Deliverable 2.3

Pilots' definition and user requirements definition

27 Sep 2024

Pilots / User Requirements

Deliverable Number	D2.3	
Deliverable Name	Pilots' definition and user requirements definition	
Work Package	WP2	
Related Task	2.4	
Lead Beneficiary	CATAA	
Type	R	
Dissemination Level	PU	
Authors	Ana T. Eugénio [CATAA] Ana Rodrigues [CATAA] Carolina Azeitona [CATAA] Christophe Espírito Santo [CATAA] Inês Brandão [CATAA] Mário Cristóvão [CATAA]	Beatrice Gobbo [POLIMI] Odysseas Spyroglou [TRUENIQUE LTD.] Tassos Kanellos [ITML]
Reviewers	R1: Marc Bonazountas [EPSILON] R2: Emma Symes [FIPL]	
Version	FINAL (V3)	
Due Date	30/09/2024	

REVISION AND HISTORY CHART

Version	Date	Author/Reviewer	Summary of changes
V0	07/09/2024	CATAA	1st Draft for review
R1	13/09/24	Markos Bonazountas [EPS]	Revised 1st Draft
V1	19/09/2024	CATAA	2nd Draft for review
R2	23/09/2024	Emma Symes [FIPL]	Revised 2nd Draft
V3	27/09/2024	CATAA	Pre-final for Coordinator review
FINAL	30/09/2024	Odysseas Spyroglou [TRQ]	Final for submission

TABLE OF CONTENTS

INDEX OF FIGURES

INDEX OF TABLES

ABBREVIATIONS

Abbreviation	Full name
AI	Artificial Intelligence
EU	European Union
GDPR	General Data Protection Regulation
SLP	Social Leverage Point(s)
STP	Social Tipping Point(s)
UC	User Case

EXECUTIVE SUMMARY

The NEUROCLIMA project aims at promoting systemic transformations and citizen engagement towards climate resilience and adaptation. By creating an integrated "nervous system" to connect policymakers, climate communicators, educational institutions, and citizens, this project leverages both human and artificial intelligence (AI) to support dissemination and decision-making processes. These processes are designed to be clear, trustworthy, reactive, and proactive in response to environmental changes and societal concerns.

NEUROCLIMA's Deliverable 2.3 details the user and pilot requirements for Work Package 6, including the Objectives and Framework, User Group Identification, User Requirements Elicitation Methodology, User Requirements Definition, Stakeholder Engagement Plan, Design, Setup and Evaluation, Risks and Mitigation Strategies, and Data Collection and Analysis Plan.

Objectives and framework

In this project, pilots will be deployed to evaluate the impact and applicability of NEUROCLIMA's monitoring, engagement and educational tools. Although each pilot has different objectives and user groups, they share the common goal of increasing citizen literacy in climate change, policies, and adaptation strategies. These pilots will involve diverse stakeholders and users across six European countries (Cyprus, Belgium, Greece, Ireland, Italy, and Portugal), through workshops and activities in multiple sites, organised in iterative phases to promote continuous deployment, assessment, and validation of the tools.

The NEUROCLIMA pilot framework is designed to operationalize the project's objectives by capitalising on social tipping and leverage points to drive behavioural change towards climate change adaptation, cultivating climate literacy and informing citizens about the green transition through innovative educational and engagement approaches.

User Group Identification

By understanding the demographics and characteristics of its target user groups, NEUROCLIMA tailors its tools, methodologies, and educational resources to meet their specific needs. This approach ensures the pilot studies are relevant and effective in fostering climate resilience and citizen engagement across the EU.

User Requirements Elicitation Methodology

The methodology for user requirements gathering in the project combines multiple approaches to capture comprehensive insights from diverse users. By employing surveys, interviews and workshops, the project ensures that needs, preferences, and challenges are thoroughly understood and addressed, ultimately leading to the development of effective tools and resources for climate resilience and citizen engagement.

User Requirements Specifications

A comprehensive list of user requirements ensures that the developed tools and systems are functional, usable, and accessible to all intended user groups.

Stakeholder Engagement Plan

The Stakeholder Engagement Plan is designed to ensure that the pilots are relevant, effective, and responsive to the needs of diverse stakeholders. By fostering dialogue, collaboration, and feedback, the project aims to build a robust, inclusive, and impactful framework for climate resilience and citizen engagement across diverse EU countries.

Pilot design, Set up and Evaluation

Pilots will involve the use of NEUROCLIMA's AI monitoring tools, digital learning platforms, and creative engagement methods by different users, which will be followed by careful monitoring and feedback, to ensure that the pilots meet their objectives and contribute significantly to the overarching goals of this project.

Risk and Mitigation Strategies

By identifying risks and implementing proactive mitigation strategies, this project is minimising potential disruptions and maximising the success of its pilot studies. Continuous monitoring and adaptation will be key to addressing emerging risks and ensuring the pilots achieve their intended outcomes.

Data Collection and Analysis

This project's plan for data collection and analysis ensures rigorous and comprehensive evaluation of its pilots, facilitating evidence-based decision-making and continuous improvement. By combining quantitative metrics with qualitative insights, the plan aims to provide a holistic understanding of pilot performance and impact.

Conclusion

In conclusion, through detailed execution plans, continuous monitoring, and feedback mechanisms, the NEUROCLIMA project aims to meet its objectives and significantly contribute to climate resilience and citizen engagement. By carefully addressing pilot and user requirements, the project strives to ensure the success of its studies and the broader goals of enhancing climate literacy and fostering behavioural change across different EU societies.

1 About NEUROCLIMA

*NEUROCLIMA is a European project (Jan 2024 – Dec 2026)[1], that aims to raise awareness, provide best practices, and ensure **sustainable use of climate change adaptation and resilience solutions. NEUROCLIMA leverages both human and artificial intelligence (AI) to support dissemination and communication strategies**, it collaborates with other EU-funded initiatives, develops viable business models, standardises outcomes, and invests in frameworks and toolkits addressing citizen and stakeholder needs and climate change challenges. NEUROCLIMA's impact through the use, commercial and other, may span well over 2030.*

This present deliverable, D2.3, provides detailed information on the Pilots and User requirements to be implemented in *Work Package 6 ("Use Case Deployment, Operation, Validation and Assessment")* of this project. It outlines the pilot's objectives, framework, target user groups, engagement methodology, user requirements, pilot design and setup, evaluation methods, risk mitigation strategies, data collection and analysis processes.

T2.1: Defining and capitalising upon social tipping and leverage points: setting the landscapes	T2.2: Setting the theoretical base for the implementation of climate change adaptation	T2.3: Evidence mapping on climate-related policies and EU missions and impact assessment for long-term sustainability	T2.4 User requirement elicitation and pilots definition	T2.5: Technical and operational requirements analysis and architecture blueprint
The science base behind behavioural change for climate	Knowledge Framework for Climate Adaptation Actions	Lessons learned. Benefits and Opportunities for EU societies	Use-case scenarios. Storyboards and workflow. End user requirements.	Technical Specifications of each system component
D2.1 Ethnographic research review and innovation landscape analysis on social tipping and leverage points		**D2.4 Mapping on climate-related policies and EU missions and impact assessment for long-term sustainability**	**D2.3 Pilots definition and user requirements definition**	**D2.2 Technical, operational and interoperability specifications and reference architecture**
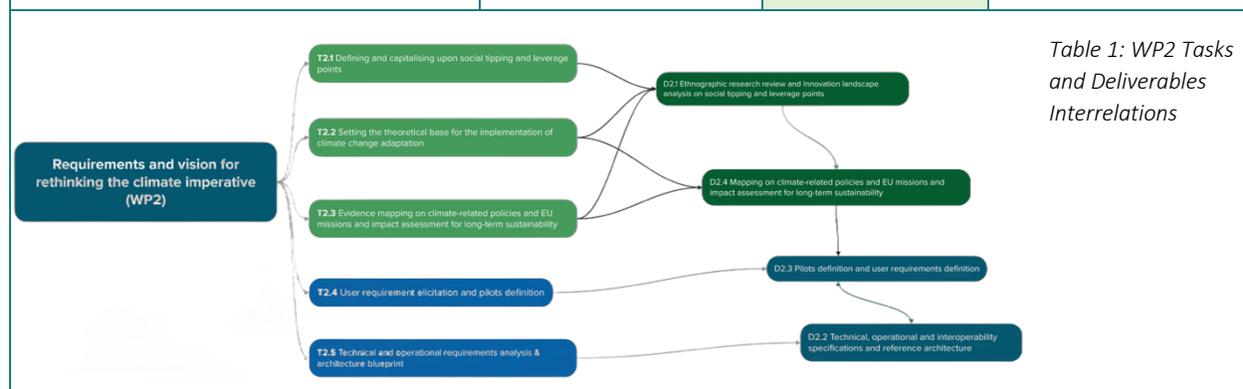
Table 1: WP2 Tasks and Deliverables Interrelations

---

[1] Research and Innovation Action (RIA) funded by the EU under the Horizon Europe program (HORIZON-CL5-2023-D1-01-09).

Within this project, **two pilots will be deployed to evaluate the impact of the proposed innovations and demonstrate their applicability across various domains and scenarios**. The pilots will focus on applying the proposed services, interfaces, and approaches, aiming to increase user engagement, and promotion of climate adaptation through participatory design, and creative expression. Each pilot will include two representative use cases; the ultimate goal is for a gain in skills that can evaluate the data presented in the media resulting in a rise of 70% climate literacy by the users.

2 Introduction to the deliverable

2.1 Objectives of the Pilot Studies

Currently, most citizens obtain information about climate change online, through news channels, blogs, and social media, amongst other digital sources. However, this abundance of information is frequently unverified and even contradictory, which makes it difficult to discern between valid and non-valid data, leading to confusion and suspicion (Figure 1**).**

The NEUROCLIMA project will deploy two pilots to evaluate the impact of its proposed innovations and their applicability across various domains. These pilots will utilise the project's monitoring infrastructure, frameworks, and engagement mechanisms to test and demonstrate the effectiveness of the EU Adaptation Strategy and the Mission on Adaptation to Climate Change. Although each pilot has different objectives and users, they share the ultimate goal of increasing citizen literacy in climate change phenomena, policies, and adaptation strategies.

Each pilot will explore two key areas:

- *the application of services and approaches by researchers and citizens*, and
- *the promotion of climate adaptation through participatory design, creative arts, and democratic engagement.*

The pilots will feature two representative use cases each and will involve diverse stakeholders through workshops and activities across multiple sites. The pilot study will be organised in different phases (Table 3), in order to promote and encourage an iterative process of deployment, assessment and validation.

The verification methods include training sessions, engagement with policymakers, researchers, students, and educators, and the creation of datasets on learning analytics related to democratic participation. Our goal is for at least 70% of participants to gain new climate literacy skills.
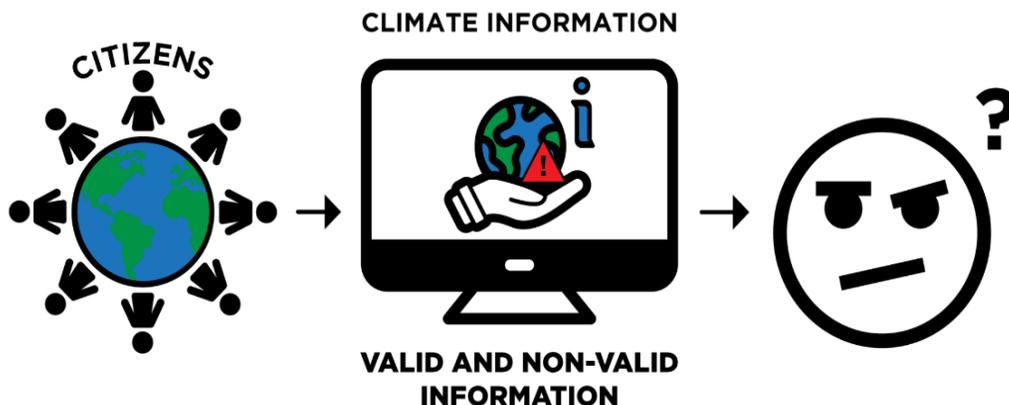
Figure 1: Scheme depicting how the abundance of unverified information online about Climate Change can confuse citizens who aim at being informed.

2.2 Pilot 1: Capitalising upon social tipping points and leverage points for behavioural change towards climate change adaptation

The first step includes finding valid and trustworthy online sources on climate change and respective policies and adaptation strategies and organising this data in different categories (discourses/speeches, policies, actions, initiatives, scientific data, news, EU policies, etc.) that will form the foundation of the project AI monitoring tool. To that end, the consortium has prepared a joint document on "Data Resources" with these categories. This resource is crucial for the technical partners in developing the tools required for the project.

Ideally, data sources are explored using Application Programming Interfaces (APIs) to ensure uninterrupted connectivity and seamless integration. Pilot 1 will test the efficiency of this tool in finding social tipping and leverage points for climate change adaptation. The pilot will work with two types of users: (i) journalists and content creators, and (ii) policy and decision-makers (**Figure 2**). With this Pilot, the AI monitoring tool will be revised and finalised, according to user feedback.

This pilot will be performed in five countries: **Portugal, Cyprus, Belgium, Ireland** and **Greece**, and run for **eight months**.
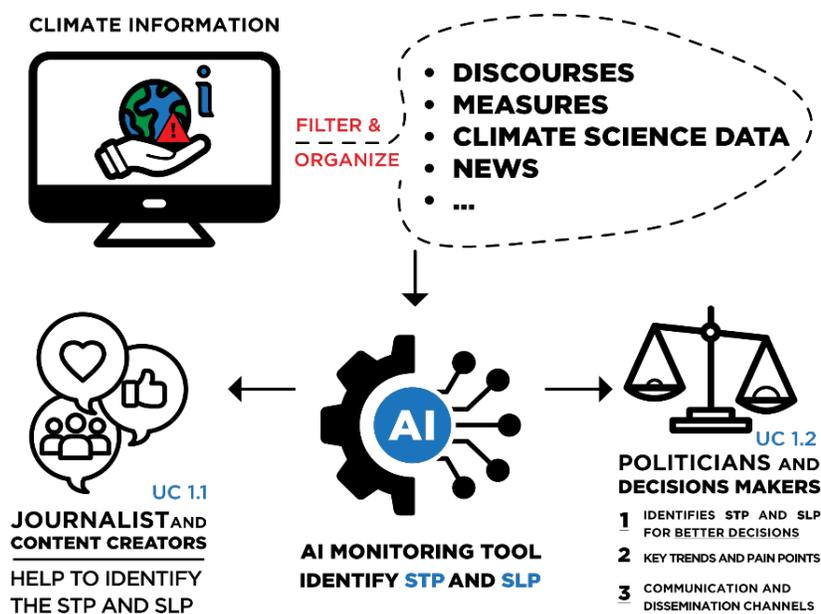
Figure 2: Scheme of Pilot 1. Data on climate policies and adaptation strategies will be filtered for validation and organized in different categories (such as discourses, measures applied, climate science data and news articles). This data will then be used to develop an AI monitoring tool that will help identifying social tipping points (STP) and social leverage points (SLP). In User Case (UC) 1.1, journalists and content creators will test the usability of this AI tool in identifying STPs and SLPs, and to fight misinformation. In UC 1.2, politicians and decision makers will be introduced to the AI tool platform to identify STPs, SLPs, key trends and pain points the citizens care about and test the platform's usefulness in communicating and disseminating climate policies.

UC 1.1: Measuring the impact of AI monitoring tools, traditional and experimental information approaches and tools on identifying social tipping and leverage points

The implementation of NEUROCLIMA's proposed AI monitoring tools will be tested by journalists and content creators to identify societal expectations, needs, pain points, and social tipping and leverage points about climate change. The pilot will proceed with participatory learning groups and workshops.

UC 1.2: Measuring the impact of AI monitoring tools for policies/decision makers towards identifying and activating social tipping and leverage points for climate change adaptation

The implementation of NEUROCLIMA's proposed AI monitoring tools will be tested by policymakers and decision-makers via workshops to assess the usefulness of the tools in getting acquainted with climate change and climate change mitigation and adaptation strategies. The use case will investigate the usefulness of the tools throughout the policymaking cycle and at local, regional, and national levels.

