respectful and inclusive approach in science communication directed towards underserved audiences.

### 3.4 Conclusions from the perspective of climate scientists and climate science communicators

The workshop discussions shed light on barriers faced in effectively communicating science to target audiences in general and to underserved audiences more specifically. This chapter demonstrates the perspective of climate scientists and climate science communicators. They are aware that scientific papers and reports are insufficient to ease knowledge acquisition as target audiences lack the time to consume them and to distil relevant messages. Climate scientists and climate science communicators identified barriers that affect knowledge acquisition: lack of time and specialist communication skills, lack of guidance on relevance and appropriate communication channels, and the challenges of addressing competing daily priorities and language barriers.

It can be concluded that some general strategies for effective climate science communication can be equally applied to underserved audiences and wider audiences. To address the lack of time and specialist communication skills from the side of scientists, it is recommended to involve experts with these specialist skills in the project team, along with budgetary allocation or to engage with boundary organisations as knowledge brokers to co-create relevant information for these groups, and for underserved groups specifically.



It is essential to understand the groups' information needs thoroughly; to familiarise oneself with their communication styles and preferred communication channels, and to foster trust-building interactions.

Climate scientists and climate science communicators should embrace innovative methods and formats to engage specific audience segments. These novel approaches encompass leveraging social media platforms and utilising visual mediums, such as graphic novels and films, to enhance communication efficacy and resonance.

Diverging priorities and language barriers were mentioned specifically in the context of underserved groups, which makes it extra challenging for science communicators. Strategies to overcome these barriers can also be found in co-creating messages and to continuously assessing the impacts. Language barriers are multiple and hampering communication. Visual storytelling through infographics and animations can enhance accessibility for these groups. Additionally, adopting a respectful and inclusive tone in communication is crucial to avoid unintentionally discriminatory language and to foster stronger engagement with underserved audiences.

Implementing the recommended strategies will contribute to breaking down barriers and enhancing the effectiveness of science communication efforts targeted towards underserved audiences. Addressing barriers to reaching underserved audiences can further improve overall audience reach and, therefore, engagement and impact.

Continued exchange of successful communication approaches will further advance science communication in addressing underserved groups' needs and promoting scientific knowledge dissemination to diverse audiences.

## 4 Findings from the perspective of citizens

This chapter presents the findings on information-seeking behaviour, barriers and strategies derived from the perspective of a specific target audience, particularly citizens in regions prone to climate risks. To accomplish this objective, we conducted interviews with inhabitants living in areas that have experienced severe climate-related events within the preceding five years. We specifically targeted community groups and individuals who had demonstrated an interest in engaging in adaptation activities, assuming they would have undertaken proactive measures to access and utilise information for such actions. By scrutinising their motivations behind climate adaptation actions and their information-seeking behaviour, we aimed to gain deeper insights into the barriers to knowledge acquisition and potential approaches to alleviate them.

### 4.1 Categorisation of explored cases

We conducted 16 interviews involving 22 citizens to explore their approaches to acquiring knowledge about climate change. Some interviews were conducted with individual participants, while others were group interviews with multiple participants. Since some interviewees were part of a group actively engaged in the same region, our findings encompassed 12 separate cases distributed across various towns, cities, or regions in Europe. These cases represented instances where individuals or groups actively sought knowledge to support climate change-related actions. We intentionally included a diverse range of extreme events, such as wildfires, heatwaves, droughts, and floods. Some citizens have experienced





multiple extreme events in recent years, with some being classified as victims due to the damage, distress, and health impacts they endured.

A small number of interviewees were climate change professionals, while the majority were non-professionals who were actively engaged in climate change-related activities. We categorised the cases based on the types of actions primarily undertaken by the interviewees, including raising awareness, preparedness, or recovery efforts.

Eleven interviews, involving both individuals and communities, focused primarily on climate event preparedness. These interviewees live in nine regions across Europe, including Poland, Spain, France-South, the Netherlands, the United Kingdom, Belgium-Antwerp, Belgium-Flanders, Slovenia-Meteo, and Slovenia-climate group. Additionally, we conducted three interviews with representatives from Belgium and the Netherlands actively involved in recovery activities following climate-related events. Furthermore, two interviews were conducted with representatives from communities in France and Italy, demonstrating a primary focus on climate change awareness and broader mitigation efforts.

## 4.2 Actions: motivation to take different actions

### 4.2.1 Types of actions

The interviewees, who had first-hand experiences of extreme weather events, took various actions at household and/or neighbourhood levels. The actions they shared with us can be categorised into five groups:

- **Raising awareness and influencing:** they shared information online or via WhatsApp and 'lobbied' local authorities to take meaningful actions. Furthermore, they encouraged residents, friends, and family members to actively participate in addressing climate change issues.
- **Preparing for climate change:** Some interviewees took individual actions at the household level, such as relocating to cooler rural areas or implementing measures to prevent flooding in their gardens. Others participated in community-based initiatives such as letter-writing campaigns to decision-makers and joining citizen science projects. Another neighbourhood even transformed into garden streets, fostering resilience against future extreme weather events.
- **Recovering from extreme weather events:** Certain interviewees conducted independent investigations to better understand the causes and impacts. Others participated in community-driven actions, such as cleaning and rebuilding damaged houses.
- **Improving their environment:** Participants took action to improve their local environment by renovating green playgrounds and developing food gardens at schools. These efforts aimed to create more sustainable and resilient communities.
- **Actions that also reduce living costs:** Several interviewees took practical steps to reduce energy consumption and enhance home insulation, leading to both climate change mitigation and cost savings for their households.

Overall, the actions of these interviewees highlight the importance of individual and community-level initiatives in addressing climate change and its consequences. The interviews showcased the potential for positive change when individuals come together to tackle climate-related challenges.



## 4.2.2 Motivations for actions

To gain a comprehensive understanding of the process of knowledge acquisition, it is crucial to understand the underlying motivations driving climate change-related actions. The study revealed a diverse array of triggers prompting individuals and communities to seek information and engage in proactive measures:

- **Fear of climate change impacts:** Concerns about extreme weather events motivated individuals to be prepared and protect their homes, families, and future generations.
- **Personal experiences of climate change impacts:** Interviewees who had personally experienced the consequences of extreme weather events, such as heatwaves or droughts, were driven to take action to mitigate future impacts or assist to victims.
- **Specific personal experiences:** Certain events, such as the birth of a child, led to reflections on the future world and the desire to educate the younger generation about sustainability. Other events were protests and strikes that indicate that activism is a way to drive meaningful change.
- **Reaction against political decisions:** Opposition to political decisions, such as demolition plans, became a driving force behind sustainability projects aimed to improve and enhance neighbourhoods.
- **Professional involvement in the climate change field:** Some interviewees, working professionally in this domain, felt compelled to share their knowledge to increase awareness. For instance, one individual established a community group advocating for political change, while others engaged in self-education and information exchange among professionals to bolster their capabilities.
- **Willingness to reduce living costs:** In response to energy crises, some individuals invested in sustainable energy alternatives, such as opting for biking over driving and practising energy conservation.

Additionally, the interviews identified two significant supporting factors that influenced the implementation of climate actions:

- **Funding:** The availability of local funding or subsidies facilitated the practical realisation of ideas, such as developing garden streets or establishing sustainability initiatives.
- **Connectivity:** Strong social networks within neighbourhoods appeared to mobilise larger groups of people for collective action, indicating that the presence of a well-connected community played a crucial role in sustaining long-term community efforts.

Despite their motivation to act, participants commonly faced the challenge of time constraints, which hindered their ability to seek information and progress in their climate-related endeavours.

## 4.3 Information seeking and sharing behaviour of citizens and community groups

In this section we compile interviewees' stated actions on searching for information and the channels they use to share information. From their comments and our conclusions – based on their interview answers, we have compiled a list of barriers they meet.

### 4.3.1 Information seeking behaviour of citizens to inform individual climate actions

This section focuses on the interviewees who were not part of a community group but were taking climate action at household level. We explored what information they looked for and which communication



channels they had accessed. Their answers show that they often turn to information sources they use commonly and / or trust. Answers also demonstrate climate professionals' role in their own communities as trusted sources and purveyors of information.

#### **Searching for general climate change information:**

The people who were not professionally active in climate change searched or received general climate change information via:

- Their online networks such as climate change-focused community groups on Facebook, LinkedIn, and other social media platforms
- Personal networks like work colleagues, family, friends, neighbours, and hobby associations
- Officially organised community meetings.

Additionally, those professionally active in climate change sought information from work-related sources, including scientific papers, reports, project websites, and science platforms.

#### **Searching for information on exposure to climate impact risk:**

- Accessing weather information on online weather forecast
- Consulting local risk maps before making housing decisions

#### **Searching for information on household mitigation and adaptation measures:**

Considering using insulation and green energy, including solar panels and heat pumps; closing curtains to keep temperature down in the house; cross-ventilation. Information has been actively searched via:

- Local commercial suppliers' and energy companies' online product information
- Personal recommendations from family and friends who had applied similar measures
- Social media, in particular LinkedIn.