2.3 Pilot 2: Cultivating climate literacy and informing citizens about the impact of initiatives for the green transition through blended learning experiences and creative expression for the implementation of climate change adaptation

Pilot 2 focuses on the impact of different tools for participation, information, engagement and education of citizens and students for the implementation of behavioural and systemic change in the scope of climate change adaptation (**Figure 3**). From one side, information and education tools will be assessed, while, on the other hand, toolkits for creative expression around the climate imperative proposed by the project (platform) will be presented, applied and assessed through participatory activities.
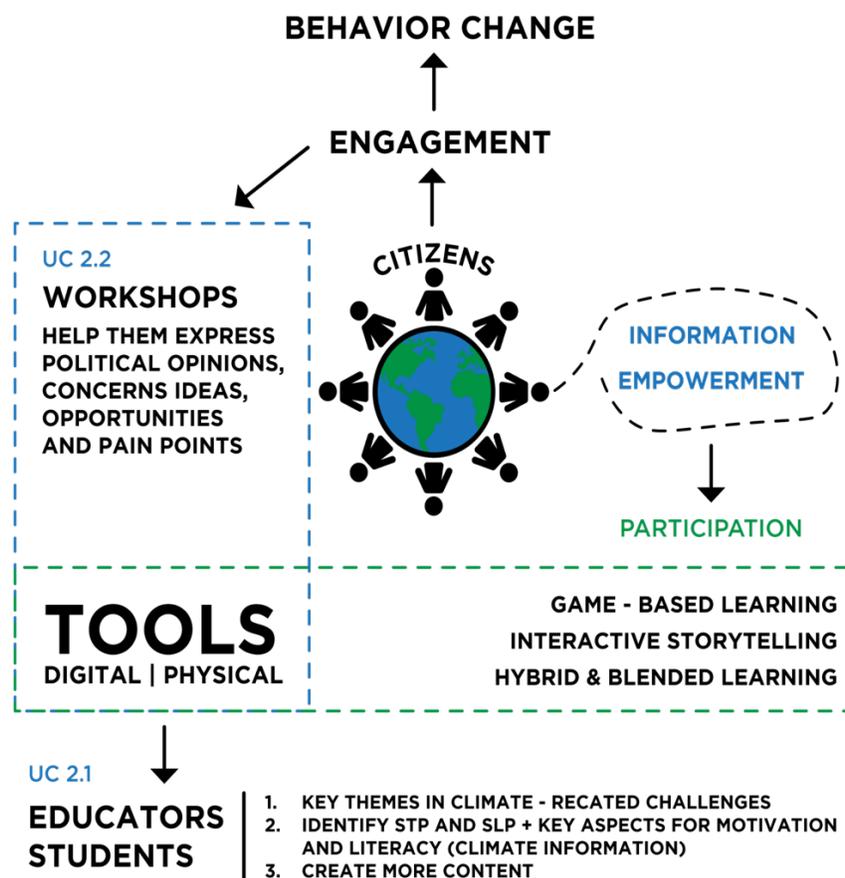
Figure 3: Scheme of Pilot 2: informative and educational tools will be developed to increase Climate literacy. In UC 2.1, tools based in game-based learning, interactive storytelling, and hybrid and blended learning, will be used by educators and students to find information about key themes in climate change and its impact, and to help identifying STPs and SLPs. In UC 2.2, through participatory design and creative expression methods implemented in workshops, citizens will develop their ability to express informed opinions, concerns, ideas and pain points on climate change adaptation strategies. UC 2.1: Implementing behavioural and systemic change through blended learning tools, participatory design and interactive storytelling

2.2.1. UC 2.1: Implementing behavioural and systemic change through blended learning tools, participatory design and interactive storytelling

This use case examines the impact of innovative engagement and learning approaches, such as gamification, game-based learning, interactive storytelling, and hybrid and blended learning, by integrating digital tools into climate literacy education.

These tools have the potential to activate social tipping points and leverage behavioural change towards climate change adaptation. By offering playful experiences and tailored hybrid learning tools, the project seeks to achieve two main objectives:

    (i)   inform educators and students about how adaptation efforts affect their lives, and

    (ii)   educate them on the broader impacts of the green transition, climate change, and other key sustainability themes. The partners recognize the need to test these educational tools developed in earlier project phases to evaluate their effectiveness with the target groups.

UC 2.2: Participatory design and creative expression as the driving force for the implementation of climate change adaptation.

This use case explores how various forms of citizen expression, such as creative writing, cinematography, and performing arts, influence citizen engagement, participation, and investment in decision-making and the enforcement of new measures within the green transition framework. By utilising citizen expression as a versatile communication tool across different media, the use case includes the implementation of diverse workshops in each country.

These activities will encourage citizens and students to reflect on the challenges and opportunities presented by current and new initiatives in the green transition, as well as their societal impacts.

3 Pilot Framework Introduction

The project is based on a living lab approach (Abowd, G. D., et al, 2000), meaning the work will be closely situated in real-world settings, utilising an iterative process of design, implementation, analysis, and revision. The pilot cases operate in this manner, employing a wide range of traditional and experimental tools and approaches aimed at behavioural change and citizen engagement.

3.1 Pilot Framework Goals

The NEUROCLIMA pilot framework is designed to operationalize the project's objectives by focusing on two main goals:

(i)   capitalising on social tipping and leverage points to drive behavioural change towards climate change adaptation, and

(ii)   cultivating climate literacy and informing citizens about the green transition through innovative educational and engagement approaches.

3.2 Structure of the Pilot Studies

The pilot framework is structured around two primary pilot studies, each encompassing specific use cases designed to address distinct aspects of climate change adaptation and citizen engagement (**Table 1**). The planning and roll out of the pilots is coordinated with the release versions of the tools (**Table 2**).

Table 2: Structure of the two pilots for the NEUROCLIMA project, each with two user cases.

Pilot	Focus	UC	Target Group	Implementation
1	How novel AI monitoring tools and social, economic, and political methodologies can aid policymakers, decision-makers, journalists, and content creators in contributing to climate change adaptation.	1.1	Journalists and content creators	📍Portugal, Greece, Ireland, Belgium, and Cyprus. 🧮**100** Journalists and Influencer
		1.2	Policy makers	📍Portugal, Greece, Ireland, Belgium, and Cyprus. 🧮**100** policy and decision makers
2	Impact assessment of educational, engagement, and informational tools on climate literacy and citizen involvement in climate change adaptation.	2.1	Educators, students, and citizens	📍Italy, Portugal, Cyprus, Greece, and Ireland. 🧮**1500** students, **50** educators, **1500** citizens
		2.2	Citizens and youth workers	📍Italy, Portugal, Cyprus, Greece, and Ireland. 🧮**1500** citizens and **50** youth workers.

		Year 1												Year 2												Year 3											
		Q1			Q2			Q3			Q4			Q5			Q6			Q7			Q8			Q9			Q10			Q11			Q12		
		M01	M02	M03	M04	M05	M06	M07	M08	M09	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36

Table 3: Timeline for the planning and development of the pilots for the NEUROCLIMA project.

Row labels (left to right, top to bottom):

WP6
- T6.1 — The NEUROCLIMA pilot cases' planning and evaluation framework
- T6.2 — Pilot 1
- T6.3 — Pilot 2
- T6.4 — Cross-pilot validation and assessment
- T6.5 — Scaling out and the transferability of NEUROCLIMA results

NEUROCLIMA Portal and Pilots
- Minimum Valuable Product Platform (MVP)
- Release 1
- Release 2

MVP
- Pilot dissemination / outreach activities to attract participants
- Partners involved in pilot organization review the MVP and provide feedback to technical partners
- Recruitment of pilot participants
- Organisation of workshops with experts for deliberation that will produce datasets to be analysed by NEUROCLIMA AI solution
- Development of R1

Release 1
- Technical partners perform revisions to NEUROCLIMA solution based on received feedbak
- WP6 Leader delivers initial sample of first workshop datasets to technical partners
- WP6 Leader delivers final version of complete workshop datasets to technical partner
- Technical partners add datasets received from pilot workshops to the system and analyse them
- Educators recruited as pilot participants for UC2.1 use the e-Learning Tool (T5.2) to add educational content
- Organisation of main UC2.2 workshops based on implementation of toolkits
- Preparatory activities for UC1.1, UC1.2, UC2.1 (e.g., training)
- Partners involved in pilot organization and small focus groups of recruited pilot participants use the R1 and provide feedback to technical partners
- Development of R2

Release 2
- Broader audience and testing (scaling out & transfer results)

Rollout of pilots
- UC1.1: Journalists use the solution to help them write articles (they deliver the articles in the end as a proof of concept)
- UC1.2: Policy-makers use the solution to help them assemble propositions for new legislation initiatives
- UC1.2: Policy-makers use the solution to expose their propositions to the public in an online deliberation context and citizens provide feedback
- UC2.1: Students use the solution to access the educational material added by educators and perform relevant activities in a hybrid learning context.
- UC2.1: Students use the game-based learning application
- UC2.2: Interested parties access the solution to be informed about the NEUROCLIMA toolkit
- Participants provide their feedback regarding the solution (e.g., on usability) using structured interviews and surveys/questionnaires.
- Other data related to pilot evaluation are collected

Outocomes
- Delivery of D4.2 'Final version of the NEUROCLIMA climate-sensitive policy co-creation framework'
- Delivery of D5.3 'Green policy composition and decision making assistant'
- WP6 Leader releases all collected data from pilots to all partners for analysis
- Analysis of data collected from pilots for evaluation purposes
- Delivery of D5.2 'NEUROCLIMA Integrated Solution'
- Delivery of D6.2 'NEUROCLIMA pilots evaluation and transferability of outcomes'

3.3   Pilot 1: Capitalising on Social Tipping and Leverage Points for Behavioural Change

Focus

This pilot explores how novel AI monitoring tools and social, economic, and political methodologies can aid policymakers, decision-makers, journalists, and content creators in contributing to climate change adaptation.

Use Cases (UC)

UC 1.1: Measuring the impact of AI monitoring tools and informational approaches on identifying social tipping and leverage points.	UC 1.2: Assessing the effectiveness of AI monitoring tools for identification and activation of social tipping and leverage points.
Target Groups: Journalists and content creators.	**Target Groups:** Policymakers.

Implementation

This pilot will be conducted across multiple sites in five countries (Portugal, Greece, Ireland, Belgium, and Cyprus), involving 100 journalists and content creators and 100 policymakers (**Figure 4**).
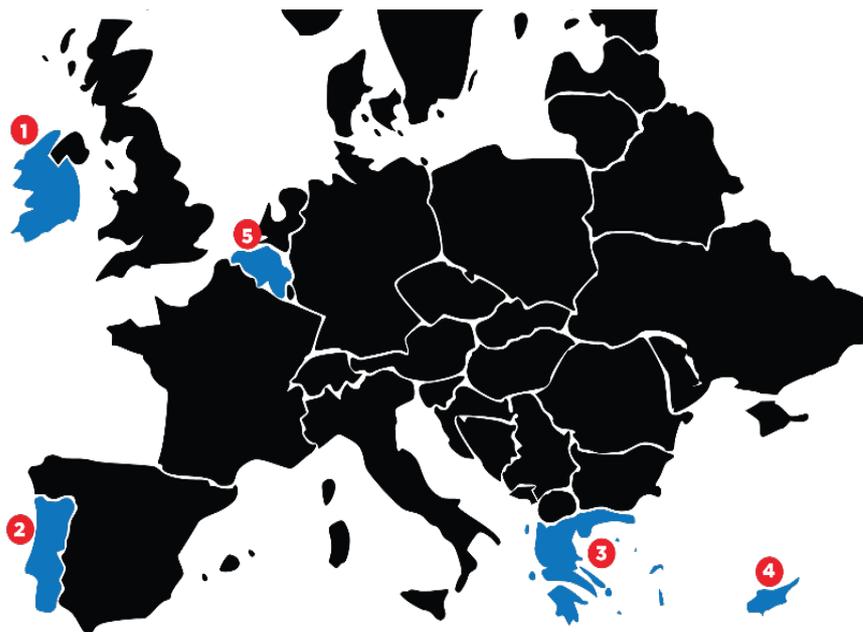
Figure 4: European countries in which Pilot 1 will take place: 1) Ireland; 2) Portugal; 3) Greece; 4) Cyprus; 5) Belgium.

3.4 Pilot 2: Cultivating Climate Literacy and Citizen Engagement

Focus

This pilot examines the impact of educational, engagement, and informational tools on climate literacy and citizen involvement in climate change adaptation.

Use Cases (UC)

Use Case 2.1: Implementing behavioural and systemic change through blended learning tools, participatory design, and interactive storytelling.	Use Case 2.2: Promoting participatory design and creative expression as a means of driving climate change adaptation.
Target Groups: educators, students and citizens.	**Target Groups:** Citizens and youth workers.

Implementation

This pilot will also be conducted across multiple sites in five countries (Italy, Portugal, Cyprus, Greece, and Ireland), involving 1500 citizens, 1500 students, and 50 educators (**Figure 5**).

Figure 5: European countries in which Pilot 2 will take place: 1) Ireland; 2) Portugal; 3) Greece; 4) Cyprus; 5) Italy.

3.5   Pilots Implementation and Methodology

Design and Execution

Each pilot and use case will follow a structured design, implementation, and assessment process, tailored to the specific local and national contexts of the participating countries. This approach ensures the relevance and effectiveness of the tools and methodologies developed as well as the iteration process.

Monitoring and Evaluation

Robust mechanisms will be established to monitor progress, collect feedback, and evaluate the outcomes of the pilots. The use of AI tools and learning analytics will be instrumental in assessing the impact and effectiveness of the proposed interventions.

3.6   Expected Outcomes and Impact

Behavioural Change

The NEUROCLIMA tool will allow for the identification and activation of social tipping points and leverage points, which can lead to better-informed and more impactful policymaking. The tool will have enhanced capabilities for journalists, content creators and policymakers to navigate and filter climate-related information effectively.

Climate Literacy

Citizens will be able to use NEUROCLIMA to gain an improved understanding of and engagement with climate-related issues. To this end, NEUROCLIMA will develop and disseminate educational content and curricula tailored to climate literacy needs. Furthermore, there will be fora in which policymakers can request feedback from citizens on climate-related proposals.

Systemic Transformation

If successful, bidirectional communication between citizens and policymakers will be strengthened via the use of NEUROCLIMA, leading to more concrete recommendations and tools for achieving climate resilience and adaptation strategies across the EU. It will also lead to greater peer-to-peer understanding on climate-related issues, mitigating the polarisation of the user base.

See the summary of the pilot's framework in **Figure 6**.
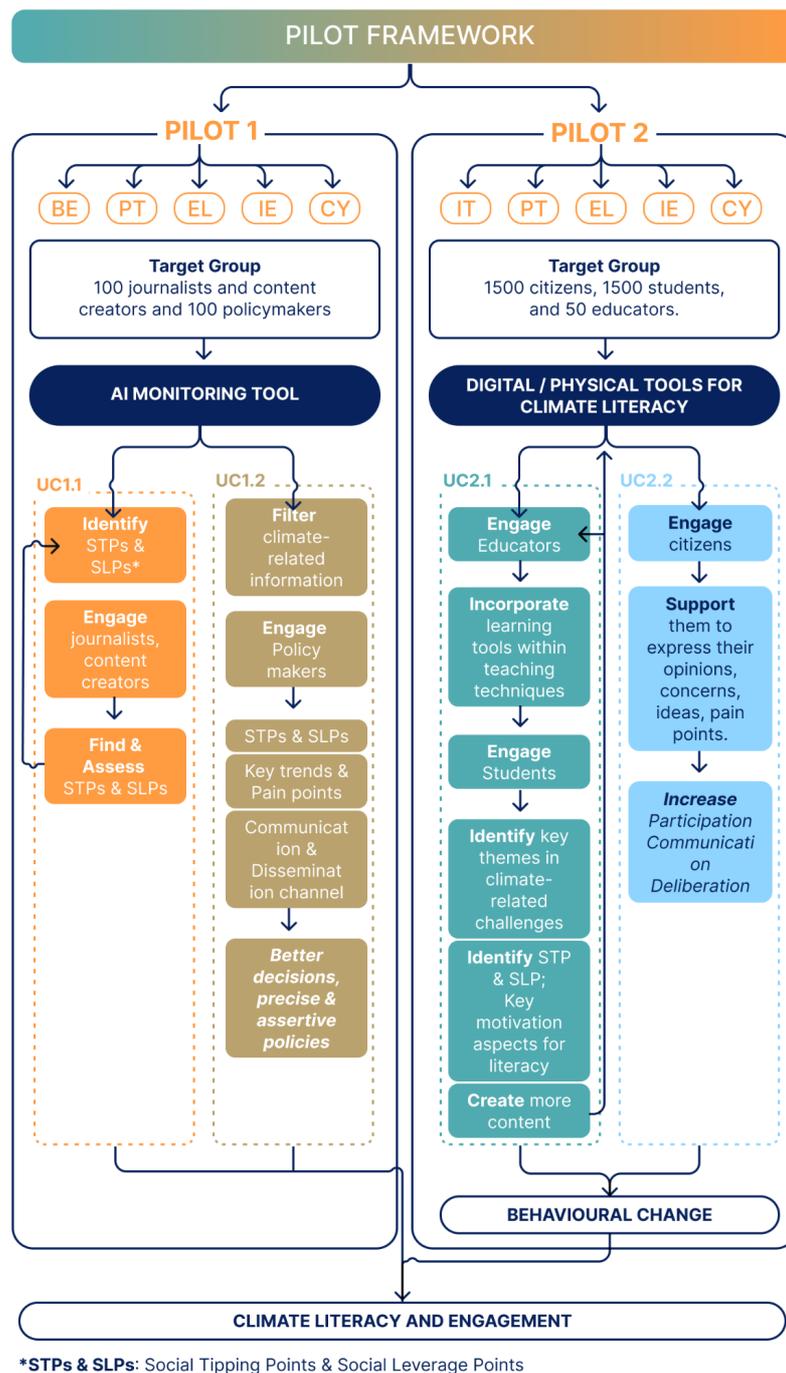
Figure 6: Schematic representation of the pilot's framework.

4 User Group Identification

Identifying the target user groups is critical to the successful implementation of the NEUROCLIMA project's pilot studies, ensuring that the tools, methodologies, and educational resources are tailored to their specific needs and contexts.

4.1 Pilot 1: Capitalising on Social Tipping Points for Behavioural Change

UC 1.1 - Journalists and Content Creators

Demographics:

- Age Range: 25-65 years old.
- Geographical Spread: Journalists and content creators from Portugal, Greece, Ireland, Belgium, and Cyprus.
- Professional Background: Professionals working in print, broadcast, and digital media, including social media influencers and bloggers.

Characteristics:

- Information Gatekeepers: As key figures in the dissemination of information, they play a crucial role in shaping public opinion and promoting climate literacy.
- Tech-Savvy: Generally comfortable with digital tools and platforms, with varying levels of expertise in AI and data analysis.
- Motivations: Driven by a desire to provide accurate, timely information to the public and combat misinformation, particularly in the context of climate change.

UC 1.2 - Policymakers and Decision Makers

Demographics:

- Age Range: + 25 years old.
- Geographical Spread: Policymakers and decision makers from Portugal, Greece, Ireland, Belgium, and Cyprus.
- Professional Background: Individuals holding positions in government agencies, environmental regulatory bodies, and policy advisory roles.

Characteristics:

- Decision Makers: Responsible for formulating and implementing policies related to climate change adaptation and resilience.
- Data-Driven: Highly reliant on accurate, evidence-based information to make informed policy decisions.
- Challenges: Often face information overload and need tools to efficiently process and synthesise large volumes of data.

4.2 Pilot 2: Cultivating Climate Literacy and Citizen Engagement

UC 2.1 - Educators and Students

Demographics:

- Educators:
  - Age Range: 20-65 years old.
  - Geographical Spread: Educators from Italy, Portugal, Cyprus, Greece, and Ireland.
  - Professional Background: Teachers, professors, and educational administrators at primary, secondary, and tertiary levels.
- Students:
  - Age Range: +8 years old.
  - Geographical Spread: Students from Italy, Portugal, Cyprus, Greece, and Ireland.
  - Ranging from Primary Schools to Senior Universities, but primarily high school students.

Characteristics:

- Educators:
  - Curriculum Developers: Responsible for integrating climate literacy into educational programs.
  - Tech-Enhanced Learning: Increasingly incorporating digital tools and blended learning approaches into their teaching.
  - Motivations: Aim to inspire and educate the next generation about climate change and sustainability using traditional and/or innovative tools (being creative and thinking outside-the box)
- Students:
  - Digital Natives: Generally comfortable with using digital technologies and online learning platforms.
  - Curious and Engaged: Eager to learn about climate change and participate in activities that foster environmental stewardship.
  - Challenges: Varying levels of baseline knowledge about climate issues and access to educational resources.

UC 2.2 Citizens and Community Groups

Demographics:

- Age Range: All age groups, primarily with a focus on active community members aged 18-65.

- Geographical Spread: Citizens from Italy, Portugal, Cyprus, Greece, and Ireland.

- Community Background: Includes members of local community organisations, NGOs, and informal citizen groups interested in environmental issues.

Characteristics:

- Engaged Citizens: Actively involved in community activities and initiatives related to environmental sustainability.

- Diverse Perspectives: Represent a broad spectrum of socioeconomic, cultural, and educational backgrounds.

- Motivations: Driven by a desire to contribute to their community's well-being and advocate for effective climate change adaptation measures.

5   User Requirements Elicitation Methodology

This section outlines the comprehensive methodology used to gather user requirements, ensuring that the needs, preferences, and challenges of the target user groups are thoroughly understood and addressed.

5.1   Overview of Methodology

The methodology for user requirements gathering combines qualitative and quantitative approaches to capture a wide range of insights from diverse stakeholders. The key methods employed include surveys, interviews, workshops, and focus groups, each serving a distinct purpose in the overall data collection strategy.

5.1.1 Surveys

- Purpose:
    - To collect quantitative data on user needs, preferences, and challenges.
    - To reach a broad audience efficiently and gather insights.
- Process:
    - Design: Develop structured questionnaires tailored to each user group (e.g., policymakers, journalists, educators, etc.).
    - Distribution: Use online survey platforms (Google Forms) to distribute surveys via email, social media, and project websites. Leverage partner networks to reach a wider audience.
    - Analysis: Use statistical tools to analyse survey data, identifying common themes, trends, and key user requirements.
- Key Focus Areas:
    - Awareness and understanding of climate change adaptation.
    - Specific needs and pain points related to climate literacy and engagement.
    - Preferences for tools, resources, and communication channels.

An initial survey was conducted between August and September of 2024. The questions were presented in the Google Forms software and publicised in NEUROCLIMA's social media platforms (**Figure 7**), as well as through mailing lists of potential stakeholders.

The full data collected from the survey responses can be found in ANNEX I.

56 anonymous responses were submitted in response to the survey, from which 28.6% were from regular citizens, 21.4% from policymaker representatives, 21.4% from educators or related professionals, 14.3% from students, 8.9% from journalists or content creators, and 5.4% from artists potentially interested in participating in the pilots.

Figure 7: "Call to action" image shared on social media to encourage participation in the survey.

Pilot's UC 1.1., target users are journalists and content creators. The responses from these users in the survey indicated a prevalence of online research and interviews to write articles, for which fact-checking websites and cross-referencing multiple sources are the most used tools to verify the authenticity of information. In fact, they consider that the access to reliable

sources and the ability to verify information are the biggest challenges they face to produce truthful and relevant content for their audiences.

Focusing on the topic of climate change adaptation, the methods these users currently utilise to identify potential tipping or leverage points are mostly social media analytics and trend analysis tools, and they assess the potential impact of their content by the feedback of readers. Finally, for NEUROCLIMA's AI platform solution, they believe the most important feature will be an advanced search algorithm to find credible sources, which is transparent in its methodology, and that will result in the improvement in quality and accuracy of their content.

For Pilot's UC 1.2., target users are policymakers. The users from this category that responded to the survey were predominantly local government officials and policy advisors or analysts, working in Environment departments. For developing policies, these users typically gather information from academic research data, by consulting experts, and by accessing governmental reports. On climate change adaptation, they identify social or leverage tipping points from data obtained in case/pilot studies and by stakeholder/third parties' consultations and consider that the biggest challenges for the identification and activation of these tipping points are related to the lack of reliable and adequate data, public resistance to change, and political opposition. For NEUROCLIMA's AI platform solution, these target users consider that the most useful features would be advanced data analysis and visualisation tools and real-time access to environmental data. They would measure this platform's usefulness in their work by a measurable impact on climate change adaptation.

Pilot's UC 2.1 is focused on students and teachers for main target users. Most users answering the survey are studying or teaching in the areas of environmental or natural sciences. They are involved in climate change learning mostly via movies/documentaries, and also by attending multimedia presentations, guest lectures and workshops. The most relevant challenges faced while teaching or learning about this subject are time constraints and restrictive curricula, but also the difficulty in finding reliable and engaging materials, the lack of budget, and keeping students interested and engaged. These users consider that the most useful features in NEUROCLIMA's learning tools would be interactive simulations and visualisations, access to up-to-date climate data, and collaborative projects/activities. They consider that multimedia elements, such as video and animation, are important for climate education, and would measure the effectiveness of NEUROCLIMA's learning tools solution by the students' level of interest and engagement, and also by the improvement of their climate literacy.

Pilot's UC 2.2 targets general citizens, and artists in particular, as users. The citizens that responded to this survey come from different areas of study and interest, and currently engage in the topic of climate change primarily through online platforms, community projects, and workshops. They mostly use tools such as art supplies, writing, and online collaboration tools for participatory design and creative expression in climate change related activities.

The biggest challenges these users face in developing these activities are the lack of resources and time, and the difficulty in integrating this subject in their agendas and finding reliable resources. The features that these users consider would be the most useful in NEUROCLIMA's solution for participatory design and creative expression activities would be resources for community engagement projects, interactive design tools, and the access to project templates and ideas. They also consider that it would be important to have multimedia elements as part of this solution, and they would measure its success by the improvement in climate literacy and the engagement levels and satisfaction of citizens in these activities.

5.1.2 Interviews

The interviews will be developed and conducted in Deliverable 2.4.

- Purpose:
  - To gather in-depth, qualitative insights from key stakeholders.
  - To explore specific issues and requirements in detail.
- Process:
  - Selection: Identify and select a diverse group of interviewees representing each target user group.
  - Conduct: Conduct semi-structured interviews, allowing for flexibility to explore topics in depth while ensuring coverage of key questions.
  - Recording and Analysis: Record interviews (with consent) and transcribe them for detailed qualitative analysis. Use thematic analysis to identify patterns and insights.
- Key Focus Areas:
  - Detailed understanding of user roles and responsibilities.
  - Specific challenges faced in implementing climate change adaptation strategies.
  - Expectations and requirements for AI monitoring tools, educational resources, and engagement frameworks.

5.1.3 User Story Map Workshops

- Purpose:
  - To engage NEUROCLIMA partners in collaborative discussions and co-design activities.
  - To validate and refine user requirements through interactive sessions.
  - To validate and revise learning methodologies.
- Process:
  - Planning: Organise in person and online workshops involving NEUROCLIMA partners.
  - Execution: Facilitate workshops using structured activities such as brainstorming sessions and scenario analysis. Encourage active participation and open dialogue.
  - Documentation and Analysis: Document workshop activities and outcomes. Analyse findings to refine user requirements and identify actionable insights.
- Key Focus Areas:
  - Design of tools and methodologies for climate change adaptation.
  - Identification of needs and pain points, and potential solutions.

6 User Requirements Specifications

The User Requirements Specifications outlines the essential requirements that the NEUROCLIMA project must meet to ensure the successful implementation of its pilots. These requirements are categorised into functionality, usability, and accessibility to cover all aspects necessary for the effective and efficient operation of the pilot systems and tools.

6.1 Functional Requirements

AI Monitoring Tool for Journalists, Content Creators and Policymakers

- **Content Verification**: Implement mechanisms to verify the trustworthiness and origin of information sources.
- **Free text keywords**: to receive recommendations while searching for topics.
- **Recommended/default keywords**: to help in topic selection.
- **Ranked results**: according to 1) potential to act as social tipping and leverage points; 2) popularity in social media; 3) how many data sources are available; 4) credibility / reliability.
- **Filters for search results**: by 1) category & sub-category; 2) target audience; 3) date; 4) geographical area (e.g., local / regional / national / EU level).
- **Save search results**: for later consultation.
- **Line-summary of each search result**: to quickly create short-lists of relevant results.
- **Short summary of each search result:** to quickly overview the result.
- **Access to original sources of search results**: for reference and to include in reports.
- **Generate data visualisations** (e.g. bar charts, geographical maps) for scientific data (e.g., statistical data, geospatial / EO data): to reinforce articles; with customizable parameters of data visualisation (e.g., order, ranges, lists).
- **Ability to upload own articles**: for 1) proof-reading; 2) improvement suggestions; 3) validation of information.
- **Chatbot**: for personalised communication.

Decision Support System for Policymakers

- **Comprehensive Monitoring Infrastructure**: data aggregated from social media, public forums, and policy-related discussions.
- **Short summary for policy search results**: summarised policies about specific topics.
- **Filters for search results based on public opinion/policy feedback**: argumentation mining and clustering, topic summarisation and provision of deliberation analytics.
- **Actionable Insights**: Provide actionable insights and recommendations based on analysed data to support policy-making decisions.
- **Tool to initiate online deliberation/discourse**: 1) invite other users for discussion and collect opinions and feedback; 2) poll mechanism; 3) data visualisation.

Learning Tools for Educators and Students

- **Personal area:** to manage created and saved resources.
- **Templates to create new educational material**: for playful interactive learning, interactive storytelling; etc.
- **Access to reliable and updated information on climate change**: easily transposable to educational material; include access to archive materials to tell local stories.
- **Sharable resources**: with other teachers/students around the world.
- **Feedback mechanism**: to evaluate and improve resources.
- **Forum / global platform**: to share ideas and to organise international seminars, webinars, workshops and collaborative projects.
- **Hybrid / Blended Learning Support**: Ensure tools support both physical and virtual learning environments.
- **Learning and Evaluation Analytics**: Implement analytics to track progress, engagement, and learning outcomes.

Engagement Platform for Citizens

- **Online Engagement Platform**: Develop a platform for participatory design and creative expression around climate change adaptation.
- **Creative Toolkit**s: Provide toolkits for creative writing, cinematography, performing arts, and other forms of expression.
- **Workshop Facilitation**: Organise and support both on-site and virtual workshops for citizen engagement.

6.2   Usability Requirements

User-Friendly Interfaces

- **Intuitive Design**: Ensure user interfaces are intuitive and easy to navigate, minimising the learning curve for users.
- **Clear Instructions**: Provide clear, concise instructions and tooltips to guide users through each tool and feature.
- **Consistency**: Maintain consistency in design and functionality across all tools and platforms.
- **Customizable Dashboards**: Provide a customizable dashboard to allow users to configure views, alerts, and reporting according to their specific needs.

Training and Support

- **Training**: Offer training sessions for all user groups to ensure they can effectively use the tools and systems; explain how the system uses to produce its search results / recommendations.
- **Ongoing Support**: Provide ongoing technical support and resources, such as user manuals, FAQs, help desks, and/or Chatbot, to assist users as needed.

Feedback Mechanisms

- **User Feedback**: Incorporate mechanisms for users to provide feedback on their experiences, issues, and suggestions for improvement.
- **Iterative Improvements**: Use feedback to make iterative improvements to the tools and systems.

6.3 Accessibility Requirements

Inclusive Design

- **Accessibility Standards**: Ensure all tools and platforms comply with relevant accessibility standards to accommodate users with disabilities.
- **User Preferences**: Allow users to customise the interface according to their preferences, including font size, colour schemes, and layout.
- **Assistive Technologies**: Ensure compatibility with assistive technologies such as screen readers, voice recognition software, and alternative input devices.
- **Responsive Design**: Develop tools with responsive design to ensure functionality across various devices and screen sizes.

Multilingual Support

- **For example:** LMM (Large Multimodal Model) tool
- **Language Options:** Provide multilingual support to accommodate the diverse linguistic backgrounds of users across different EU countries.
- **Localised Content:** Ensure content, instructions, and support materials are localised for each participating country.

7 Stakeholder Engagement Plan

Effective stakeholder engagement is crucial for the success of the NEUROCLIMA project, particularly in ensuring that the pilot studies are relevant and receive useful feedback. This section outlines the strategy and methods for engaging various stakeholders throughout the pilot studies.

7.1 Identification of Stakeholders

The NEUROCLIMA project will engage a diverse group of stakeholders across 6 regions of Europe (PT, EL, CY, IE, IT, BE), including:

- Policymakers and Decision Makers: Government officials and other policymakers involved in climate change adaptation strategies. It is important to note that climate change transverses verticals and is an important element in policymaking at large. Thus, the project also aims to engage with policy makers at all levels and sectors.
- Journalists and Content Creators: Media professionals and influencers who play a critical role in information dissemination.
- Educators and Students: Teachers and students who will use educational tools and resources developed by the project.
- Citizens and Community Groups: Members of the public, including local community groups and NGOs.
- Researchers and Academics: Experts in climate science, social sciences, and related fields.

7.2 Engagement Objectives

The primary objectives of the stakeholder engagement plan are to:

- Ensure stakeholder needs and perspectives are integrated into the pilot design and implementation.
- Facilitate continuous feedback loops to improve the tools, methodologies, and educational resources developed.
- Foster collaboration and shared understanding among stakeholders.
- Enhance the relevance, usability, and impact of the project outcomes.