#### **Searching information to prepare for extreme weather**

Weather forecast information was mainly searched for via:

- TV and radio weather forecasts, and national meteorological service
- Social media – Facebook, WhatsApp (children's school and sports club groups).

Action information for upcoming extreme events was received via:

- Public sources such as mobile phone text alert systems, local authority meetings and consultations, house to house visits, TV and radio broadcasts
- Commercial suppliers and house insurance providers.

#### **Searching information to rebuild homes during recovery from extreme events**

During recovery from extreme events, individuals tended to rely on help and information received at that moment, mainly from emergency and support organisations and consultation meetings, rather than actively seeking information on how to rebuild resiliently.

#### **Searching information to better understand why extreme events happened and 'why me?'**

- Media and social media
- Local community meetings.



Although many individuals are actively seeking and receiving this information, it appears that their information needs remain unmet, possibly due to a perceived lack of details regarding the measures that will be implemented to prevent such occurrences.

### 4.3.2 Information seeking behaviour of citizens to inform community actions.

This section focusses on interviewees who were part of a community group. What information did they look for and where did they access that information?

#### **Seeking information to raising awareness about climate change to get more people engaged:**

- Free, online sources, like websites from trustworthy organisations
- Free media, including international news agencies
- Social media posts.

#### **Seeking information to help a community to prepare for climate change:**

By professionals:

- Sharing information among experts via presentations and webinars
- Sharing reports and data among each other
- Accessing information from National Meteorology Service, European data sources
- Lessons learned from practices in their region or in other European cities, shared by their professional network developed during climate change projects.

By volunteers:

- Peer-to-peer, such as group members (members of the group who are trusted suppliers of information), learning visits to other cities, people's personal experiences shared via online storytelling with videos
- Network of community members with experts such as municipal officers, local architects, academics
- Collaborating with a local NGO that can mobilise broad network of expertise
- Training course on climate change (delivered by a boundary organisation)
- Community-based scientific projects (citizen science).

#### **Seeking Information to clarify responsibility and improve collaboration and future prevention after an extreme event:**

- Official sources such as a post extreme weather event evaluation report carried out by a research organisation, municipal information including reports and maps
- Local history sources and local media archives
- Personal and professional network of experts.

#### **Seeking information for neighbourhood improvement received via:**

- Peer to peer via a network of experts among the group members
- Knowledge exchange meetings with other groups
- Online and social media such as TikTok, Pinterest, online search, national media.

Knowledge uptake analysis among the target audience: Exploring effective approaches, discovering best practices, and overcoming barriers



Analysing interviewees' information-seeking behaviour, made it evident that accessing information through familiar and trusted sources was a common approach.

### 4.3.3 Sharing information to engage others in climate actions

This section compiles how our interviewees shared the information they gathered to stimulate different types of climate actions. It underscores the significance of their regular communication techniques.

#### **Trusted peer to peer:**

- Word of mouth to friends, family, and neighbours, often during joint gardening or encounters at local markets
- Private online groups such as WhatsApp and Slack to share links to publicly available content
- Group newsletters to disseminate information about the latest initiatives taken within the neighbourhood.

#### **Within their wider community / neighbourhood:**

- Engagement in public or neighbourhood social media groups, such as WhatsApp groups and Facebook pages. These communications often take the form of videos, visuals, and short posts
- Organising enjoyable community events to foster dialogue and information sharing.
- Engagement with the neighbourhood via participation in citizens' science project. For instance, data gathered by sensors in participants' gardens and shared through an online information dashboard. Results of gathered data communicated publicly via newsletters, articles in national newspapers and TV news on the results and face-to-face event.

#### **With local and national authorities:**

- Conducting letter-writing campaigns to advocate for climate-related issues
- Providing responses to public consultations to influence decision-making processes.

#### **With the wider, general public:**

- Engaging in publicity campaigns to raise awareness and promote climate-related actions
- Maintaining websites and online platforms with recorded presentations and videos to reach a broader audience.

#### **With the media:**

- Offering comments on topical climate issues, providing valuable insights and perspectives
- Translating complex climate information into easily understandable terms and data visualizations that journalists can use in their articles.

The dissemination of information through these channels illustrates the commonly used communication approaches to share information among people to foster climate action.



## 4.4 Barriers encountered in the uptake of knowledge and potential strategies to overcome them

The results from the interviews demonstrate that IPCC reports, scientific papers and reports are not searched for by citizens involved in climate action, mainly because they are too technical, and it takes too much time to digest them. Only those professionally working in climate change are accessing these scientific materials and data sources. We therefore also observe that citizens who are professionally engaged with climate change, play an important role to help other citizens to access scientific climate research results.

Based on interviewees' answers and comments, we compiled a list of barriers they encounter and possible strategies.

### **Complexity of the concepts of climate change, adaptation and mitigation; climate change can seem irrelevant to local communities that have not been impacted yet – disseminate knowledge by sharing stories.**

The difficulty of understanding the concept of climate change (long term consequences with outcomes that are difficult to predict) might prevent uptake of scientific information and the scope of a group's action may stay relatively narrow. Climate adaptation and climate mitigation are not always clearly differentiated by interviewees, nor is the link between the two coherently expressed; climate action is often within a broader scope of the action group, such as pollution prevention, wildlife promotion, or neighbourhood improvement. A potential strategy for this barrier is to use stories of people's experiences. Stories, whether verbal or captured on video, have been used successfully to explain the importance and relevance of climate change. Personal stories are powerful because people can easily relate to them; they help people to process the information and make sense of it. Examples are videos on how farmers deal with drought, explaining the different complex concepts.

### **Climate change information is generally negative - frame messages as an opportunity, rather than a burden or cost, and make climate action and awareness-raising eventful.**

A lot of climate change information seems to tell people that life will get less convenient and more expensive, said a UK interviewee, while people are generally less financially secure since the pandemic. So suggested strategies are to provide knowledge in a positive and actionable way; keep information and action time efficient; focus on climate actions that could result in lower living costs and an improved living environment. Messages should be simple to digest and the use of humour could be further explored. Fun activities mentioned include group gardening, farmers' market, free festival, neighbourhood party, community walk, visits to neighbours' gardens.

### **Who to trust in 'translating' complex climate research? – 'The messenger is more important than the message'**

Opinions of friends and family strongly influence citizens. Word of mouth is concluded to be a powerful approach. Several interviewees indicated that information should be delivered through 'messengers' who they already know and trust to ease knowledge acquisition. Suggestions are to connect scientific information with local actors or local media. These local, familiar and trusted sources can give practical help to scientists and climate science communicators, as they have better knowledge of what methods of communication and delivery are most likely to be effective. One community group worked with an NGO. When scientists do engage directly with citizens, it was recommended that they behave more like 'one of



them', sitting with a group over a cup of coffee, and taking time to build a real relationship in the neighbourhood. Presentations about the end-results of a study are also very much appreciated, as several interviewees indicated that this does not always happen, despite having contributed to collecting data. Several interviewees mentioned the role of civil protection departments in communicating with citizens acquisition. These relationships are often already established and can be a good channel to ease knowledge uptake.

### **When is the best time? - Make use of the momentum of the impacts of climate change to communicate information**

According to the interviewees, the best time to communicate on climate change is around extreme events. Some interviewees indicated that information had come belatedly which damaged victims' trust in government. They felt unheard and resentful. Local action groups, local professionals and local universities - seen as impartial - are mentioned as being able to bridge the gap in trust between governments and citizens. In addition, people worry about the future and want to know what is being done to prevent comparable events. There is a strong need for these groups to be engaged in developing of adaptation and mitigation measures. Another good time to communicate is on national and international climate-themed days, because the media is paying specific attention to the topic and information can more easily get to the target audience.

### **Engaging harder to reach citizens within communities and neighbourhoods – sharing tried and tested mechanisms**

Several community groups expressed difficulties in reaching and engaging specific segments of citizens. Lower-income households were repeatedly highlighted among these groups, given their understandable focus on pressing priorities such as family budgets. Consequently, there is a need for guidance on effectively reaching out to these audiences to aid them in climate change preparedness. Interviewees who mentioned this challenge emphasised that these audiences reside in diverse and intricate contexts, necessitating climate scientists and climate science communicators to consider these factors when preparing and delivering information.

Another group that requires greater attention is that of the more vulnerable victims of extreme events. Without equitable, considerate, and respectful care, they may easily experience feelings of marginalisation and lack the necessary resources to fully recover from the impacts of extreme weather events. It was recommended to use communication channels that these groups already rely on, such as established and trusted NGOs within their communities. Effectively communicating with vulnerable citizens should occur at a neighbourhood level, where a deeper understanding of local economic circumstances exists, as opposed to relying solely on public broadcasting services. Moreover, additional support is needed to assist these individuals in mentally overcoming the (sometimes traumatic) experiences of extreme weather events and restoring their sense of security.

### **Language barrier - sharing information in different local languages.**

Not all people use the same terms and speak the same language. To ease knowledge acquisition, interviewees suggest that information should be provided in local language, terms using local references and with the vernacular of different types of social groups.