7.3 Engagement Strategies

Communication and Outreach

- Initial Briefings and Workshops: Conduct initial briefings and workshops to introduce the project objectives, scope, and pilot studies to stakeholders.
- Dedicated Website and Online Platform: Develop a project website and online platform to serve as a central hub for information, resources, and stakeholder interactions.

Active Participation and Collaboration

- Stakeholder Advisory Groups: Establish advisory groups comprising representatives from each stakeholder category to provide ongoing guidance and feedback.
- Focus Groups and Interviews: Conduct focus groups and interviews with stakeholders to gather in-depth insights and specific feedback on pilot activities.

- Collaborative Workshops and Co-Design Sessions: Organise workshops and co-design sessions where stakeholders can actively participate in the development and refinement of tools and methodologies.

Feedback Mechanisms

- Surveys and Questionnaires: Distribute surveys and questionnaires to collect structured feedback from stakeholders at various stages of the pilot studies.
- A/B testing for choosing the most effective engagement (**Figure 8**).
- ELSE Test: Apply the ELSE test by evaluating the feedback to assess the effectiveness, learning, satisfaction, and efficiency of the tool. This will involve asking targeted questions to determine how well the tool meets its objectives, aids in user understanding, satisfies users, and performs efficiently.
- Interactive Feedback Mechanisms: Implement interactive feedback mechanisms, such as online forums and live Q&A sessions, to allow stakeholders to share their thoughts and suggestions in real-time.

Figure 8: Representation of the A/B split testing, a methodology for comparing two versions of something to determine which one performs better.

7.4 Specific Engagement Activities for Each Pilot

Pilot 1: Capitalising on Social Tipping Points for Behavioural Change

For Policymakers, Journalists and Content creators:

- Engagement Workshops: Host workshops to train stakeholders on the use of AI monitoring tools and methodologies.
- Feedback Sessions: Feedback sessions to discuss the effectiveness of the tools and gather suggestions for improvement.
- Pilot Testing: Involve stakeholders in pilot testing the tools in real-world scenarios and collect their experiences and insights.

Pilot 2: Cultivating Climate Literacy and Citizen Engagement

For Educators, Students, and Citizens:

- Educational Tool Training: Provide training sessions for educators on using the digital learning tools and resources.
- Participatory Design Workshops: Conduct workshops where students and citizens can contribute to the design of educational content and creative expression activities.
- Creative Expression Workshops: Organise workshops focused on creative writing, cinematography, and performing arts to engage citizens in climate-related discussions.

7.5 Monitoring and Reporting

Engagement Tracking

- Engagement Metrics: Develop metrics to track engagement levels, such as the number of participants in workshops, feedback received, and the frequency of stakeholder interactions.
- Engagement Reports: Produce regular engagement reports summarising activities, feedback, and how stakeholder input has been integrated into the project.

Adaptive Management

- Responsive Adjustments: Be prepared to make responsive adjustments to the engagement plan based on stakeholder feedback and evolving project needs.
- Transparency: Ensure transparency in how feedback is used, providing stakeholders with clear explanations of changes made as a result of their input.

8 Pilot Design & Setup

The NEUROCLIMA project aims to develop and implement a robust framework to enhance climate resilience and citizen engagement across the EU through innovative Human-AI decision support systems. This section outlines the design and technical setup of each pilot, along with the execution plan to ensure successful implementation.

8.1 Pilot 1: Capitalising on Social Tipping and Leverage Points for Behavioural Change

Pilot 1 focuses on recruiting journalists, content creators, and policymakers to familiarise them with the NEUROCLIMA solution and encourage them to use the tool's functionalities for content creation, monitoring climate-related sentiments, and drafting and discussing policy proposals.

Table 3 shows the following aspects of the Pilot 1 use cases:

- **Methods and tools setup: involves** **selecting, configuring, and preparing** the methodologies and tools that will be used throughout the use case.
- **Implementation:** the process of **executing** the project plan by putting the designed solutions, methods, and tools into action.
- **Monitoring and Feedback:** involves **continuously observing and tracking** the progress and performance of the use case to ensure it is meeting its objectives.
- **Evaluation: systematic assessment** of the project or use case to determine its success and effectiveness.

Table 4: Design aspects of Pilot 1.

UC	Methods and tools setup (B)	Implementation	Monitoring and feedback	Evaluation
1.1 **Design for Journalists and Content Creators**	Workshops: design both physical and virtual workshops to facilitate participation and gaining familiarity with the tools. Participatory design: design activities involving stakeholders in the design process to ensure the results meet their needs and are usable. Creative expression: design activities to facilitate the process of conveying thoughts, feelings, and ideas through various artistic and imaginative means.	Recruit 100 journalists and content creators from the participating countries (PT, EL, IE, BE, CY). Conduct training sessions to familiarize participants with the AI monitoring tools and the project's objectives. Rollout the pilot activities with journalists and content creators. Journalists and content creators use the monitoring tools to identify social tipping and leverage points. Participants use the dashboard to locate or create content. Provide continuous support to ensure effective usage.	Monitor usage and performance of the tools. Collect feedback from journalists and content creators via surveys and focus groups to identify areas for improvement.	Evaluate the effectiveness of the tools in enhancing climate-related content creation and dissemination. Assess data on the impact of AI tools on identifying social tipping points.

1.2 Design for Policymakers and Decision Makers	Workshops: design both physical and virtual workshops to facilitate participation and gaining familiarity with the tools. Participatory design: design activities involving stakeholders in the design process to ensure the results meet their needs and are usable. This includes timing the activities to occur in relevant phases of the policy cycle. Deliberation: design activities to facilitate the process of bidirectional communication between policymakers and citizens.	Recruit 100 policymakers and decision makers from the participating countries (PT, EL, IE, BE, CY). Conduct training workshops to introduce participants to the monitoring infrastructure and analytics tools. Rollout the pilot activities with policymakers: encourage them to navigate the monitoring infrastructure, draft policy proposals and engage with citizens for feedback. Provide continuous support to ensure effective usage.	Track the usage and impact of the decision support system. Gather feedback from policymakers through interviews and workshops to refine the tools.	Assess the effectiveness of the system in identifying and activating social tipping points. Evaluate the overall impact on policy formation and public engagement.

8.2 Pilot 2: Cultivating Climate Literacy and Citizen Engagement

The design and setup of Pilot 2 use cases result from the collaborative efforts and evaluations by WP2, WP3, WP4, and WP5. By bridging user requirements with technical requirements, and considering the current challenges and state-of-the-art frameworks, educational toolkits, and scenarios, Pilot 2 aims to empower target users (namely educators, students, citizens, community groups and youth workers) to achieve systemic and behavioural changes in the scope of climate change adaptation using the "NEUROCLIMA integrated toolkit for climate-related policy co-creation — 'The platform' / 'The Solution').

The table below shows the following aspects of the Pilot 2 use cases:

- Methods and tools setup: involves **selecting, configuring, and preparing** the methodologies and tools that will be used throughout the use case.
- Implementation: the process of **executing** the project plan by putting the designed solutions, methods, and tools into action.
- Monitoring and Feedback: involves **tracking** the progress and performance of the use case to ensure it is meeting its objectives.
- Evaluation: **systematic assessment** of the project or use case to determine its success and effectiveness.

Content creation is informed by WP3 (Framework and educational toolkits) and curated within WP5 (NEUROCLIMA Integrated solution). Implementation, monitoring, and evaluation are encompassed in WP6.

Table 5: Design aspects of Pilot 2.

Funded by
the European Union

UC	Methods and tools setup	Implementation	Monitoring and feedback	Evaluation
2.1 **Design for Educators and Students.**	Game-based learning: educational content is integrated into the game's mechanics, allowing students to learn through interactive and immersive experiences. Interactive storytelling: a narrative technique where the audience can influence the direction or outcome of the story. This method involves active participation from the audience. Blended learning tools: educational resources that combine traditional face-to-face classroom methods with online and digital media. These tools facilitate a hybrid approach to teaching and learning, leveraging the advantages of both in-person and virtual environments.	Recruit 1500 students, 50 educators in multiple sites (IT, PT, CY, EL, IE) Design training sessions of the platform for educators. Rollout the pilot activities with educators and students using participatory design strategies. Educators use the Digital Learning Tools to identify social tipping and leverage point Educators use the Content Repository to locate or create content. Educators use the Learning Analytics to assess the effectiveness of the proposed learning experience and provide personalised guidance to students. Provide continuous support to students and educators to ensure effective usage.	Monitor student engagement and learning outcomes. Collect feedback from educators and students to enhance the learning tools and resources.	Evaluate the impact of the learning tools on climate literacy and engagement. Assess the effectiveness of these learning approaches in promoting behavioural and systemic change
2.2 **Design for Citizens Community Groups and Youth Workers.**	Workshops: design both physical and virtual workshops to facilitate citizen participation and expression. Participatory design: design activities involving stakeholders in the design process to ensure the results meet their needs and are usable. Creative expression: design activities to facilitate the process of conveying thoughts, feelings, and ideas	Recruit 1500 citizens and 50 youth workers from various community groups and NGOs in the participating countries (IT, PT, CY, EL, IE). Design initial training sessions on using the engagement platform and toolkits. Rollout the pilot activities with citizens. Launch the engagement platform and distribute toolkits to participants. Conduct workshops to encourage creative expression and participatory design	Monitor the level of citizen participation and the quality of creative outputs. Gather feedback from participants to improve the engagement platform and toolkits.	Evaluate the impact of creative expression on citizen engagement and climate literacy. Assess the effectiveness of participatory design in fostering a sustainability-focused mindset.

	through various artistic and imaginative means.	activities.		

9 Pilot Evaluation Criteria

The evaluation criteria for the NEUROCLIMA pilots are designed to measure the success of each pilot in achieving its objectives. The criteria include key performance indicators (KPIs), that will provide a comprehensive assessment of the pilots' effectiveness and inform any necessary adjustments or improvements.

9.1 General Evaluation Framework

Functional Performance

- System Reliability: Measure the uptime and reliability of the AI tools, decision support systems, and engagement platforms.
- Data Accuracy: Assess the accuracy of data analysis and insights generated by the AI monitoring tools and analytics engines.

Usability

- User Satisfaction: Conduct surveys and interviews to gauge user satisfaction with the tools and platforms.
- Ease of Use: Use usability testing to measure the ease of navigation and user interface intuitiveness.
- Training Effectiveness: Assess the effectiveness of training sessions through pre- and post-training evaluations.

Engagement

- Participation Rates: Track the number of participants actively using the tools and engaging in the pilots.
- Feedback Volume: Monitor the volume and quality of feedback received from users.
- Content Interaction: Measure the level of interaction with educational and informational content, including completion rates and engagement metrics.

Impact

- Behavioural Change: Assess changes in attitudes and behaviours towards climate change adaptation among participants.
- Policy Influence: Evaluate the extent to which the pilots influence policy-making and public opinion.
- Climate Literacy: Measure improvements in climate literacy among students, educators, and citizens.

9.2 Data Collection and Analysis

Quantitative Data:

- Usage Statistics: Collect data on tool usage, content interaction, and participation rates.
- Survey Results: Analyse responses from pre- and post-pilot surveys to measure changes in knowledge, attitudes, and satisfaction.
- Performance Metrics: Monitor system performance metrics such as uptime, response times, and data processing accuracy.

Qualitative Data:

- User Feedback: Gather qualitative feedback from focus groups, interviews, and open-ended survey questions.
- Observations: Record observations from pilot implementation to identify strengths and areas for improvement.

9.3 Reporting and Review

Regular Reporting:

- Periodic Reports: Provide updates on pilot progress, highlighting key achievements and challenges.
- Interim Reports: Deliver interim reports at key milestones to review progress against KPIs and make necessary adjustments.

Final Evaluation:

- Comprehensive Assessment: Conduct a comprehensive assessment at the end of each pilot, summarising quantitative and qualitative findings.
- Recommendations: Provide recommendations for scaling and sustaining successful elements of the pilots.
- Stakeholder Review: Present the evaluation findings to stakeholders for feedback and validation.

10 Risks & Mitigation Strategies for Pilots

Identifying and addressing potential risks is crucial for the successful execution of the NEUROCLIMA project pilots, and this section outlines the key risks and proposes strategies to mitigate them effectively.

10.1 Technical Risks

Risk - Integration Complexity: Difficulty in integrating AI monitoring tools and decision support systems with existing infrastructure and content management system platforms used by journalists and policymakers.

Mitigation Strategy:

- Early Testing and Prototyping: Conduct early-stage testing and prototyping to identify integration challenges and address them proactively. Thoroughly assess technical feasibility before setting up.
- Resources: Ensure ample resources are allocated for technical assistance and problem-solving.
- Collaborative Workshops: Organise collaborative workshops involving IT teams and end-users to ensure seamless integration and functionality testing.
- Prepare backup plans for alternative data collection methods if necessary.

10.2 Operational Risks

Risk - Data Security Concerns: Potential breaches or vulnerabilities in data security when collecting, processing, and storing sensitive information from users and stakeholders.

Mitigation Strategy:

- Compliance with Data Regulations: Ensure compliance with GDPR and other relevant data protection regulations.
- Secure Infrastructure: Implement robust encryption protocols and secure data storage solutions to protect sensitive information.
- If necessary: explore more suitable anonymisation techniques.
- Some NEUROCLIMA´s partners have experience with data collection at the European level thus minimising the risk.

10.3 User Acceptance Risks

Risk - Low User Adoption: Resistance or reluctance among journalists, policymakers, educators, and citizens to adopt new AI tools and learning platforms.

Mitigation Strategy:

- User Engagement Campaigns: Launch targeted user engagement campaigns to demonstrate the benefits and usability of the tools.
- Training and Support: Provide comprehensive training sessions and ongoing support to help users familiarise themselves with the tools and overcome adoption barriers.

10.4 Stakeholder Engagement Risks

Risk - Limited Stakeholder Engagement: Challenges in engaging policymakers, educators, and community groups in the pilot activities, leading to reduced effectiveness and impact.

Mitigation Strategy:

- Stakeholder Mapping: Conduct stakeholder mapping exercises to identify key influencers and decision-makers.
- Tailored Communication: Develop tailored communication strategies to effectively communicate the benefits and relevance of the pilots to different stakeholder groups. Ensure that stakeholders understand the importance of their involvement and the benefits to the project.
- Engagement plan: Implement a comprehensive stakeholder engagement plan early in the project, including regular communication, workshops, and feedback sessions.
- Multiple channels of communication: so that engagement can reach a diverse range of stakeholders.
- Previous Experience: Thanks to previous work of the NEUROCLIMA partners, some networks are already established. The established and active networks reduce this risk.

10.5 Ethical Risks

Risk - Ethical Concerns: Any testing engaging citizens in a pilot study on climate policy raises ethical concerns.

Mitigation Strategy:

- Ensuring informed consent, avoiding coercion or manipulation, and protecting vulnerable populations from harm.

10.6 Bias and Subjectivity Risks

Risk - Misrepresentation: Users might not represent the broader public.

Mitigation Strategy:

- Careful selection of citizens is required to represent all societal traits.

10.7 Evaluation and Measurement Risks

Risk - Incomplete Data Collection: Insufficient data collection or unreliable metrics that hinder accurate evaluation of pilot performance and impact.

Mitigation Strategy:

- Comprehensive Monitoring Plan: Develop a detailed monitoring plan with predefined KPIs and data collection methods.
- Quality Assurance Checks: Implement regular quality assurance checks to ensure data accuracy and completeness throughout the pilot duration.

10.8   External Risks

Risk - Regulatory Changes: Changes in EU regulations or policies related to data privacy, climate adaptation, or educational standards that could impact pilot implementation.

Mitigation Strategy:

- Continuous Monitoring: Stay informed about regulatory developments through regular updates and consultations with legal experts.
- Flexibility in Adaptation: Maintain flexibility in pilot design and execution to adapt to regulatory changes swiftly and effectively.

10.9   Financial Risks

Risk - Budget Overruns: Unexpected costs or budget constraints that could impact the scope and scale of pilot activities.

Mitigation Strategy:

- Detailed Budget Planning: Develop a detailed budget plan with contingency reserves for unforeseen expenses.
- Cost-Benefit Analysis: Conduct regular cost-benefit analyses to ensure efficient resource allocation and management.

10.10   Communication Risks

Risk - Misalignment in Communication: Miscommunication or misunderstanding between project partners, stakeholders, and participants regarding pilot objectives, requirements, or outcomes.

Mitigation Strategy:

- Clear Communication Channels: Establish clear communication channels and protocols to facilitate transparent dialogue among all stakeholders.
- Regular Updates and Reports: Provide regular updates and progress reports to keep stakeholders informed and aligned with project goals.

10.11   Sustainability and Exploitability Risks

Risk - lack of use of NEUROCLIMA results: The local authorities of the piloting cities will not integrate in their governance and planning process the NEUROCLIMA pilot results, evidence and recommendations.