## 4.5 Conclusions from the perspective of citizens

The findings from the perspective of citizens in regions prone to climate risks offer valuable insights into their information-seeking behaviour, motivations for climate-related actions, and the barriers and strategies to ease access to knowledge. It is clear that citizens are not a homogenous group and that we were able to identify subgroups in terms of their information-seeking behaviour.

The motivations driving climate change-related actions varied from fear of climate change impacts, personal experiences of extreme weather events, to reactions against political decisions, and professional involvement in the climate change field. Additionally, the desire to reduce living costs and create sustainable communities played a significant role in driving proactive measures.

The interviewees sought information through familiar and trusted sources, such as online networks, personal networks, and community events and meetings. These communication channels were also actively used to share information among community members. We can conclude that only climate professionals directly accessed scientific reports and the interviewed professionals took up an important role to bring the science into their communities.

The interviewees indicated several barriers in knowledge acquisition and suggested strategies to overcome these barriers:

- **Complex Concepts:** Climate change information should be conveyed in a simplified manner, avoiding jargon and technical language.
- **Negatively Framed Messages:** Climate communication should focus on positive actions and solutions rather than emphasising the negative consequences.
- **Trusted Messengers:** Messages delivered by trusted individuals, such as local experts and community leaders, are more likely to be received and accepted.
- **Right Moment to share Information:** Timing is crucial; climate information should be provided when citizens are more receptive and open to learning.
- **Hard-to-Reach People:** Special efforts should be made to engage people who face financial hardship or are not yet engaged in community actions.
- **Language Barrier:** Climate information should be presented in multiple languages to ensure accessibility and inclusivity.

To overcome these barriers and better serve these citizens in risk prone areas, the recommended strategies for science communicators are:

- **Invest time in building neighbourhood relationships and expanding personal networks:** Citizens have expressed a strong appreciation for the personal relationships they have developed with experts, highlighting the key role these experts play in enabling climate actions. Real-life events have proven to be the most effective way to build such trusted relationships, as they provide opportunities to engage, provide, and access information, especially when these events are enjoyable and interactive. Climate scientists and climate science communicators should recognise their potential to play a vital role in improving the scientific literacy of the communities they live in, as they can serve as valuable resources for their neighbours and friends, helping them access the information they seek. Moreover, climate scientists and climate science communicators should take responsibility for translating scientific information into practical terms relevant to





their own living circumstances, and they should actively support their communities in taking action against climate change. Professionals who initiate action groups within their local communities can serve as guideposts, directing other members to reliable scientific sources. By investing time in building these meaningful connections and fostering communication within communities, scientists and climate professionals can play a crucial role in empowering citizens to understand climate-related challenges and take proactive measures to address them effectively.

- **Make use of online networks and social media to share science results:** Citizens mention not accessing scientific reports or data, finding them difficult to understand and use in their daily lives - in short it is too time-consuming, daunting in its formats and too difficult to read and process. But interviewees have shown that they make extensive use of social media because of its ease in sharing information within targeted groups (primarily mentioned were WhatsApp, Facebook, Instagram). As science communicators, online networks and social media are therefore important communication channels to reach target audiences. However, the interviewees indicated that it can also generate a negative response from climate-deniers and little mention was made of verifying and fact-checking.
- **Media engagement pays off; Interviewees say that they are able to find journalists, contact TV and radio stations or have access to local newspapers who are interested in reporting their activities and/or interviewing them. This provides groups and individuals with a traditional route to spread their narrative and achievements. Professionals we interviewed stated that broadcast journalists are eager to receive climate science information and climate / weather data in a digestible form that they can understand and that they can share with their readers, listeners and viewers who will also be able to understand it.**
- **Jumping on the citizen science bandwagon: This is an effective way to provide and disseminate scientific information to keen citizens who then share the activity and outcomes with their networks of family, friends, neighbours and peers. In one instance where participating citizens acted as ambassadors, on average each reportedly informed 16 other people about the project and the meaning of it for society. However, care needs to be taken to seek out and engage those beyond the obvious audience of retired, already engaged professionals and then to evaluate and share successful achievements.**
- By implementing these strategies, scientists and climate professionals can play a crucial role in empowering citizens to understand climate-related challenges and take proactive measures to address them effectively.

## 5 Monitoring and evaluation to assess knowledge acquisition.

In the realm of science communication, active monitoring and evaluation of the impact of communication activities is key. Such monitoring practices are not yet widely implemented within climate science, mainly because of the perceived challenges and time-consuming nature, as highlighted during our workshop discussions and the interviews with community groups.



To foster progress and enhance the efficacy of climate science communication, there is a need for greater emphasis on developing robust methods for monitoring and evaluation. This is especially important when new approaches are used to reach underserved audiences. As knowledge about successful communication strategies for such groups is limited, careful examination through monitoring and evaluation becomes essential.

Evaluating communication efforts allows science communicators to identify strengths and weaknesses in their methods, ascertain the extent of their impact, and refine their strategies to achieve maximum impact. Recognising the unique challenges associated with reaching underserved audiences, a tailored monitoring and evaluation framework can help identify the factors contributing to successful communication, guiding future efforts in this area (National Academies of Sciences, Engineering, and Medicine, 2017).

During the workshop, Roger Street emphasised the importance of building anticipated societal impacts into communication and engagement strategies for underserved audiences to improve chances of success. Roger said: “The scope and nature of beneficiaries (reach) should be identified based on the targeted impacts and the intentions of the funding body(ies) and key partners. Strategy and plans should clearly identify impact pathways for each targeted beneficiary, along with rationale and means of measuring success.” Roger also emphasised the importance of building feedback loops into strategies, learning and sharing what works and what doesn’t in relation to knowledge acquisition. This is where monitoring and evaluation approaches come into play.

This appeal for improved monitoring and evaluation stems from the climate scientists’ and climate science communicators’ viewpoints. From the perspective of the recipients themselves, monitoring the impact of their actions can be complex. Nevertheless, a limited number of community groups have actively monitored the impact of their actions concerning behavioural and social changes.

- **Large scale periodic surveys:** In the scope of a large citizens’ science project in Belgium, two large scale periodic surveys (2021 and 2022) were carried out among a group of citizens that participated and a group of citizens that did not participate in the project. The survey intended to assess how information provision resulted in changes in the garden and gardening behaviour over time.
- **Counting plants and trees:** The garden street project in Belgium has monitored impact by annually counting the number of plants and trees that were introduced in the street.
- **Counting references to website:** The group of volunteering experts that wants to make climate science more accessible for journalists and public decisionmakers are monitoring their impact by asking people to refer to the website source. The more references that can be found, the more impact they have.
- **Counting numbers of people at events:** Several interviewees count the number of people joining their events, or the number of people who regularly came to webinars and presentations.
- **Social media and website traffic; subscribers:** a large number of interviewees were part of community groups that managed website and social media channels. While often not actively monitored, these communication channels have metrics that ease monitoring and evaluation of the information provision, for instance, number of tagged posts, number of followers.
- **Satisfaction survey:** an interviewee was part of a group that carries out satisfaction surveys after webinars and workshops to get feedback on the communication approach and related aspects.



- **Counting the number of people or organisations that use the information:** a community group in France reached out via email to members of the parliament to provide information ahead of a vote on a particular decision. This group measures success by counting the number of members who have voted in line with their position. Another group assessed as impact being invited to take part in formal consultation committees.
- **Assessing change in comfort or living costs:** one interviewee indicated the impact of their action by lower energy bills.

For long-term impacts that may not be immediately evident, it is essential to maintain contact with intermediaries, ambassadors, or champions associated with the target audience to capture delayed effects. Staying connected and seeking feedback from audience representatives can help in understanding the far-reaching effects of the communication efforts.

In conclusion, both the workshop and the interviews indicate that adopting robust monitoring and evaluation practices is essential for effective science communication, particularly when engaging underserved audiences. By assessing the impact of communication activities, science communicators can continuously improve their approaches, enhance their effectiveness, and contribute to building a more informed and engaged society.

## 6 Conclusions and recommendations to enhance knowledge acquisition and uptake

Climate science must reach all segments of society to build climate resilience. To achieve this, climate scientists and climate science communicators need to improve their outreach to underserved audiences. These groups often lack awareness and resources to respond effectively to climate change. This report aims to bridge this gap by understanding barriers for knowledge acquisition and promoting effective communication to build climate resilience for these groups.

This report presents the findings of two activities undertaken in WP5 of the MAGICA project. The first activity was an online workshop with climate scientists and climate science communicators within European research projects. The second activity was interviews with European citizens already affected by climate change. Unlike many existing studies that focus on effective methods and tools for climate science communication, very little attention (at least in literature) is paid to the motivations, information needs, and information search strategies of the audiences themselves. Our research approach is to better understand the complex context of climate scientists and of the climate science communicators who strive to convey their message; and that of the audiences seeking relevant information. In both perspectives, we explore the context of engaging with underserved groups. Our research approach assumes that understanding both perspectives and their interaction can lead to more effective strategies for promoting social inclusion in climate change science communication and knowledge acquisition.

Encouraging climate scientists and climate science communicators to view the communication process from the receivers' perspectives allows them to learn from the barriers audiences encounter and the search strategies and platforms they utilise. By incorporating this understanding into their communication strategies, climate scientists and climate science communicators can foster social inclusion and better engage underserved audiences.



## Keen to learn and exchange

During the workshops and the interviews it became abundantly clear that the participants, were very interested and engaged in exchanging about their experiences. It shows the need for more exchange of climate knowledge and effective communication strategies.

Supporting both climate science communicators in the use of best strategies and their audiences in better searches will enhance impact and efficiency of the communication and reduce costs and efforts of both groups. MAGICA can contribute significantly to these activities in the coming years by facilitating the exchange of climate knowledge and promoting effective communication strategies. This collaborative effort will help build climate resilience across all segments of society.

## Target audience is not homogeneous – embrace diversity

Analysing barriers and strategies for better knowledge acquisition from the perspective of the target audiences resulted in clear evidence that the target audience, in this case citizens, is not homogeneous at all. They have shown many reasons to take action and many different motivations to do so. Additionally, some citizens take actions at household level, while others have organised themselves into community groups. We have observed a comparable diversity within the target audience when policymakers were taken into consideration. This group differs in regard to the level at which they operate (national, regional, local), which determines the type of information they need. This diversity needs to be recognised and embraced in communication approaches. While the tendency in climate change communication is to work with social profiles of target audiences, it is recommended to thoroughly investigate subgroups and their needs. Researchers should understand the characteristics and preferences of their target audiences before and during communication endeavours.

## Monitor, learn and exchange on effective communication approaches

To meet the diversity of the subgroups, it is important to monitor the effectiveness of communication actions and be prepared to adapt strategies when necessary. Climate scientists and science communicators should, therefore, purposefully develop impact pathways and apply a monitoring approach to track impact during and after the project. As there is a strong willingness to learn from other communication approaches, it is recommended to exchange monitoring results with other groups of climate scientists and climate science communicators.

## Personal relationships, social media presence and traditional media to reach out to citizens

Workshop participants demonstrated that their communication approaches can be generally clustered along five main types: textual (online or offline), meetings/events, traditional media, social media, and visuals/maps (online or offline). We observed that an array of communication techniques are utilised during a range of meetings and events, which provide a direct channel for engaging with target audiences and fostering meaningful relationships. We also noticed an increasing interest in and utilisation of non-traditional communication formats and channels. However, there is still a need to further develop and understand how to apply these methods successfully, as they are not yet widely prevalent. Incorporating visual materials, such as infographics, photos, cartoons, and video clips, can be particularly effective in reaching and engaging underserved audiences, especially when language or low literacy pose challenges.



However, the application of visual materials requires specific expertise, as improper use can lead to misinterpretation or even cause anxiety.

Individuals who actively seek information turn to the same sources, mainly traditional media, social media, and friends and family. Citizens who are members of a community or group, moreover, also approach policymakers, online sources, and connect to experts with whom they have a personal relationship. Only a small number of the interviewed individuals accessed scientific papers or reports due to challenges in locating them, the perceived / genuine complexity of scientific language, and the content not aligning with their specific needs. Relating the workshop findings to the approaches that citizens take to seek information, we observe that they match as follows:

- Via a personal network that may have been built during meetings and events
- Social media and online communication
- Traditional media, like TV, radio, and newspapers

### **Personal relationships**

It became evident that citizens place great importance on building personal relationships with experts. These trusted relationships can grow into a very effective communication approach, enabling the climate scientists and climate science communicators to put scientific results into the relevant context and co-create a message that matters to people. Climate scientists and climate science communicators should invest more time in building and sustaining these relationships.

Workshop participants frequently mentioned the importance of hands-on interaction with their target audiences. This shift towards direct engagement with audiences, fostering open dialogues, and cultivating dependable relationships underscores the importance of embracing innovative communication strategies, as explored in chapter 2.1. These strategies encompass models such as dialogue, lay expertise, and participation, which diverge from the traditional information deficit paradigm.

### **Social media presence**

The interviews showed that citizens are most likely to turn to sources that they use most often in their lives – both to find out climate information and to share it, such as Facebook, Instagram, WhatsApp groups, the internet, and traditional media. Climate scientists and climate communicators who took part in the MAGICA workshop are aware of the value of social media to reach a large audience but less so about how to use it most effectively for the purposes of knowledge acquisition. They should access formal or informal (e.g. from more social media-savvy colleagues) to improve their social media expertise and collaborate with social media experts to reach a broader audience.

### **Traditional media**

Furthermore, it was clear that not all interviewees actively seek information; rather, they often come across it incidentally, primarily through social media, friends and family, and traditional media such as newspapers and TV. This highlights the importance of communicating via channels that people are familiar with, in particular newspaper, radio, and TV.



## Intermediary organisations as knowledge brokers

The findings demonstrate the crucial role of intermediary organisations such as governmental organisations, NGOs and individuals in communicating climate science. Intermediary organizations or intermediary persons appeared to be key in communicating climate science to citizens by bridging gaps, simplifying complex information, and fostering trust for effective public understanding and action.

### **Policymakers**

Policymakers have a dual role – they are a target audience but arguably they also have a role as intermediaries in communicating climate science, which has not been explored in this activity. Nevertheless many of these conclusions and recommendations apply to those planning and delivering policy at local, regional, national and international levels both to their citizens and within government.

Climate scientists and climate science communicators predominantly direct their communication efforts towards adaptation officers, emergency officers, and other climate change-related departments. Meanwhile, citizens tend to seek information through government websites, flyers, and other official sources to gain insights into the impacts of climate change and how to prepare.

In common with other target audiences, policymakers have many and diverse subgroups; there is a wide variety of roles, across different departments and with differing levels of knowledge and experience and varying motivations.

During one of the workshop breakout groups, information was shared anecdotally that climate science information often ‘gets stuck’ in the policy process: it may be delivered and received but there it stops. Based on comparing policymakers with other target audiences and their barriers, we suggest that climate scientists and climate science communicators work more closely with policymakers to co-create mechanisms to disseminate relevant information and resources across different departments and within their own departments, adapting content accordingly, to extend the understanding, reach and impact of climate science information and research. We suggest that there is potential for further work to be done in this area.

### **NGOs**

Another important intermediary is NGOs as they appear to take up a crucial role as knowledge brokers and help to put climate science results into the local context of the citizens with whom they work. In addition, target audiences attach a certain level of trust to policymakers and NGOs, affecting their information-seeking behaviour as well as how citizens act upon the information.

### **Social responsibility of science communicators**

We also observe that science communicators play a modest role in the information-rich landscape that surrounds their audiences. To make a meaningful impact, they must strive to connect closely with their audience, understanding their specific information needs and preferences regarding communication channels.

It is noteworthy that citizens' information-seeking actions are largely informal and unstructured, often refraining from relying on official sources. This behaviour is driven by the diverse range of their questions, varying from immediate, practical, and localised inquiries to broader, long-term concerns. However, in groups and communities, some individuals with relevant knowledge and expertise often take the role of knowledge broker or boundary-spanner and do access established sources such as (scientific) publications and reports. They function as links between the rest of the group and scientists, policymakers or



professionals within their group. This is, therefore, an important opportunity for climate scientists, as they are most familiar with their community context.

## Citizens as ambassadors in climate science communication

Last, but not least, we have gathered evidence of the significant role citizens play in sharing information among community members. In one interview, it was reported that each citizen involved discussed climate and their project activity with an average of 16 other people, underscoring how citizens can act as influential ambassadors in science communication.

## Inclusive climate science communication for underserved groups

Specific attention is paid to underserved audiences. While we have not spoken to these groups directly, we have been able to collect a better understanding on barriers and communication approaches to better engage these groups.

While there are many underserved groups, the climate scientists and climate science communicators participating in the workshop had identified the following groups as people who should benefit from improved science communication in the near future:

- People in rural and remote areas who face economic disadvantages and lack awareness, especially regarding EU climate action.
- Citizens who display disinterest in climate issues or adhere to climate denial perspectives, showing insensitivity towards the topic.
- Local policy and decision makers, including politicians, who may not receive sufficient attention in current science communication efforts.
- Young people, who present challenges in terms of appropriate channels, timing, and skills for effective engagement.
- Individuals who are not proficient in English or the local language, along with older generations, presenting difficulties in reaching them through modern communication channels.

Climate scientists and climate science communicators acknowledged the significance of involving these groups to build societal and community climate resilience. However, they encounter challenges in identifying, reaching out to, and engaging with these specific groups. Neglecting underserved groups in projects runs the risk of solely addressing audiences already knowledgeable and engaged in climate action, thus limiting the overall impact of communication efforts. To overcome this issue, one suggested approach is to conduct an exploratory study either before or during the early stages of a project to identify any "invisible" groups.