Mitigation strategy:

- Establish strong relationships with local authorities early in the project, emphasising the benefits of integrating NEUROCLIMA pilot results into governance and planning processes.
- Collaborate closely with local authorities throughout the project to align objectives and foster ownership of the recommendations.

11 Data Collection & Analysis Plan

The Data Collection & Analysis Plan for the NEUROCLIMA project pilots outlines the methodologies and procedures for gathering, managing, and analysing data throughout the pilot studies. This plan ensures that data collection is systematic, reliable, and aligned with the objectives of evaluating pilot performance and impact.

11.1 Data Collection Methods

Quantitative Data Collection

- Usage Statistics: Capture usage metrics such as tool interactions, session durations, and frequency of use.
- System Logs: Collect system-generated logs to monitor technical performance, errors, and uptime.
- Surveys and Questionnaires: Administer structured surveys and questionnaires to gather quantitative feedback from participants on user satisfaction, usability, and perceived impact.
- Performance Metrics: Track key performance indicators (KPIs) related to system reliability, data accuracy, and integration efficiency.

Qualitative Data Collection

- Interviews: Conduct semi-structured interviews with stakeholders, including journalists, policymakers, educators, and citizens, to gather in-depth qualitative insights on user experiences and perceptions.
- Focus Groups: Organise focus group discussions to explore specific themes such as user preferences, challenges faced, and suggestions for improvement.
- Case Studies: Develop detailed case studies to illustrate the impact of the pilots on individual participants and communities.
- Document Analysis: Analyse relevant documents, reports, and project artefacts to supplement qualitative data collection.

Data Management

- Data Storage: Ensure secure and compliant storage of collected data, adhering to GDPR and other relevant data protection regulations.
- Anonymization: Anonymize personal data to protect participant privacy and confidentiality.
- Version Control: Maintain version control and documentation of data sources, ensuring data integrity and traceability throughout the analysis process.

11.2 Data Analysis Methods

Quantitative Data Analysis

- Descriptive Statistics: Calculate mean, median, mode, and variance to summarise quantitative data collected from usage statistics and surveys.
- Correlation Analysis: Explore relationships between variables such as user demographics and engagement metrics.

- Performance Evaluation: Assess KPIs to measure system performance and user engagement over time.

Qualitative Data Analysis

- Thematic Analysis: Identify recurring themes and patterns within qualitative data gathered from interviews, focus groups, and case studies.
- Content Analysis: Analyse textual data from open-ended survey responses and document analysis to extract meaningful insights.
- Coding and Categorization: Code qualitative data using thematic codes to organise and interpret qualitative findings.

Reporting and Interpretation

- Regular Reporting: Provide interim and final reports detailing data findings, analysis outcomes, and insights derived from both quantitative and qualitative data sources.
- Visualisation: Use data visualisation techniques such as charts, graphs, and infographics to present key findings and trends effectively.
- Interpretation: Interpret data analysis results in the context of pilot objectives, identifying strengths, weaknesses, and opportunities for improvement.

Continuous Improvement

- Feedback Loop: Establish a feedback loop to integrate insights from data analysis into ongoing pilot activities and adjustments.
- Iterative Process: Use iterative analysis to refine data collection methods and analysis techniques based on emerging findings and stakeholder feedback.

12 Conclusions

The assessment of the NEUROCLIMA project's pilot and user requirements has shed light on the project's current course and future direction. This section summarises the insights from the user requirements, pilot evaluations, risk management approaches and data collection and analysis, pointing out what needs attention now and what will be necessary as pilots progress.

12.1 Meeting User Needs

The user requirement specifications aim to address the needs of different groups involved in the project. For the AI monitoring tools and decision support systems key features like content verification, customisable dashboards, and data visualisations take priority. These tools will enable journalists and policymakers to access accurate and relevant information. For educators and students, the learning tools will provide interactive and blended learning options. These features aim to boost climate literacy and make learning more interesting.

12.2 Evaluation Insights

The pilots' assessment criteria centre on tool performance, ease of use, and overall effect. User satisfaction scores and engagement levels will measure the pilots' success. Early feedback and evaluations indicate high user satisfaction and engagement. As teams roll out the pilots continuous monitoring will help these trends persist and enable needed tweaks.

12.3 Managing Risks

The project has spotted several risks in technology, data security, user adoption, and stakeholder engagement. Plans exist to tackle these risks, like early testing, data protection, and user engagement drives. As the pilots move forward, teams must stay watchful for new challenges and adjust strategies as needed to keep the project on course.

12.4 Data Collection & Analysis Plan

The project is planned to gather and handle data effectively. We will use a mix of quantitative methods like tracking tool usage, system performance, and survey results, along with qualitative approaches such as interviews, focus groups, and case studies. Our data management will focus on keeping information secure and private, following GDPR guidelines, and we will analyse the data using various techniques to uncover key insights and trends. Regular updates and visual reports, combined with ongoing feedback, will help us make continuous improvements and stay on track with our project goals.

Overall, the following steps should be considered:

- **Improvement of Training and Support**: continue offering in-depth training and help to make users feel at ease with the tools.
- **Boost Engagement**: Aim to involve a broader audience and get all target groups to take part.

- **Adjust Evaluation Metrics**: Regularly review and adjust how performance and impact are measured to get accurate insights;
- **Be Ready to Change and Stay Flexible**: Prepare to adapt to new rules or needs that come up to keep the project useful and on point.

To sum up, the NEUROCLIMA project has a solid plan to meet user needs and assess its success. By focusing on these requirements, monitoring performance, managing risks effectively, and employing a robust data collection and analysis plan, the project is set to achieve significant impacts in climate change adaptation and resilience.

REFERENCES

[1] Abowd GD, Atkeson CG, Bobick AF, Essa IA, MacIntyre B, Mynatt ED, Starner TE. 2000. Living laboratories: the future computing environments group at the Georgia Institute of Technology. CHI '00 Extended Abstracts on Human Factors in Computing Systems (CHI EA '00). Association for Computing Machinery, New York, NY, USA, 215–216 (doi:10.1145/633292.633416).

13 ANNEX I

Responses gathered from the initial survey presented in Chapter 5: User Requirements Elicitation Methodology - 5.1: Overview of Methodology

Type of user answering the survey

What type of user are you?

56 responses

- Artist
- Journalist, content creator, related professions
- Student
- Educator, school board member, related professions
- Policymaker representative
- Citizen

Questions for UC 1.1 target users: journalists and content creators

Please, select specific content areas of your interest (all that apply).

5 responses
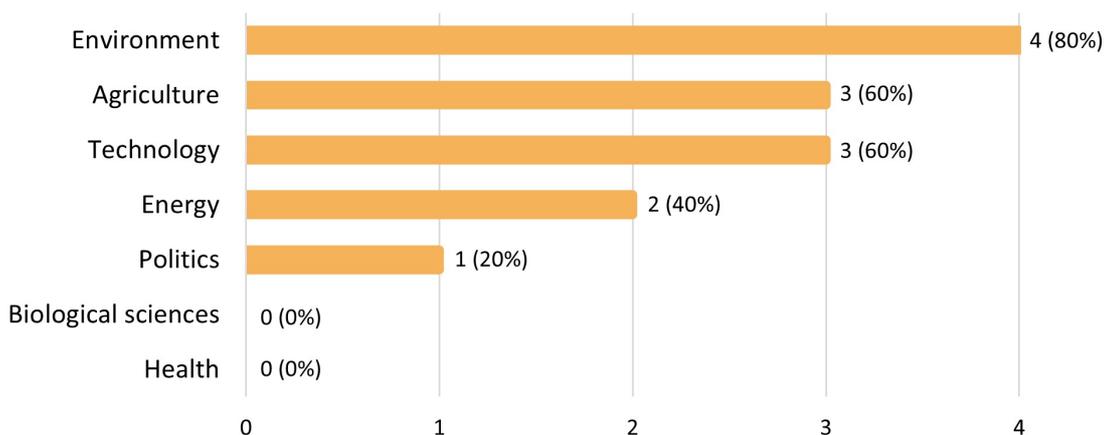
What is your highest level of education?

5 responses

- Doctorate (Ph.D.)
- Master's Degree
- Bachelor Degree (or equivalent)
- Vocational/Technical Education
- Secondary Education
- Middle Education
- Primary Education
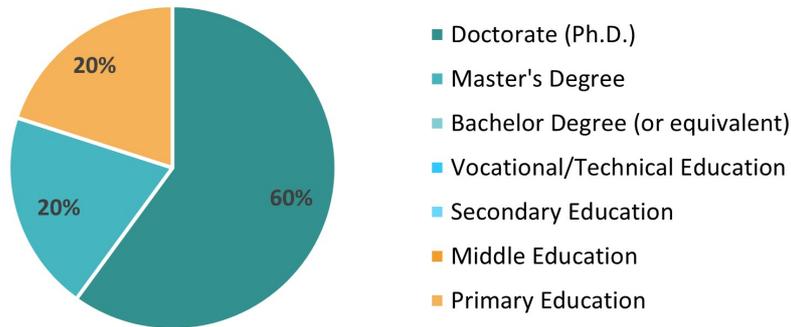
How would you rate your ability to use digital tools and technology in your daily task?

5 responses

- Very High: I am highly proficient and use advanced digital tools regularly.
- High: I am comfortable using most digital tools and technologies.
- Moderate: I can use basic digital tools but may struggle with more advanced ones.
- Low: I have limited experience with digital tools and technology.
- Very Low: I have minimal or no experience with digital tools and technology.
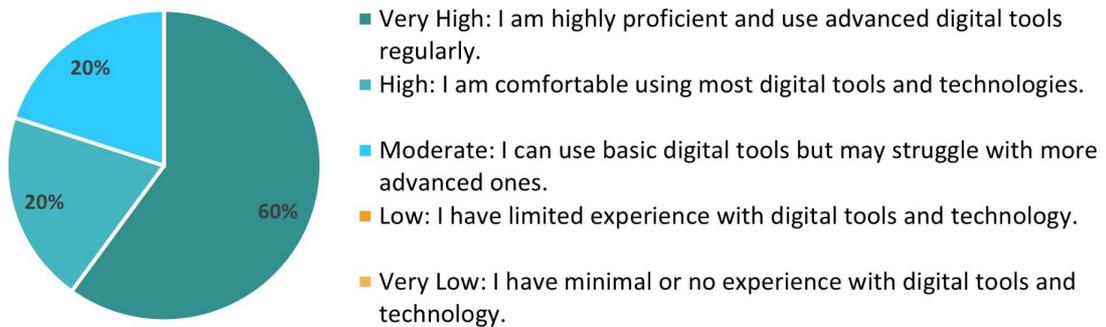
How do you typically conduct research for your articles? Select all that apply.
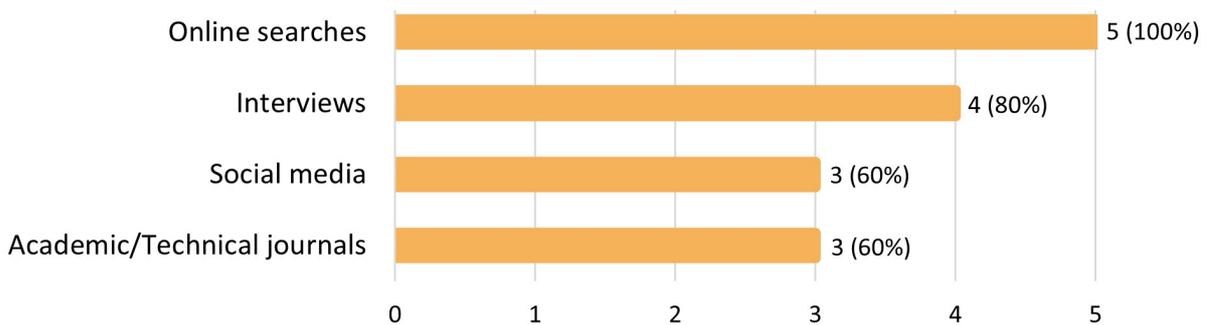
5 responses

5 responses
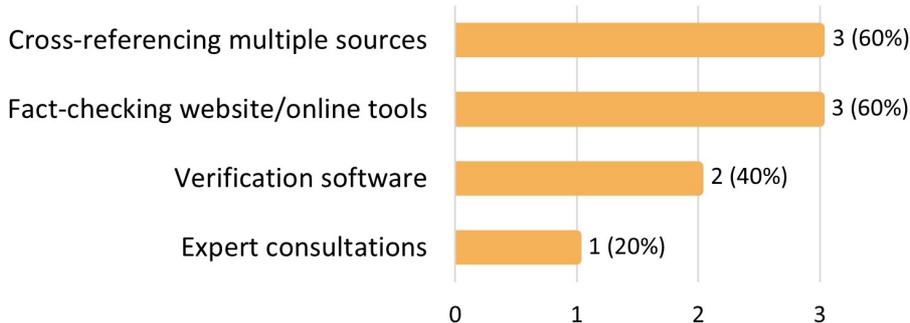
What are the 3 biggest challenges you face in producing truthful, relevant, and verified content? Please select exactly 3 options.
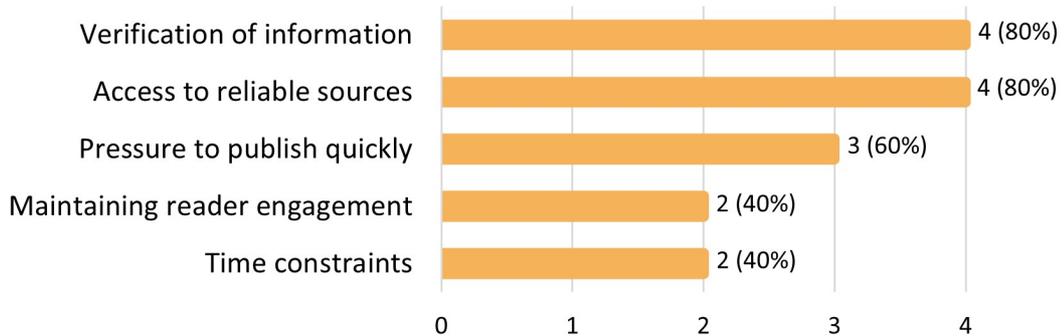
5 responses

How important is it for you to understand the topics that resonate most with your audience when creating content on climate change adaptation?
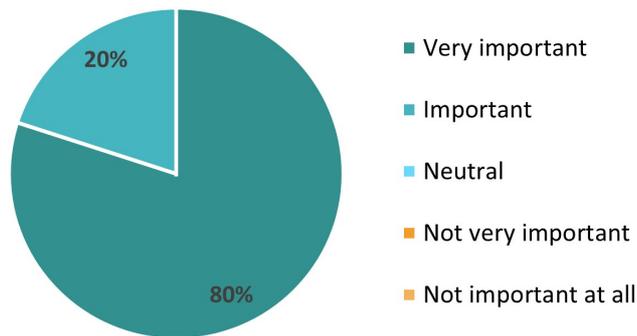
5 responses

What methods or tools do you currently use to identify topics that could act as tipping or leverage points for climate change adaptation in your audience?

5 responses
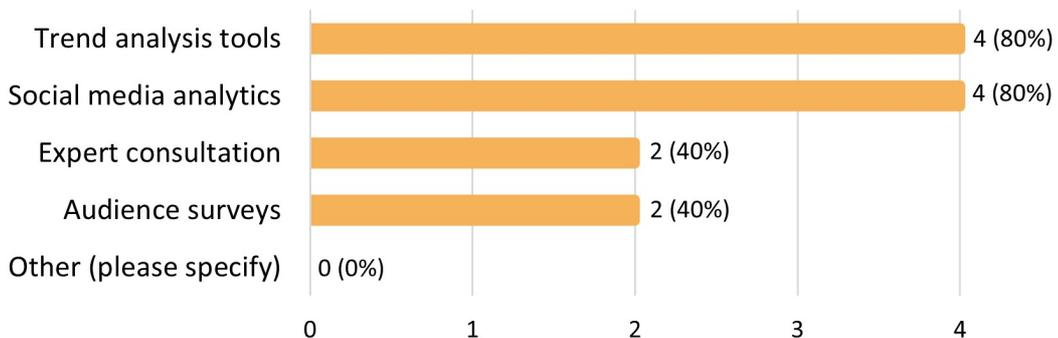
How important is it for you to predict the outreach and impact of your content on climate change adaptation?