Underserved audiences face barriers that are comparable to the barriers of mainstream target audiences, such as limited time and the lack of relevant information to address their specific needs. Some groups may also have different priorities, resulting in negative or ambivalent attitude towards climate change and therefore also a reduced interest in climate change information. For instance, climate deniers and people experiencing financial hardship are often not actively looking for information on climate change and may even reject this information. Another barrier is language, both in terms of literacy and linguistic aspects. And a third barrier is the remote location of some of these groups, which hampers the



development of personal trusted relationships. These people may also have not sufficient finance to travel to cities to develop these personal relationships.

General recommendations for effective climate science communication apply to underserved audiences as well, but some are more pertinent: Engaging with intermediary organisations or representatives from these target groups is essential. Interviewees recommended to take sufficient time to identify the intermediaries and to make use of the network to get in touch with new organisations too. Collaboratively developing communication approaches with and having these intermediaries disseminate the messages can help build trust, as they already have established relationships with the underserved audiences. Other relevant recommendations are:

- Overcoming language barriers by using local languages and respectful, non-discriminatory language.
- Co-creating content with the target groups, using persuasive language, and understanding their information needs and preferred communication channels.
- Leveraging social media and visual mediums as innovative ways to reach specific audience segments, especially those in remote areas

## Communication requires expertise, time and budget

It has been acknowledged that scientific reports have a limited readership, primarily due to time constraints, complexity and theoretical direction of the content, which are barriers that target audiences are confronted with. Consequently, climate scientists and climate science communicators must proactively adopt various alternative methods to reach their target audiences, which demands significant time investment—a common barrier experienced by climate scientists and climate science communicators. It takes time to engage with target audiences or intermediary organisations to co-create communication approaches and messages. Therefore, the recommendations are to:

- Attract and hire skilled communicators to support science outreach efforts,
- Allocate sufficient time and budget within research projects for effective communication activities, possibly even involving target audience representatives in the proposal writing,
- Sharing insights into successful and unsuccessful communication strategies, for instance through climate science and climate science communication networks.

## Role of MAGICA to ease knowledge uptake

Incorporating co-creation and two-way learning, building trust, and maintaining long-term contact are integral for scientists to make impact with science results. This approach empowers audiences, ensures message relevance, and fosters an enduring relationship that contributes to meaningful and impactful science communication. The MAGICA project can contribute in several ways to the above recommendations.

By providing comprehensive guidance, skill development opportunities, and fostering exchanges on best practices, MAGICA can help build the necessary capacity to bridge the gap between scientific knowledge and effective implementation and fostering inclusive science communication. This is already being done and will be done in the future through MAGICA's programme of workshops, conferences and forums, as well as the planned Knowledge Hub. In addition its newsletters and social media posts continuously strive to share examples of best practice and innovation in the field of inclusive science communication. Specifically, the ECCA conferences (2023 and 2025) intend to connect those responsible for implementing





climate adaptation measures with the scientists behind cutting-edge research and innovations by facilitating face-to-face conversations, informal and formal knowledge exchange, as well as network-building. MAGICA also plans to organise an officer exchange programme focusing on successful communication and knowledge exchange practices for mutual learning in cooperation (e.g., science communication officers in scientific organizations, national knowledge broker organizations, journalists and scientists).

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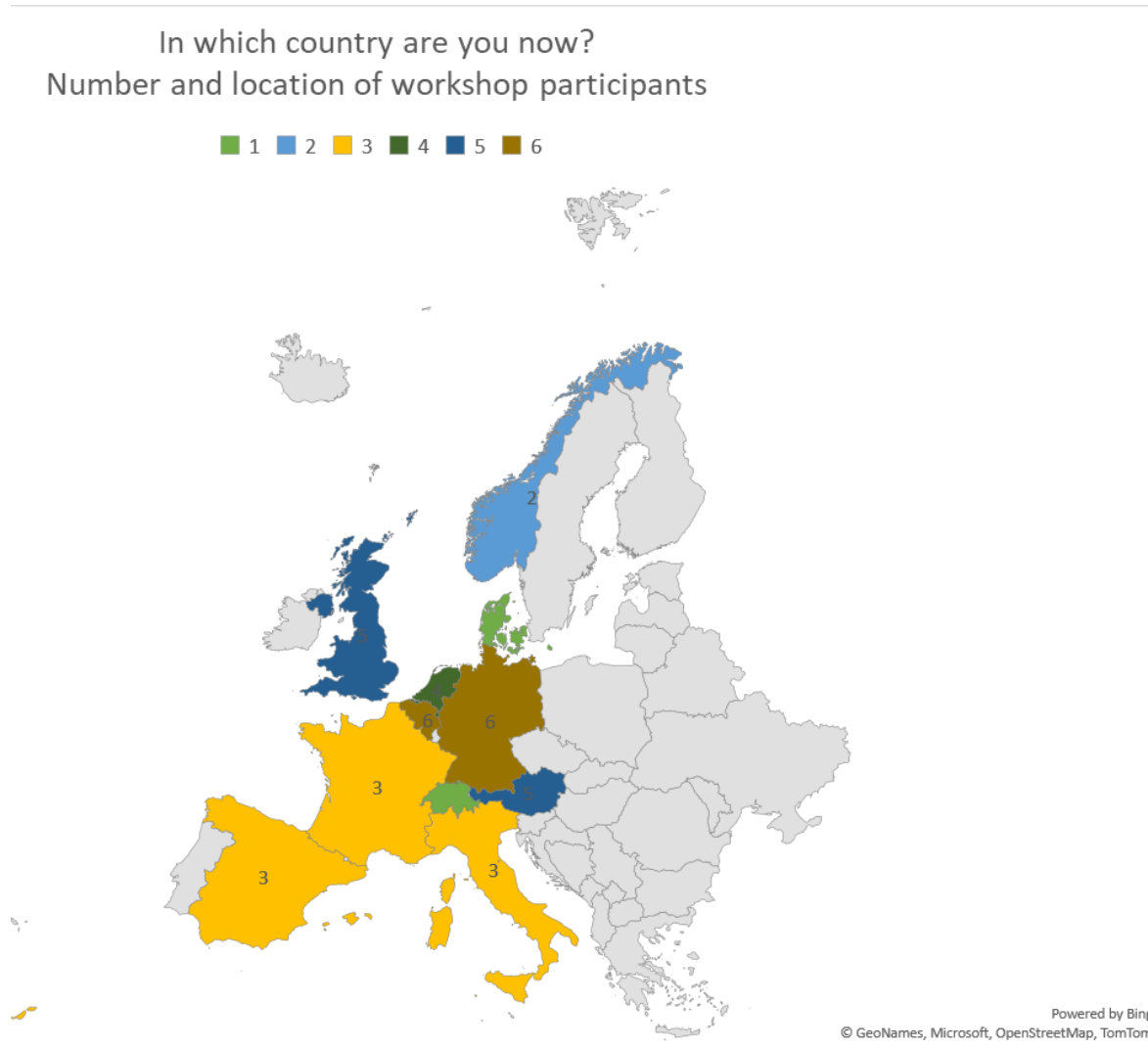
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## Annexes

### Annex 1: Profile of workshop participants

Mentimeter was used at the start of the workshop to help the facilitators as well as the participants to get an overview of the profile of the participants. We observed a good representation of North, West and South Europe. Eastern Europe was not represented in the workshop, which is the result of the selection bias: most European-funded research projects are not led by organisations from Eastern European countries. One participant was in Ghana at the time of the workshop, and three were in Australia. The participants were working for different organisations, mainly research institutes. There were also participants from network organisations such as JPI Oceans and Climate KIC, consultancy companies such as LGI Sustainable Innovation and regions such as the Capital Region of Denmark.





## Annex 2: Barriers to science communication and knowledge acquisition

Barriers to climate science communication from the perspective of scientists	Barriers to knowledge uptake from the perspective of citizens
Lack of time	Lack of time
Lack of guidance on appropriate communication channel	Language barrier
Lack of skill to develop effective message	Being located remotely
Lack of understanding what is relevant for target audience	Literacy barrier
	Other priorities and ambivalent attitude towards climate change
	Averting attitude towards negative information about climate change

## Annex 3: Exploration of underserved audiences: breakout group results

In section 3.3 of the main report workshop, participants took part in a questionnaire to gather the audiences they identify as underserved. The responses were:

- Low-income people in rural and remote areas who are not well informed (for instance on EU climate action).
- Citizens who have no interest in climate issues; and climate deniers (not sensitive to this topic).
- Local decision-makers; politicians.
- Young people.
- People who do not speak English or do not speak the local language and older generations (difficult to reach through modern communication channels).

In the second of two workshop breakout sessions, groups of participants were invited to select one of these audiences and explore the barriers and ways to overcome them. Some of the groups, however, took a broader perspective and contributed experiences on several groups and general reasons why audiences may be difficult to reach. This is a summary of the key points made.

**People poorly informed about climate action from low-income households in rural and remote areas.,** This group is underserved because they are not interested and not engaged in receiving or looking for knowledge because:

- They are occupied with other priorities and basic unfulfilled needs.
- They are not aware of what climate change means for them or not acknowledging the urgency.
- They do not believe in anthropogenic climate change.

Some of these groups may even give angry or aggressive responses towards scientists and other professionals involved in climate projects.

To engage this underserved group, advice was shared to consider their culture and context and to use the local language to communicate.



### **Citizens who have no interest in climate issues and climate change deniers**

Not many groups discussed the category of underserved audiences: 'Citizens who have no interest in climate issues; and climate deniers (not sensitive to this topic)'. One specific remark was that consistent and scientifically sound messages are key to responding to climate deniers.

### **Local decision-makers and politicians**

Barriers in climate science communication mostly belong to contextual or structural factors. This group is underserved because:

- It is very diverse: This diversity is often not acknowledged in current communication of science results. Some people have long careers in government and are not willing to change behaviour or way of working.
- Lack of time to read scientific reports and other materials: others may be interested in climate science results but lack time and budget for actions. Climate science communicators should address competition with other pressing issues for attention and resources and consider how to support them.
- People and priorities change after every legislative period, which makes it difficult to engage with this group.

To overcome the barriers, science results must be made as relevant as possible, and attention should be paid to the tone and wording of the message to be convincing. Co-design of the communication outputs to ensure they fit with policy and administrative needs of the decision-makers would be a way forward. It was also mentioned that often people are reached 'who are already in the bubble (as they mostly already follow channels dealing with this issue)'; but encouraging them to take action is a big struggle.

### **Young people**

It was remarked that it is a challenge to have the right channels, the time and skills to reach young people as an audience. Messages require translation for this group, for instance using TikTok videos, other visuals, or creative ways such as apps. Also, online meetings and events are more effective than emails.

### **People who do not speak English or do not speak the local language and older generations.**

Limited knowledge of English (or the common use of English as the language of climate science) impedes their knowledge acquisition. Emerging climate information platforms in English only automatically limit access to information for people who do not have a command of English. Barriers in relation to language are that co-design is very difficult, and that simultaneous translation is hardly viable when talking about certain areas of science.

Translating might be good for transparency and to reach underserved people and regions. Practical solutions are to use automatic translation into other European languages and to make use of helpdesks with people who can speak more than one language. However, one can also share information in English across networks, relying on media channels to pick it up and translate it into home languages. Workshop participants also suggested involving bilingual people in the project team, who are able to present scientific findings in the local language; to make use of interpreters during presentations; or to combine science with creative techniques such as art, storytelling, comics and animation. Another suggestion was to choose at an early stage 'ambassadors' or 'champions' from within the community as spokespeople, or presenters at workshops and meetings.

Although put forward as an underserved audience, older people as a group were not discussed.



**Barriers to engaging with hard-to-reach audiences in general.**

Workshop participants indicated the challenges of contacting hard-to-reach audiences. When little is known about the audience, it is hard to get in touch with these people. How do you identify people who might be interested in the science results? And if they are identified, it is not easy to establish contact with people who may not respond to emails from people they do not know.

The barrier to reaching out to a mix of audiences at the same time, was mentioned in the context of underserved groups. How to communicate to citizens as well as policy makers? If the work is web-based, you may not even know who your audiences are.

Another recurring barrier was the difficulty in long-term engagement between scientists and target audiences, and how to manage these relationships within the time constraints of a project.

Major barriers are seen in engaging target audiences who deal with daily challenges such as their financial situation and may have little interest in environmental and climate issues. This leads to questions on the relevance of the information for these audiences; how to transform scientific findings into people-centred outcomes; how to bridge the knowledge-action gap by translating communication into tangible actions and how to simplify complex topics for better understanding. On the other hand, we should not be biased in thinking people do not know enough to act upon. This is a form of top-down communication, based on the 'information deficit' model of communication. One participant mentioned their project's communications strategy had to overcome challenges such as corruption and political interests.





## Annex 4: Barriers to underserved audiences

Notes from Miro Board and meeting notes		
Audiences, Category	Challenges or Obstacles	Obstacles, Category Humm, C., & Schrögel,
<b>Suggested category</b>		
<b>People in rural and remote areas who are poor, not well informed</b>		
People with other priorities and basic unfulfilled needs (poor, marginalized, etc.) for those CC is not one of the main issues.	Lack of interest/engagement	individual
	Determine why someone from an entirely different field or background should be interested in the topic	structural
	Angry/aggressive response	individual
<b>Suggested category</b>		
<b>Citizens who have no interest in climate issues; and climate deniers</b>		
Climate deniers		
Ordinary citizens without any specific interest in climate		
<b>Suggested category</b>		
<b>Local decision makers; politicians</b>		
Local decision makers	Willingness but lack of budget and time for actions	structural conditions
	One challenge to reach (local) decisionmakers / policy makers is availability, needs to be 100% relevant for them to engage.	structural conditions
	Important to understand their challenges as well (time, budget, ...) they have a lot of tasks (Local policy makers). How to support them?	structural conditions
	Address competition with other pressing issues for attention and resources	structural conditions
	Relevance for the audience and bridging between the research and the audience	structural conditions
	Local decision makers: willingness but lack of budget and time for action	structural conditions
	Time availability	structural conditions
	Convincing message, not only "facts"	
	Pay attention to tone and wording of the message	
	Challenge is to translate research to practice: what is relevant for them??	
	They change after every legislative period and then everything has to start again; reaching people important (reaching them in the first instance is difficult)	structural conditions
	More difficult to reach higher up the chain & keeping them engaged once they have been reached)	structural conditions
	Often reach people who are already in the bubble (as they mostly already follow channels dealing with this issue), big struggle to reach if you want them to take action	
	Don't receive the information they need to work on	
"Older generation" in local administration	Like to do things as usual and as they did the last 20/30 years; hard to change behaviour / mindset, now there is change, need to communicate to different generation	individual
The most target audience is the most overlooked often (e.g. policy makers - )	Reason: diversity within one target group	individual
	Adapt to changes in policymakers and their priorities	structural conditions
<b>Suggested category</b>		
<b>Young people</b>		
Youth	Having the right tools, time to reach them and the right skills (e.g.: TikTok videos)	individual/ social
Pupils, young people		
Women and youth	Access to emerging platforms	
<b>Suggested category</b>		
<b>People that do not speak English or do not speak the local language and older generations (difficult to reach through modern communication channels)</b>		
People who do not speak english	Co-design in these circumstances is difficult	individual/ social
	Simultaneous translation—not so viable when you're talking about certain areas of science	
People who do not use regular media channels		
	Emerging platforms automatically may limit access of information to other groups	structural conditions
	Tiktok unofficial media channel	
	Access to emerging platforms	structural conditions
<b>Other groups</b>		
Early career researchers		
Research institutes with fewer resources		
Practitioners who are impacted by climate change		
Smaller companies, smaller cities?		
People with disabilities		
"Most target audiences are overlooked"		
<b>General obstacles</b>		
	Getting audience to follow through communication (e.g. reading communication, platforms);	individual
	Reaching target audience - e.g. emails not read/answered;	individual
	Transform scientific findings into people-centered outcomes	structural conditions
	Stay in contact and keep people interested	
	When you don't know who your audience is, it is hard to reach the right people.	structural conditions
	Where do you find the contact details of these people in an efficient way? How do you identify a group of people who might be interested (beyond the obvious ppl)?	structural conditions
	Challenge to reach different audiences in one project	structural conditions
	Bridge the knowledge-action gap by translating communication into tangible actions	structural conditions
	Overcome lack of interest or engagement	structural conditions
	Overcome challenges such as corruption and political interests	structural conditions
	Manage audience inquiries seeking numerous facts while referencing a single contradictory example	structural conditions
	Simplify complex topics for better understanding	structural conditions
	Manage time constraints, ensuring continued support even after project completion	structural conditions
	People have a lot of daily challenges	individual/ structural
	Relevance of information for the audience; bridging the gap	structural conditions
	Difficult if the comm is web based, not f2f	structural conditions
	Citizens, stakeholders & policy makers: how to communicate to all of them? Most work we do is web-based: you're not where your audience is -> no face.	structural conditions
	Lots of citizens/ companies struggle with financial situation; too little attention for environmental and climate issues, nor for adaptation measures	
	Complexity of topics	
	Bias in thinking people don't know enough to act upon	





## Annex 5: Example of template for transcripts and list of questions for interviews

### Template for transcripts from MAGICA citizen interviews

Date:

Present:

Point of contact for MAGICA (email address of lead interviewer):

Name of group:

Website:

Lead contact name & title:

Email address:

Phone number:

Summary of age range & profile of group members:

Does the group have relevant scientific/technical knowledge?

Location of group/interviewees (and geolocation link)

Short summary of extreme weather events that have affected this region in the past 3 years (and their effects):

Group's Social Media platforms links:

Twitter:

Facebook:

YouTube:

Instagram:

When formed

Number of members

Main activities / stated objectives

Methods and frequency of communication and engagement with:

- Members
- Community
- Local council (town hall)
- Higher level of government

Request a good quality hi res photo with permission to reproduce it, preferably of one of their activities (depending on consents. This would be used to illustrate the report and online).