5 responses

- ■ Very important
- ■ Important
- ■ Neutral
- ■ Not very important
- ■ Not important at all
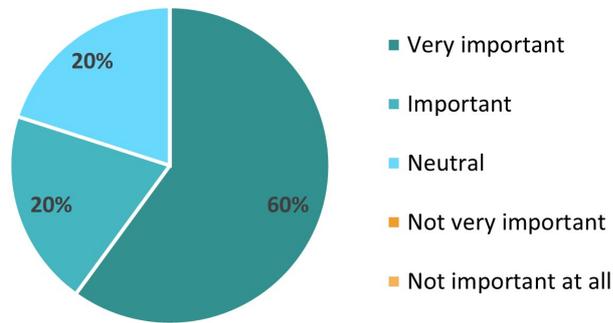
How do you assess the potential impact of your content on climate change adaptation? Select all that apply.
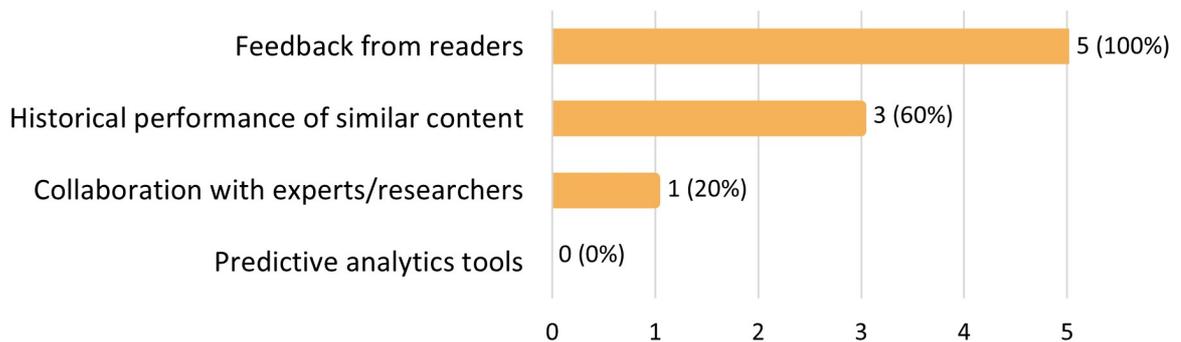
5 responses

What 3 features would be most helpful to you in a tool designed to assist with producing truthful, relevant, and verified content? Please select exactly 3 options.
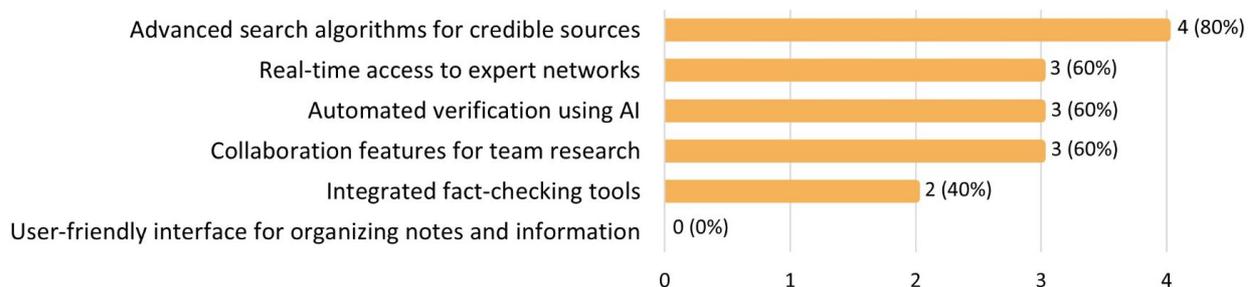
5 responses

How important is it to be able to understand the process and the reasoning that an AI platform uses to produce results when searching for content to write an article?

5 responses
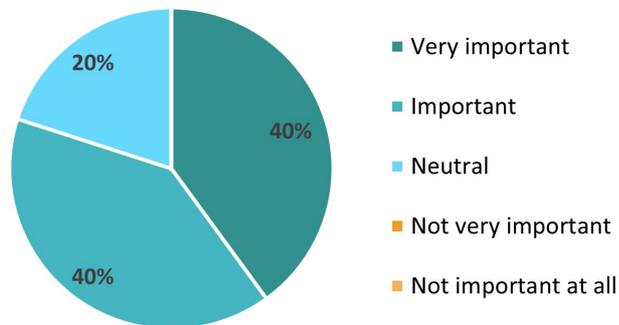
What metrics do you think should be used to evaluate the effectiveness of the NEUROCLIMA solution in your work? Select all that apply.
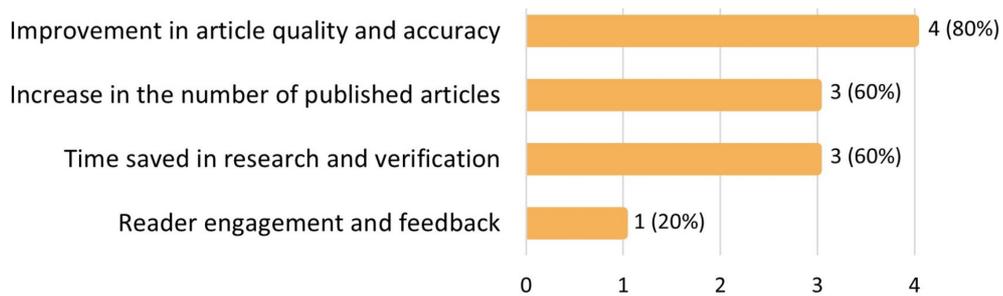
5 responses

Questions for UC 1.2 target users: policy and decision makers

What kind of policymaker are you?

12 responses

- National Government Official
- Regional Government Official
- Legislator
- Public Agency Director
- President of Portuguese Party
- Senior Environmental Technician at a Minucipality
- Employee of Internacional Organization
- Policy Advisor or Analyst
- Local Government Official

What is your primary area of policymaking?

12 responses

Environment	8 (66.7%)
Energy	3 (25%)
Governmental	3 (25%)
Tourism	2 (16.7%)
Agrofood	2 (16.7%)
Sustainability & climate action	1 (8.3%)
Sustainable Development	1 (8.3%)
Infrastructures	1 (8.3%)
Security	1 (8.3%)
Education	1 (8.3%)
Economy	1 (8.3%)
Transports	0 (0%)
Health	0 (0%)
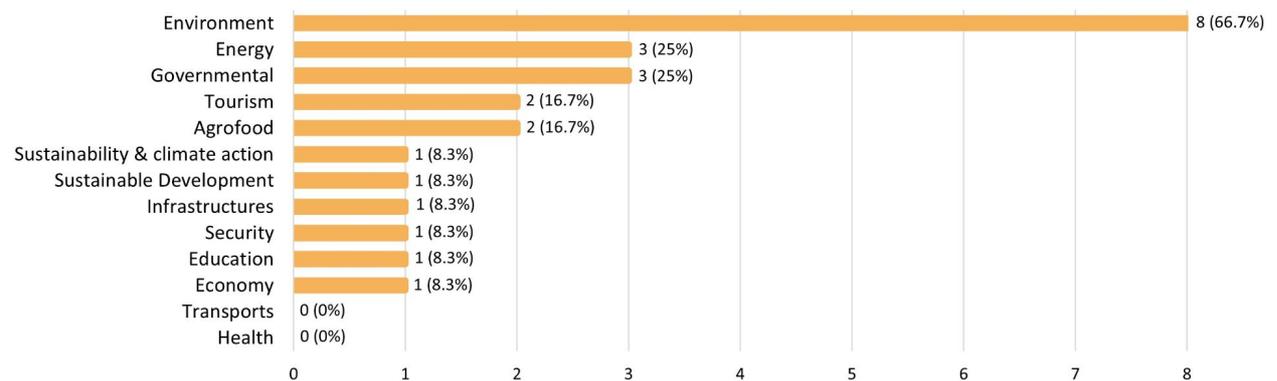
How would you rate your ability to use digital tools and technology in your daily tasks?

12 responses

- Very High: I am highly proficient and use advanced digital tools regularly.
- High: I am comfortable using most digital tools and technologies.
- Moderate: I can use basic digital tools but may struggle with more advanced ones.
- Low: I have limited experience with digital tools and technology.
- Very Low: I have minimal or no experience with digital tools and technology.
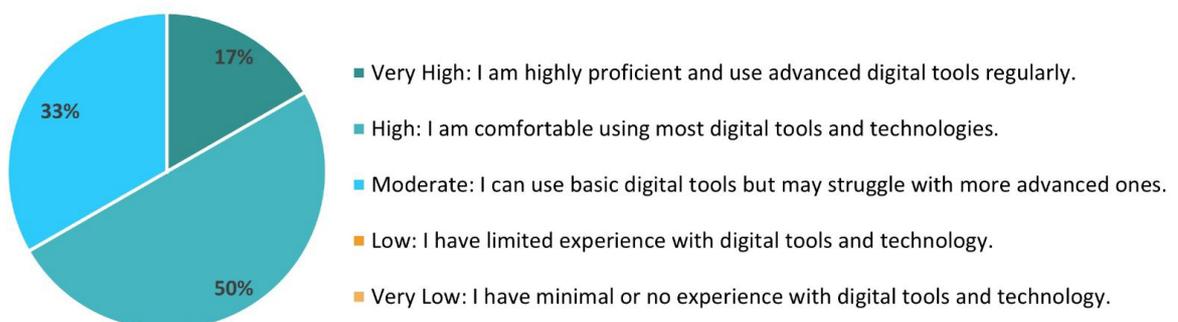
What is your highest level of education?

12 responses

- Doctorate (Ph.D.) — 17%
- Master's Degree — 41%
- Bachelor Degree (or equivalent) — 42%
- Vocational/Technical Education
- Secondary Education
- Middle Education
- Primary Education
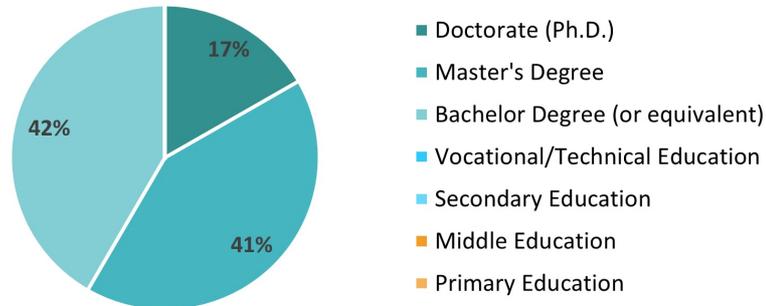
How do you typically gather information for policy development? Select all that apply.

11 responses

Academic research data	10 (90.9%)
Expert consultations	9 (81.8%)
Government reports	7 (63.6%)
Public opinion surveys	5 (45.5%)
Lobby from relevant stakeholders	3 (27.3%)
Political party strategy	3 (27.3%)
Religious or spiritual guidance	0 (0%)
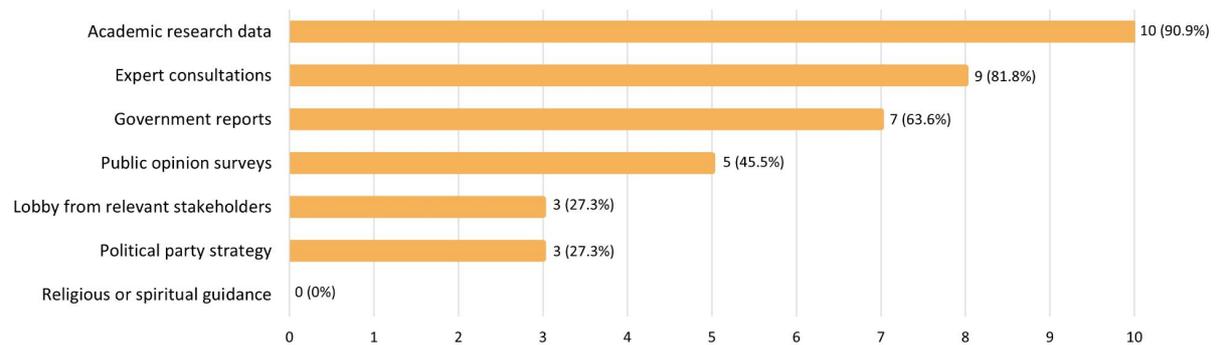
What tools do you currently use for identifying social tipping points and leverage points? Select all that apply.

12 responses

Case/Pilot studies	7 (58.3%)
Stakeholder/ third-parties consultations	6 (50%)
Predictive modelling	5 (41.7%)
Data analysis software	4 (33.3%)
I do not use tools	3 (25%)
Religious or spiritual guidance	0 (0%)
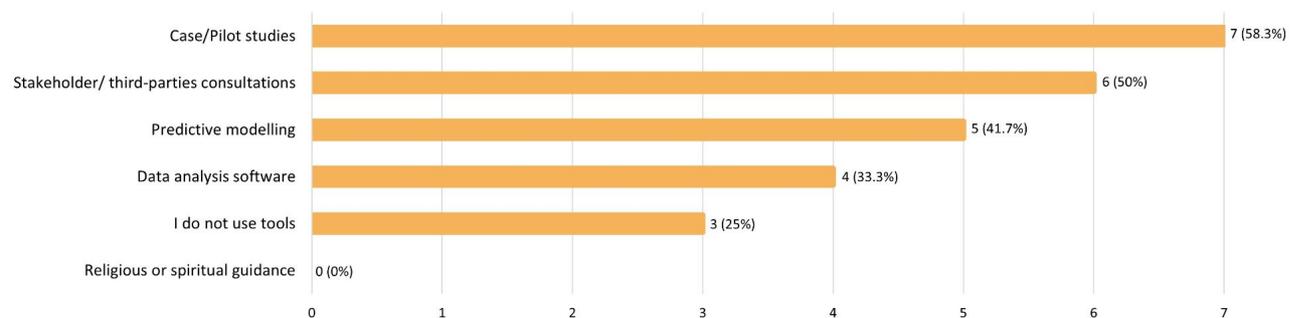
What are the 3 biggest challenges you face in identifying and activating social tipping points for climate change adaptation? Please select exactly 3 options.
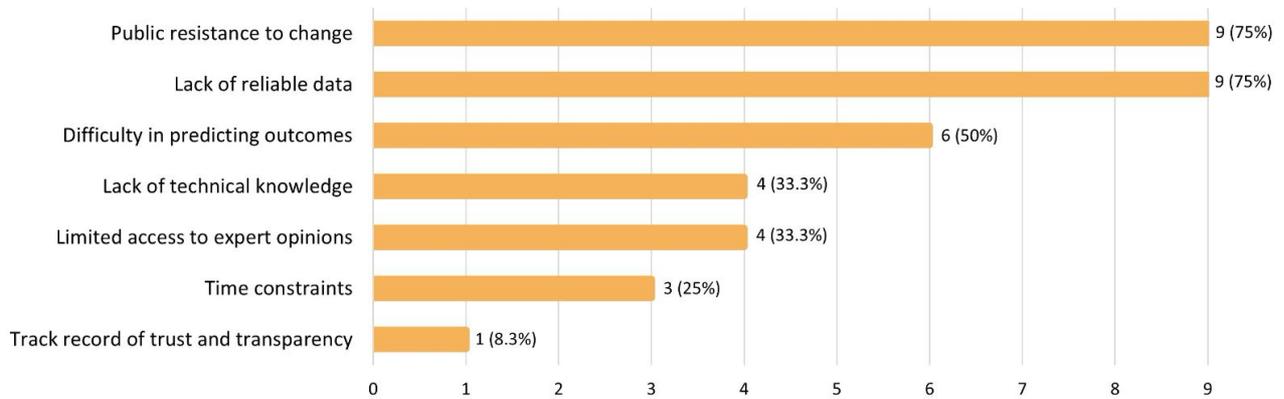
12 responses

How often do you encounter difficulties in accessing reliable data for policy development?

12 responses
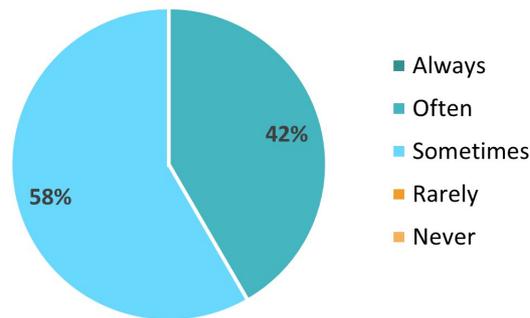
What specific issues do you face when trying to activate leverage points? Select all that apply.
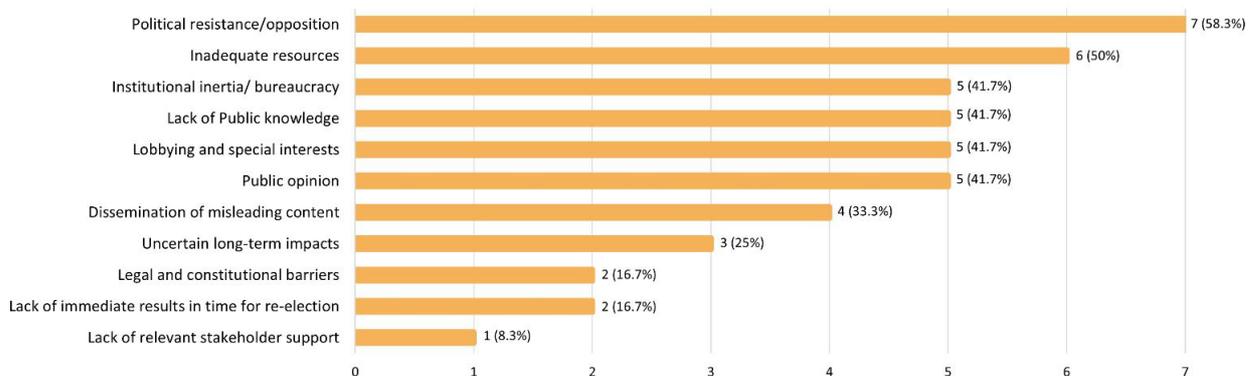
12 responses

What 3 features would be most helpful to you in a tool designed to assist with identifying and activating social tipping points? Please select exactly 3 options.