GDPR permissions:

Would you like to receive further information from MAGICA? (By email)

Short summary narrative:

Questions:

- 1 What was the trigger for the formation of the group? (Local action groups)  
(For instance, was it a local weather event/crisis, poor air quality, natural habitat issue, a scientific report, a news story, a particular local activist, politician or climate champion with specialist knowledge etc.).
- 2 What has been your most successful action to date?  
(How was that triggered? What prompted and informed this action? Where did you get information to inform, plan, execute and achieve it? How was it funded?)



- 3 How did you measure the success of the action?  
(If it is an ongoing activity, how do you monitor its progress and impact? Has this success helped to motivate the group? Did it motivate continuation / expansion of the action / other similar actions / gain members / have a stronger voice or influence locally? Would you like to be able to do the measuring and monitoring in a more scientific way? If so, would you find access to expert help useful?)
- 4 What is the most effective/reliable/trusted route/platform for you to receive information to meet your objectives? (e.g., Through a particular website, environmental group, social media group, non-profit group (NGO) etc.?)
- 5 What are the particular sources or forms of information that inspire your members to take action? (Do you seek it out yourself, does it reach you through national media, research institutions, social media [if so which platforms?], national or local government, other climate action groups? [answer in rough percentages if possible]. Did you make use of any external support [e.g., in a library, or advice from an expertise centre, a local politician, or climate resources?] If so which ones and how did you know where to find them? Did you contact local / regional municipality? Other groups? University or similar
- 6 Have you shared your achievements and if so, how? What have been the consequences of sharing your news?  
(e.g. local media coverage, communications with your local council, other neighbourhood groups, other climate action groups?) Or have you fed back the results/impact to a climate or governmental office or scientific institution?
- 7 If you used scientific information, did you find it easily?  
What information did you use? Would you have liked to have more information / resources in different terminology? Would you have liked access to a climate expert to inform you?
- 8 For groups that are not specifically named as a climate action group:
  - a. (If this is a natural habitat / neighbourhood enhancement / wildlife group or similar)  
How big an influence is climate change on your activities? To what extent does climate change inspire your activities? Do you measure your impact in terms of climate impact? Do you consider that the results of your group activities contribute to addressing climate change? If so, is there a reason why you do not term yourselves as a climate action group?
- 9 Closing question: If you were able to give everyone working in MAGICA one key message to help groups like yours to take up scientific information for climate action activities, what would it be?

## Annex 6: Storylines of the 12 interview cases

### Poland

The respondent has taken proactive measures to implement mitigation strategies in their house, which have also contributed to keeping the house cool. To achieve this, they extensively researched and compared various types of solar panels from multiple websites. Local green energy companies' websites proved particularly helpful in making informed decisions about the most suitable solar panels. Additionally, valuable insights were obtained from solar panel companies.

In terms of staying informed about heat waves, the respondent relies on various sources, including Google Weather, news outlets, and television broadcasts. These channels provide essential information to prepare for and cope with extreme heat events.



Moreover, the respondent has benefited from valuable information shared by friends and family, which played a pivotal role in their decision to invest in heat pumps and solar panels. Eager to promote sustainable practices, they have actively shared information about these energy-saving solutions with neighbours, friends, and family.

### **Spain**

In this interview, the respondent reported having personally experienced extreme events already. Therefore, several actions have been taken at the household level to reduce the impacts. The house is well insulated, and the heating is on a community heating system. Windows are closed during the day and opened at night for cross-ventilation. Furthermore, the family cycles and walks as much as possible and buys bioproducts. Information about the weather is gained via news on TV, on the internet (on different websites and platforms such as Google Weather) and the local newspaper. They also receive information through social media, in particular LinkedIn (on recent climate change research) and Facebook. Furthermore, the family is connected to WhatsApp groups of the kids' schools, which is also a source of information on upcoming weather events. And WhatsApp messages and notifications from the sports club. The respondent relies on local government actions. However, it takes time to integrate climate actions into a continuous political agenda. Local politicians come and go and, therefore, climate plans and actions are short- or mid-term with little continuation.

### **France-South**

The respondents professionally work on climate change and have made significant efforts to adjust their own behaviour to become more climate-friendly. They have taken measures such as reducing their carbon footprint by using public transport and only owning one car. Their commitment to sustainability extends to their home, where they have transformed the front garden into a green space, insulated the roof, installed double-glazed windows, and insulated the walls. While they have air conditioning, they primarily use it at night only, to conserve energy. To stay informed about weather conditions, the respondents rely on a meteorological station installed in their house, providing immediate information on temperature, humidity, and wind. Additionally, x accesses weather updates online through sources like Google Weather and the National Meteorological Service. Before purchasing the house, they consulted local risk maps to assess potential risks to their property.

The respondents indicate that the municipality also plays a role in engaging citizens on climate and disaster management. They organise meetings to share local knowledge, discuss community initiatives, and involve people in decision-making processes. The respondents attend these meetings. Furthermore, the insurance company provides them with information on risk management for natural disasters.

Professionally, the respondents' work in climate change expose them to a wealth of information through peer-reviewed papers, reports, websites, meteorological data, and maps. Privately, they stay connected to a community group on Facebook, particularly for updates on local green initiatives.

During impending extreme weather events, the respondents consult specific information service platforms and early warning systems. They receive messages on their phone, and if necessary, the municipality sounds an alarm to notify citizens to tune in to TV and radio for updates from the government on necessary actions.



### **France-action group**

In the case of this group that aims to foster a political movement for climate change, the respondent indicates that most of the information is coming from the internet and free media, including international news agencies. They do not rely on IPCC reports as they are barely readable and too technical, information is shared among members via consultation about an upcoming action. These actions are mainly awareness-raising actions or campaigns to encourage political decision-making towards climate action as, for instance reducing the speed on highways. These campaigns attract attention with smart slogans, strong images or catchy puns. They reach out to members of the parliament via email and ask to take a position on the measure. This message is documented with facts and figures and validated with robust association, supported by a well-known climatologist and a survey that the public is in favour of the measure.

### **Italy**

The respondent highlights the formation of a voluntary group at her workplace, comprising professionals dedicated to sharing and exchanging expertise on climate change and data management. The primary purpose of this group is self-education, with each meeting featuring a specific expert who imparts their knowledge to empower others. These meetings take place both online and in person, offering flexibility and accessibility to participants. The credibility of the speakers, who are recognised experts in their respective fields, fosters a sense of trust among the group members. On occasion, scientists from other organisations are also invited to share their insights during these gatherings, enriching the learning experience.

One of the major advantages of this group is that it saves participants considerable time, as they can access valuable information and expertise in one place. Moreover, the online meetings are recorded, allowing members to review the discussions later.

Additionally, the respondent is involved in civil protection work, where they maintain a website providing essential information about emergency procedures and threshold levels. Citizens receive real-time updates and guidance via their mobile phones, educating them on how to respond during extreme events. The organisation has also created promotional videos to raise awareness about their work. Data utilised for these purposes is sourced from EU data sources, ensuring accuracy and reliability. During extreme events, daily reports are shared with relevant departments to coordinate response efforts effectively.

### **UK**

In a rural coastal community, a group of dedicated citizens is determined to enhance their local environment and inspire action, particularly concerning climate change. The members of this group possess extensive knowledge and experience in environmental and climate change issues, with some having professional backgrounds in this field. They aim to broaden their understanding of the environment's significance for people's lives and the implications of climate change for their community, seeking ways to address these challenges.

To acquire information, community members often conduct individual internet searches and draw from their own experiences and knowledge. Additionally, they network with other NGOs to access valuable data and insights. This information is then adapted for the general public and shared among friends and family to increase awareness and foster a sense of community that collaboratively influences decisions and defines actions. The content primarily comprises stories and experiences shared within the community, presented through high-quality videos tailored for easy online sharing on platforms such as Facebook, Twitter, YouTube, Instagram, WhatsApp, and their website. Furthermore, the group organises numerous enjoyable and relaxed events, providing opportunities for people to meet, exchange knowledge, discuss concerns, and take action for a better environment.



Initially, Facebook played a vital role in sharing high-quality content during the COVID-19 pandemic, enabling virtual engagement when in-person meetings were not possible. However, post-pandemic, there is a growing preference for face-to-face interactions, and most communication now occurs through WhatsApp and during organised events.

The group also has a campaign team that responds to local and national environmental and planning consultations, effectively influencing local policymaking.

The success in disseminating knowledge can be attributed to a peer-to-peer approach, relying on personal testimonies from trusted sources. The messages and content are kept concise due to time constraints, acknowledging the need to prioritise engagement over exhaustive debates.

Challenges arise from the limited time available for content producers and the increasing living costs faced by community members, making it challenging for them to adopt environmentally-friendly lifestyles, which are often perceived as more expensive. Nonetheless, the group remains committed to their cause, striving to overcome these bottlenecks and continue making a difference in their community.

### **Slovenia**

A dedicated group of professionals has united to address the pressing issue of climate change by creating an online platform that collects, analyses, and publishes impactful data. This initiative aims to enhance decision-making and journalistic reporting on climate-related matters. Despite operating as a science association, the group comprises passionate volunteers committed to the cause.