12 responses

Feature	Count
Real-time access to environmental data	8 (66.7%)
Advanced data analysis and visualization tools	8 (66.7%)
User-friendly interface for policy planning	6 (50%)
Predictive modelling capabilities	6 (50%)
Integrated communication platform	5 (41.7%)
Automated reporting and documentation	3 (25%)
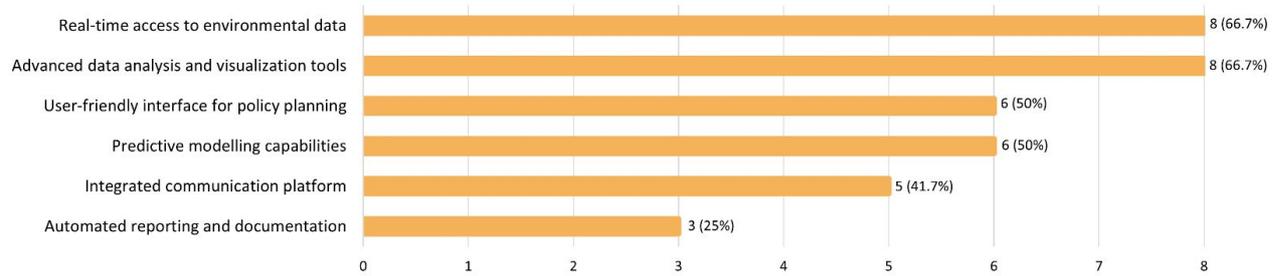
How important is stakeholder engagement in your policy development process?

12 responses
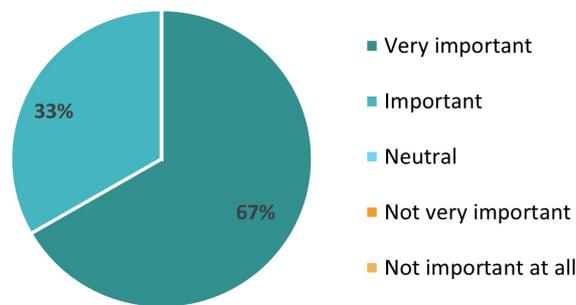
- Very important
- Important
- Neutral
- Not very important
- Not important at all

33%

67%

What metrics do you think should be used to evaluate the effectiveness of the NEUROCLIMA solution in your work? Select all that apply.

11 responses

Metric	Count
Measurable impact on climate change adaptation	7 (63.6%)
Public acceptance of policies	5 (45.5%)
Policy development speed	5 (45.5%)
Accuracy of identified social tipping points	3 (27.3%)
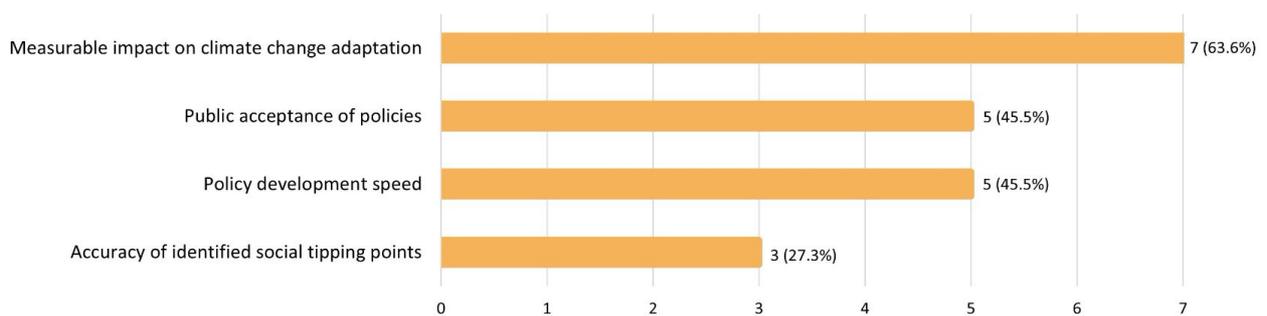
Questions for UC 2.1 target users: educators, students and citizens

What is your primary subject area?

24 responses

Subject Area	Count
Natural Sciences	10 (41.7%)
Environmental Studies	7 (29.2%)
Health / Nutrition	3 (12.5%)
General curriculum	2 (8.3%)
Geography	2 (8.3%)
Civil Engineering	1 (4.2%)
Genetics / Biotehcnology	1 (4.2%)
Economy / Business	1 (4.2%)
Arts / Design	1 (4.2%)
Social Studies	1 (4.2%)
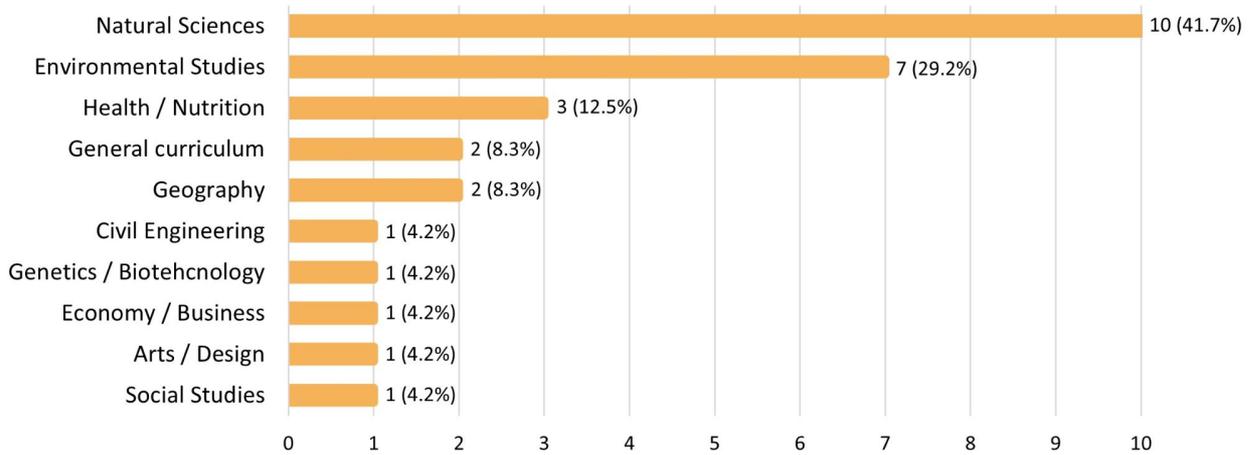
How would you rate your ability to use digital tools and technology in your daily tasks?

24 responses

- 17%
- 33%
- 50%

- Very High: I am highly proficient and use advanced digital tools regularly.
- High: I am comfortable using most digital tools and technologies.
- Moderate: I can use basic digital tools but may struggle with more advanced ones.
- Low: I have limited experience with digital tools and technology.
- Very Low: I have minimal or no experience with digital tools and technology.
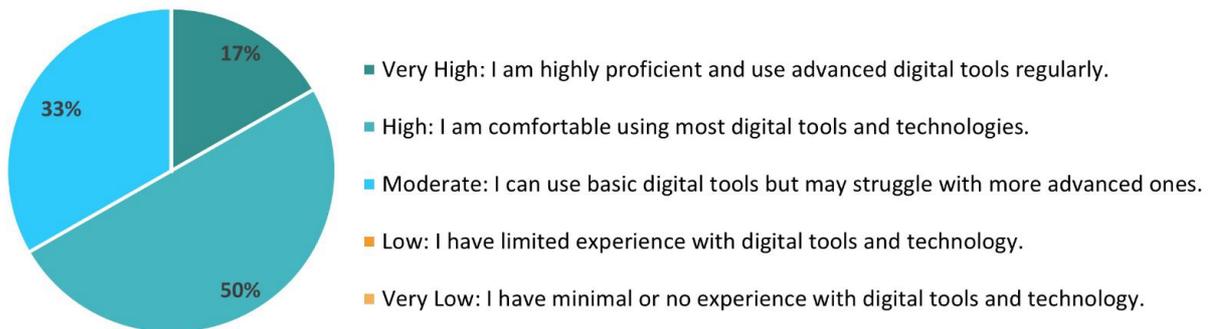
What is your highest level of education?

24 responses

- 13%
- 8%
- 25%
- 37%
- 17%

- Doctorate (Ph.D.)
- Master's Degree
- Bachelor Degree (or equivalent)
- Vocational/Technical Education
- Secondary Education
- Middle Education
- Primary Education
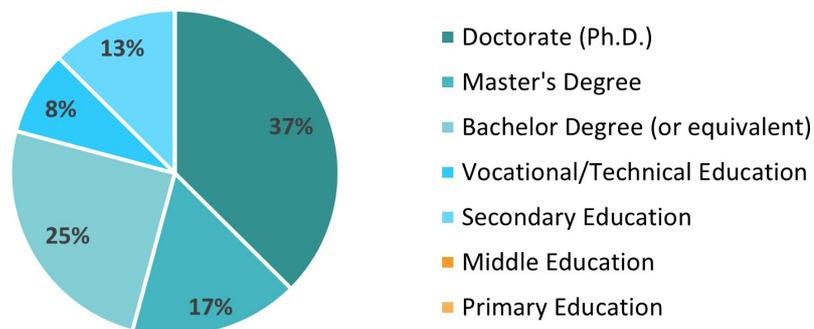
How do you currently learn or teach about climate change? Select all that apply.

24 responses

Category	Value
Movies / Documentaries	13 (54.2%)
Workshops / Guest lectures	10 (41.7%)
Multimedia presentations	10 (41.7%)
Online courses / classes	8 (33.3%)
Field trips	6 (25%)
Presential lessons	6 (25%)
Educational apps / games	4 (16.7%)
Learning Management Systems	3 (12.5%)
Textbooks	3 (12.5%)
Books and informative articles	2 (8.4%)
Nature / holistic activities	1 (4.2%)
Virtual Reality simulations	0 (0%)
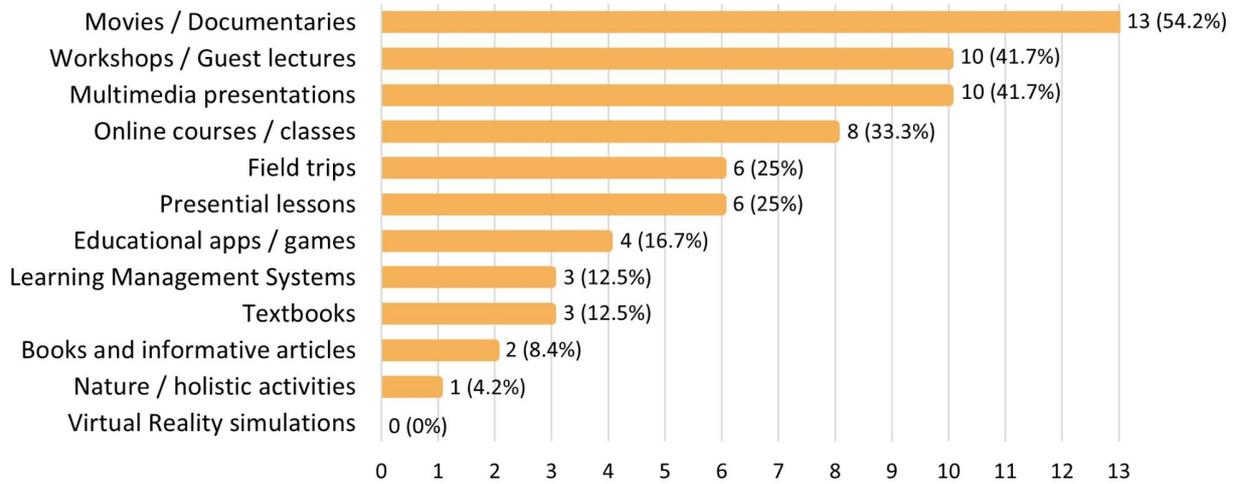
What are the 3 biggest challenges you face in teaching or learning about climate change? Please select exactly 3 options.

24 responses

Category	Value
Time constraints	11 (45.8%)
Restrictive curricula	10 (41.7%)
Budget	9 (37.5%)
Student interest and engagement	9 (37.5%)
Lack of engaging materials	9 (37.5%)
Limited access to current information	8 (33.3%)
Personal / political / religious views	7 (29.2%)
Limited hands-on activities	5 (20.8%)
Complexity of scientific concepts	4 (16.7%)
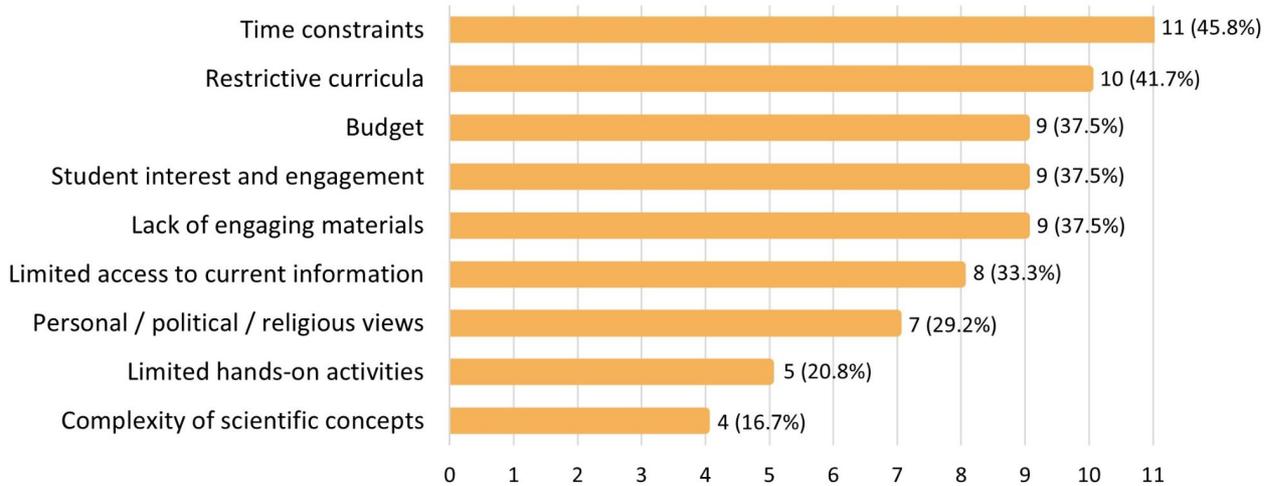
How often do you encounter difficulties in finding reliable and engaging resources for climate education?

24 responses

Pie chart legend: Always, Often (38%), Sometimes (54%), Rarely (8%), Never
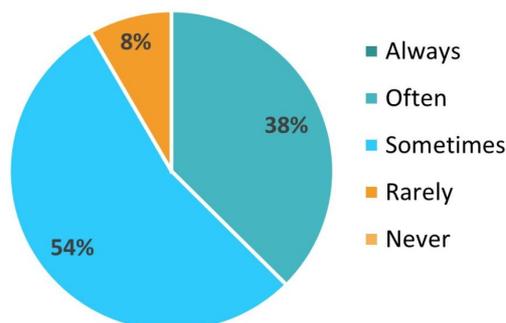
What 3 features would be most helpful to you in a tool designed to assist with climate education? Please select exactly 3 options.

23 responses

Interactive simulations and visualisations	16 (69.6%)
Collaborative projects and activities	15 (65.2%)
Access to up-to-date climate data	15 (65.2%)
Integration w/ learning management systems	10 (43.5%)
User-friendly interface for lesson planning	6 (26.1%)
Virtual reality experiences	4 (17.4%)

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

How important is it to have multimedia elements (videos, animations) in climate education?
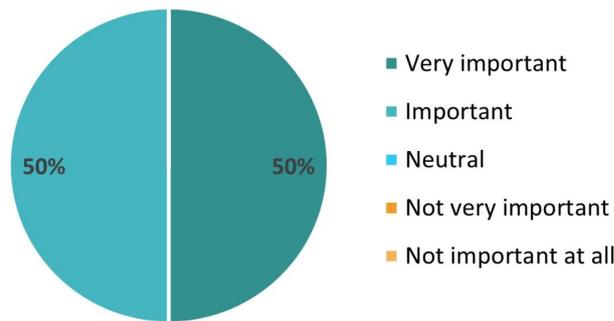
24 responses

- Very important
- Important
- Neutral
- Not very important
- Not important at all

50%   50%

What metrics do you think should be used to evaluate the effectiveness of the NEUROCLIMA solution in your work? Select all that apply.

24 responses

Student interest and engagement levels	17 (70.8%)
Improvement in climate literacy	13 (54.2%)
Ease of integration into curricular or extracurricular activities	11 (45.8%)
Arts / Design	5 (38.5%)
Writing	3 (23.1%)
Psychology	2 (15.4%)
Social work	1 (7.7%)
Culture	1 (7.7%)
Librarian work	1 (7.7%)

0 1 2 3 4 5   15 16 17
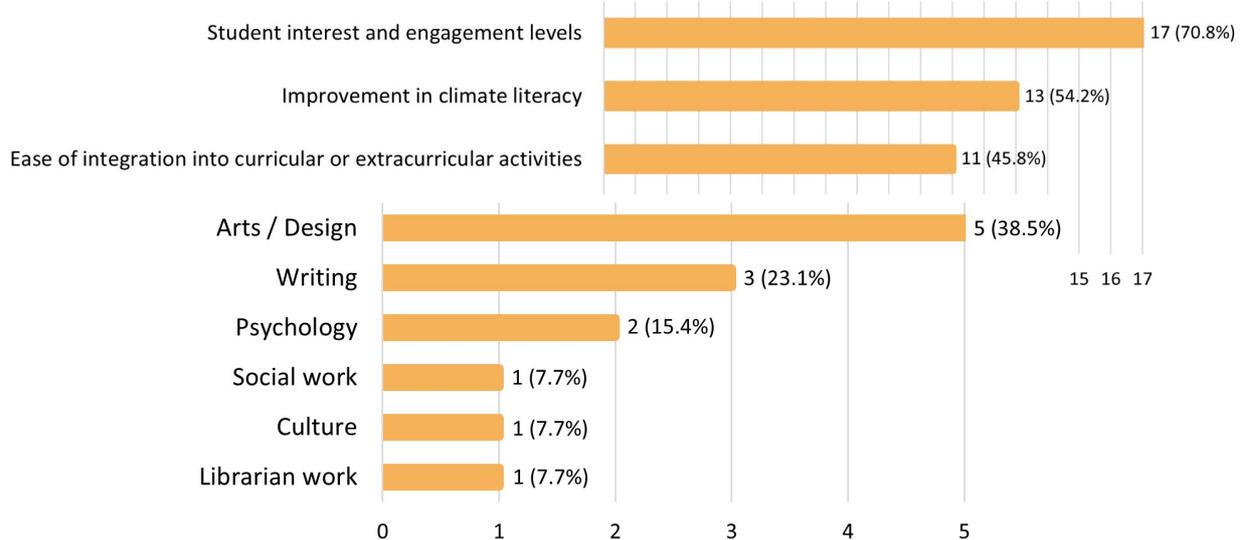
How would you rate your ability to use digital tools and technology in your daily tasks?
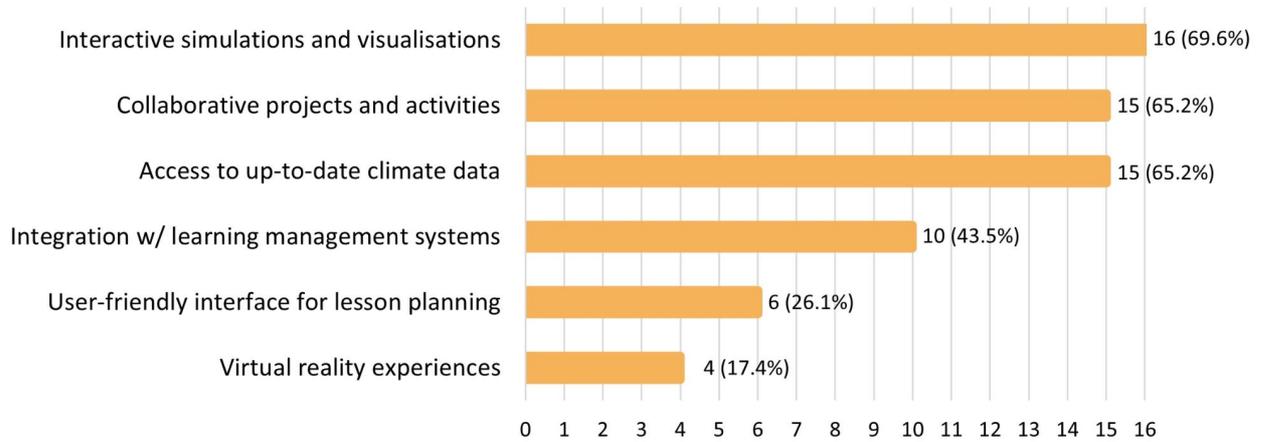
14 responses

- Very High: I am highly proficient and use advanced digital tools regularly.
- High: I am comfortable using most digital tools and technologies.
- Moderate: I can use basic digital tools but may struggle with more advanced ones.
- Low: I have limited experience with digital tools and technology.
- Very Low: I have minimal or no experience with digital tools and technology.
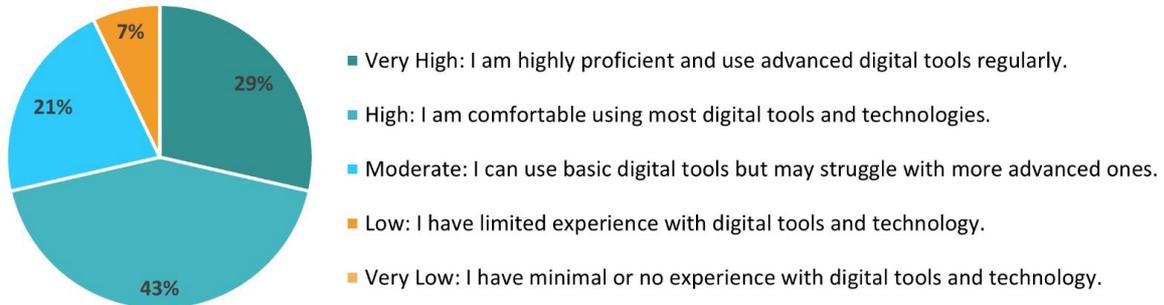
What is your highest level of education?

13 responses

- Doctorate (Ph.D.)
- Master's Degree
- Bachelor Degree (or equivalent)
- Vocational/Technical Education
- Secondary Education
- Middle Education
- Primary Education
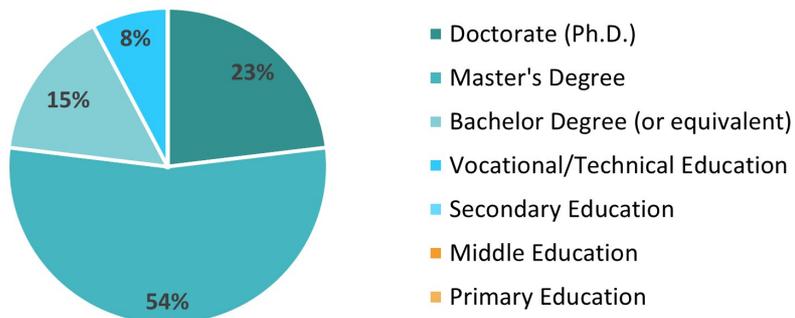
How do you currently engage in climate change activities? Select all that apply.

13 responses

Activity	Responses
Online platforms	8 (61.5%)
Workshops	7 (53.8%)
Community projects	7 (53.8%)
Climate action groups	6 (46.2%)
Political parties	4 (30.8%)
Classroom lessons	4 (30.8%)
Art projects	3 (23.1%)
Activities at libraries	1 (7.7%)
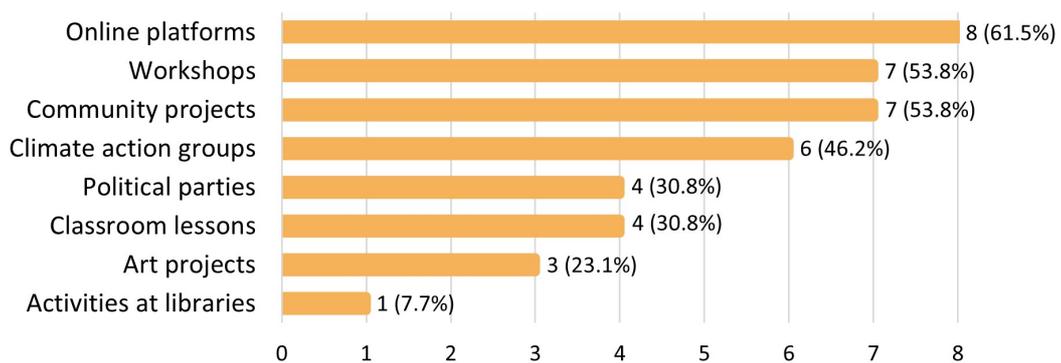
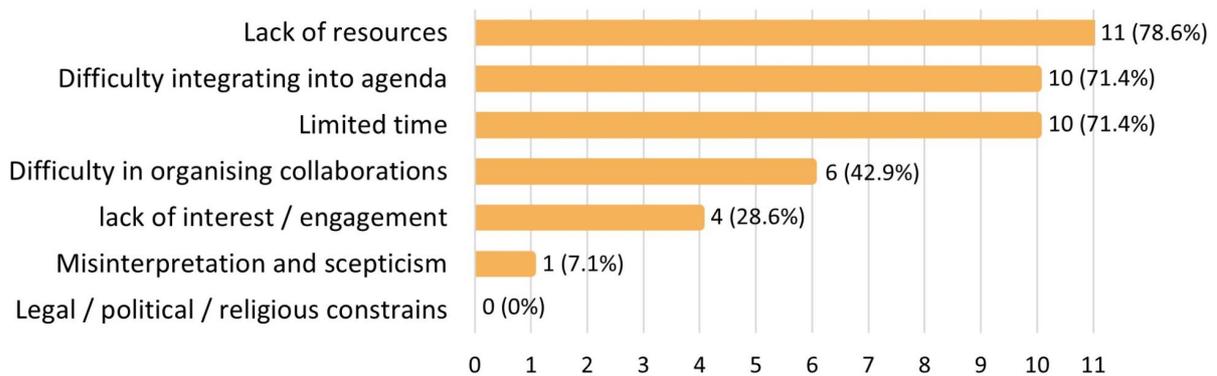**What tools do you currently use for participatory design and creative expression related to climate change? Select all that apply.**

14 responses

| Category	Value
Writing	6 (42.9%)
Online collaboration tools	6 (42.9%)
Art supplies	6 (42.9%)
Educational apps	4 (28.6%)
Design software	4 (28.6%)
Dance / music	3 (21.4%)
Film / theatre	2 (14.3%)
none	1 (7.1%)
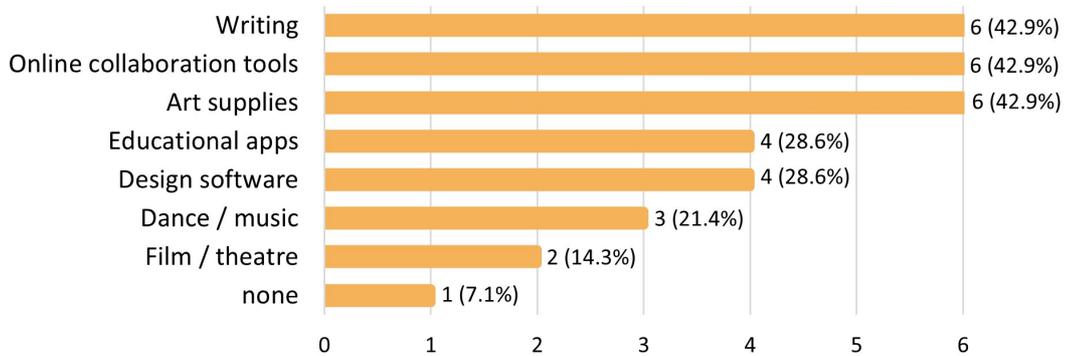
What are the 3 biggest challenges you face when trying to implement participatory design or creative expression activities? Please select exactly 3 options.

14 responses

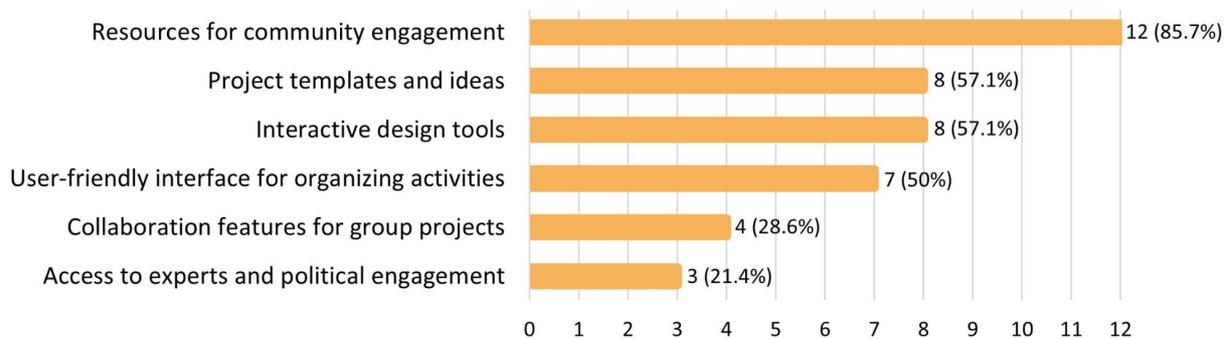| Category	Value
Lack of resources	11 (78.6%)
Difficulty integrating into agenda	10 (71.4%)
Limited time	10 (71.4%)
Difficulty in organising collaborations	6 (42.9%)
lack of interest / engagement	4 (28.6%)
Misinterpretation and scepticism	1 (7.1%)
Legal / political / religious constrains	0 (0%)

How often do you encounter difficulties in finding resources for participatory design and creative expression activities?

14 responses

- Always — 21%
- Often — 36%
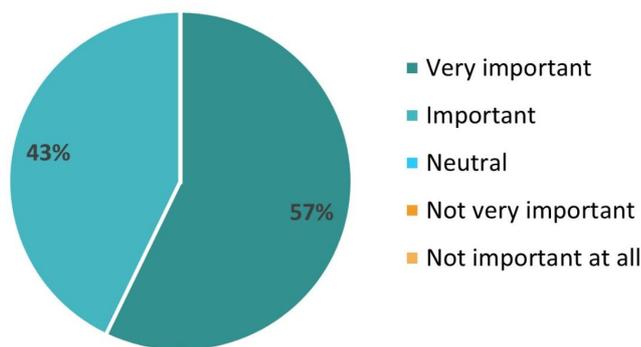- Sometimes — 43%
- Rarely
- Never
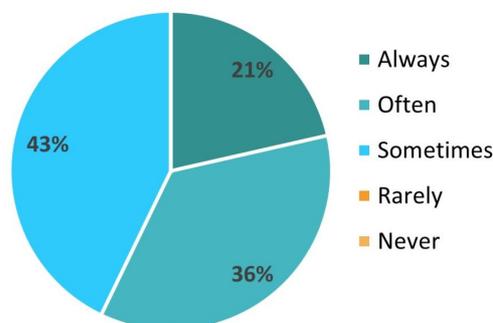
What 3 features would be most helpful to you in a tool to assist with participatory design and creative expression for climate change adaptation? Please select exactly 3 options.

14 responses

Feature	Count
Resources for community engagement	12 (85.7%)
Project templates and ideas	8 (57.1%)
Interactive design tools	8 (57.1%)
User-friendly interface for organizing activities	7 (50%)
Collaboration features for group projects	4 (28.6%)
Access to experts and political engagement	3 (21.4%)

How important is it to have multimedia elements (videos, animations) in participatory design and creative expression activities?

14 responses

- Very important
- Important
- Neutral
- Not very important
- Not important at all

57%

43%

What metrics do you think should be used to evaluate the effectiveness of the NEUROCLIMA solution in your work? Select all that apply.

14 responses

Metric	Count
Improvement in climate literacy	14 (100%)
Citizen engagement levels	9 (64.3%)
Participants satisfaction	8 (57.1%)
Behavioural change towards improved climate adaptation	7 (50%)
Ease of integrating the tool into curricula / agenda	6 (42.9%)