The platform is hosted on GitHub, ensuring transparency in all their endeavours. Their pivotal role involves translating climate data from reputable sources like the National Meteorological Institute and ECMWF into easily understandable language for a broader audience. Leveraging their diverse backgrounds, the volunteers adeptly interpret data relevant to policymakers and journalists.

Smooth communication within the group is facilitated through the platform Slack. Information about climate change is shared through their website and Twitter. Moreover, the group focuses on visualising complex data through innovative methods, making intangible information more comprehensible.

Journalists utilising the data provided by this citizens' group are kindly requested to credit both the original source and the platform itself. The initiative's success is attributed to the journalists' excellent network of expert connections and their ability to source accurate data from reliable sources.

In addition to this group, another team of professionals is committed to sharing European climate data with local users in an easily understandable manner. Sourcing information from reputable European organisations such as ECMWF, EUMETSAT, Europe Flood Awareness System (EFAS), and Copernicus Emergency Service, they disseminate data through various channels, including open days, public servants, daily national news, and popular social media platforms like Twitter and Facebook. The information is presented creatively through graphics, videos, and photos to ensure effective communication.

Their efforts have not gone unnoticed, as the group has received recognition and invitations for interviews on national and local TV and radio. These opportunities enable them to further explain weather events and warnings to a wider audience, spreading awareness about climate change and its impact.

### **Belgium-Flanders**

In this area, a significant citizen science project was conducted to engage residents in scientific research. Citizens were encouraged to participate through prominent advertisement panels along the main roads, conveying the importance of their involvement. The initial phase of the project focused on air pollution, followed by another project that measured the impact of private gardens on heat stress and water absorption. Participating citizens were provided with sensors for their gardens, and an information dashboard allowed them to compare their garden's performance with others in the neighbourhood. These



sensors and dashboards served as essential information channels. Additionally, participants were required to complete surveys and provide soil samples to assess soil quality. The information received by the citizens was then used to make necessary adjustments to their gardens. The progress of the project was communicated to citizens through newsletters, articles in national newspapers, and TV news, culminating in an in-person final event where the study results were presented.

One significant bottleneck of the citizen science project was that the majority of participants were highly educated and retired individuals who were already well-informed. Yet, aside from placing a sensor in their garden, their involvement in the project was rather passive. Many participants expressed a desire for more active engagement, such as visiting each other's gardens and sharing experiences.

A crucial success factor was that participating citizens said, on average, they shared information about the project with 16 friends and family members. This mechanism had the potential to facilitate behaviour change, but unfortunately, it was not fully utilised in the project to its maximum potential.

### **Belgium-Antwerp**

A group of dedicated citizens volunteered and came together with a shared goal of improving their street's environment. Their determination stemmed from participating in a citizen science project focused on heat stress, which revealed alarming results about the severity of heat stress experienced in certain areas. Some citizens possessed substantial expertise. Some of the expertise was gained through participation in European projects, gaining valuable insights and inspiration from other cities. Additionally, they secured local subsidies to initiate a green project in their street and received support from public officers and landscape architects with relevant expertise through a pilot project. Their efforts were further bolstered by collaborating with a local NGO, which helped them access scientific expertise, including connections with professors and experts.

One citizen, in particular, had received climate change training from a boundary organisation, further enhancing their knowledge and capabilities. The engaged citizens kept themselves informed by continuously seeking information during visits to places like the city hall, where they discovered plans and ideas for cooling the city. Specifically, they explored different types of greenery to mitigate heat, manage water, and redesign the street effectively for climate change, all while fostering community bonds. The primary source of information came from bringing various experts together to collaboratively work on the pilot project. Dissemination of information among street residents occurred through flyers and community events like planting days, garden days, farmers' markets, and festivals. The success factors in this initiative were the strong engagement of designers and local officers, who devoted their time, even during evenings and weekends, to support the citizens' endeavours. Additionally, the presence of a well-connected group of individuals with relationships with experts played a vital role in the project's success. However, the group faced some bottlenecks in engaging a significant portion of the community. Certain citizens remained negative and expressed adverse reactions.

### **Netherlands-Central**

In the context of neighbourhood improvement efforts, information is gathered from various sources, mainly depending on the preferences of the working groups involved. Some groups use TikTok for communication, while others hold more formal meetings with other neighbourhood or provincial groups to exchange knowledge. Information is also discovered online by following people on platforms like Instagram and Pinterest, and it is disseminated through newspapers and national news channels. The active participants in citizens' groups are already well-informed, making it easier for them to discuss and share ideas, like setting up a green roof, without the need for accessing scientific articles, as ample information is already available online and from fellow residents.



To ensure that citizens in the neighbourhood are kept up-to-date, communication occurs through emails and social media platforms like Facebook, Instagram, and the local newspaper (Wijkkrant). Flyers were initially used for information dissemination but faced opposition.

A significant challenge is how to keep citizens engaged and address the concerns of those who are annoyed by climate actions. It is crucial to provide clear, direct, and actionable information that can be easily understood and applied. The use of scientific jargon should be minimised as it is often too complex and irrelevant for general public consumption. Respondents have highlighted the importance of simplicity, readability, and capturing interest in the information provided.

### **Netherlands-Southern region**

We conducted interviews with respondents affiliated with two citizens' groups formed in the aftermath of an extreme event. Both groups are located in different towns affected by the event, but they share a common objective and approach.

Both groups aim to gain a deeper understanding of the event and urge responsible authorities to implement preventive measures to mitigate future occurrences. They also seek to have a voice in the development of these preventive measures.

The first community group expressed that they do not seek scientific information themselves; they believe that the government should provide them with the necessary scientific data. However, they have reviewed an evaluation report of the events conducted by a research organisation. Drawing on their personal knowledge of the area, historical flood-related events, local media news, and information from authorities and reports about the event, they analysed the report and presented arguments against the recommended preventive measures, which they consider inadequate. These arguments were shared through a formal letter and will be discussed in a forthcoming meeting facilitated by the mayor. The community group primarily addresses the responsible governmental departments and relevant NGOs, urging them to involve the group in the formulation of preventive measures. Information exchange occurs via email and face-to-face communication. Additionally, the community group has engaged with local newspapers and is collaborating with similar groups in other towns. Their success in knowledge uptake can be attributed to their strong existing network within the community and their favourable relationship with local government officials, who are arranging a meeting between the community group and relevant organisations.

The second community group, in contrast, seeks an independent investigation into the causes of the extreme event. They are dissatisfied with the existing studies, which they believe are biased and downplay issues related to poor maintenance and lack of collaboration. This group is actively seeking additional information and relies primarily on data provided by the local government, especially reports and maps. They are sceptical of information from the media and feel that responsible authorities have not adequately provided the necessary data. Due to their request for an independent investigation, the group is actively reaching out to various authorities for consultations and forming a think tank with experts from relevant domains. They collect information from the internet, receive input from authorities and former employees of responsible organisations, and share this information through local media, in-person meetings, email communication with the local council and other action groups, as well as during citizen consultations. Their success in knowledge access, uptake, and sharing is attributed to their effective relationship with the local government, which represents their viewpoints in formal discussions with other authorities. Additionally, the community group has built a comprehensive network on short notice, engaging with relevant authorities and experts willing to participate in the think tank. Information among citizens is disseminated through newsletters (email) and during meetings initiated by the foundation.



### **Belgium-Vesder**

Prior to the flood event, citizens went door-to-door to warn others to evacuate their houses.

After the extreme event, a group of citizens came forward. They formed groups to assist the victims, offering support by cleaning houses, providing food, and distributing materials. These groups were informal but came together with a shared goal to help the affected individuals. Even long after the extreme events, some citizens continued to dedicate their spare time to aid the victims.

Initially, their focus was on providing emergency support, but over time, they transformed into a movement of people advocating for a different way of living. The respondent recounted a complex situation. The government's emergency response was slow in starting. This created a sense of being neglected among the victims, perceiving that the government did not care enough about them. Later on, formal emergency and support organisations assumed coordinating roles, distributing materials, securing funding, and initiating recovery projects. Consultation meetings were held, and they reached out to each affected household to offer assistance.

However, there still remains a part of the community, particularly those from lower-income households, who feel they did not receive adequate information about what happened, the recovery plans, and measures to prevent future events.

Regarding information-seeking, the respondent, like many others in the community, sought answers to two primary questions: how did this happen, and who is responsible? Secondly, x sought information about climate change, how to address it, and what measures were being taken to assist the local population. To access this information, x relied on membership in formal committees, attending community meetings, social media platforms, local and national news (TV, radio, and newspapers), magazines, as well as discussions with colleagues, peers, and friends.

The respondent explained that this knowledge helped to broaden perspectives within the community. However, when it came to rebuilding their own house, there was little time or mental space to delve into information about sustainable reconstruction. Like most people, x was in survival mode for an extended period, and the thought of seeking information for more sustainable rebuilding did not immediately cross their minds.





## Project partners



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