(Grant Agreement 101093921)

Deliverable D4.1 - Enablers and barriers to co-design, co-develop and co-implement solutions for climate resilience

WP4 - Roadmap for policy transformational change

Version 1.0 | December 24

HORIZON-MISS-2021-CLIMA-02-05 - Local engagement of citizens in the co-creation of societal transformational change for climate resilience

This project has received funding from the European Union's Horizon Europe Research and Innovation Actions under grant agreement No 101093921

Document History

Deliverable Title	Enablers and barriers to co-design, co-develop and co-implement solutions for climate resilience
Brief Description	The Deliverable D4.1 presents an overview of citizen and stakeholder engagement key barriers and enablers, together with recommendations to support climate change adaptation practitioners in co-producing climate resilience solutions.
WP number	WP4
Lead Beneficiary	UNIGE
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Deliverable Due Date	31/12/2024
Actual Delivery Date	13/12/2024
Nature of the Deliverable	R – Document, report
Dissemination Level	PU - Public

This project has received funding from the European Union's Horizon Europe Research and Innovation Actions under grant agreement No 101093921

Revision History

Date	Ver.	Contributers	Comment
12/07/2024	0.01	Enora Bruley – Anna Scolobig	Part 1
03/09-13/10	0.02	Marta Ellena, Anna Verones, Dmitry Erhokin, Nadeja Komendantova, Sukaina Bharwani, Mathilda Englund, Sam Pickard	Part 1; Part 2
23/09/2024	0.03	Enora Bruley, Simon Keith Allen	Part 2
01/11/2024	0.04	Enora Bruley, Anna Scolobig, Simon Keith Allen	
20/11/2024	0.04	Marina Mattera	Internal Review
26/11/2024	0.05	Markus Stoffel	
02/12/2024	0.06	Enora Bruley	Final draft

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Partners short names / Legal name

APRE	Agenzia per la Promozione della Ricerca Europea
ATC	Athens Technology Center S.A.
BSC - CNS	Barcelona Supercomputing Center - Centro Nacional De Supercomputacion
FONDAZIONE CIMA	Centro Internazionale di Monitoraggio Ambientale – Fondazione CIMA
FONDAZIONE CMCC	Fondazione Centro Euro-Mediterraneo sui Cambiamenti Climatici
ECSA	Verein der Europäischen Bürgerwissenschaften – ECSA e.V.
IBE	Fundación Ibercivis
ICLEI EURO	ICLEI European Secretariat GMBH (ICLEI EUROPASEKRETARIAT GMBH)
IIASA	Internationales Institut für angewandte Systemanalyse
SEI HQ	Stiftelsen The Stockholm Environment Institute
SEI OX	Stockholm Environment Institute, Oxford Office Limited
SEI TAL	Sihtasutus Stockholmi Keskkonnainstituudi Tallinna Keskus
UNIGE	Universite de Geneve

Abbreviations

EC	European Commission
KPI	Key Performance Indicator
GA	Grant Agreement
LMS	Learning Management System
M	Month
NGO	Non-governmental organization
TG	Target Group
WP	Work Package

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1. Executive summary

Deliverable D4.1 of the European Union's Horizon Europe research project AGORA "A Gathering Place to Co-design and Co-create Adaptation" presents an overview of key barriers and enablers experienced by climate change adaptation practitioners in co-producing climate resilience solutions. By examining the factors that support or hinder adaptation co-production processes, the AGORA project aims to equip policymakers, practitioners, and communities with actionable insights to scale climate adaptation initiatives and foster transformative change across Europe. This analysis is particularly focused on the European context, although it outlines generalizable insights applicable to global adaptation initiatives.

To identify and describe what facilitates or impedes effective stakeholder and citizen engagement in climate adaptation, we used a comprehensive approach triangulating a systematic literature review, a practitioner survey, and interviews with policymakers. First, we performed a systematic review of scientific literature. We followed the PRISMA methodology to identify and further describe factors that support or hinder adaptation co-production processes. Among the 1,340 papers retrieved, we selected and analysed 123 relevant peer-reviewed papers across various adaptation contexts. This analysis highlighted over 600 factors, and we categorised them into 11 main types of enablers and 7 main types of barriers. Based on the literature review results, we then conducted an online survey to capture insights from practitioners across Europe actively engaged in climate adaptation.

We collected 51 valid responses reporting on practitioners' experience in engaging citizens and stakeholders in climate change adaptation initiatives. Moreover, we analysed which barriers and enablers play a role in the different steps of the co-production process. Finally, we conducted 20 interviews with local and regional policymakers working in AGORA's four pilot regions (i.e. Italy, Germany, Sweden and Spain). Semi-structured interviews provided an understanding of the policy landscape supporting co-production efforts. Interviewees included municipal and regional officials, who shared insights into existing co-production practices, current public policies and proposed improvements for more effective stakeholder engagement.

With this study, we first gained a better understanding of the context in which co-production processes for adaptation take place. The adaptation solutions reported are mainly institutional (e.g. co-development of adaptation strategies) or linked to research and innovation processes (i.e. co-production of knowledge). These solutions primarily target climate change as a broad sector but also environmental and land planning sectors—such as biodiversity conservation, water management, and disaster risk reduction—with less emphasis on social and economic areas. Most solutions are implemented at a local or regional scale, and participation is often voluntary, although some cases include mandates or incentives to drive collaboration. Engagement approaches vary widely, but common methods include workshops, surveys, and digital tools that facilitate direct

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involvement. The preferred forms of engagement are collaborations, where stakeholders contribute to multiple aspects of decision-making, and public consultations that allow citizens to influence outcomes by sharing their perspectives.

The main barriers to the effective implementation of adaptation co-production processes are:

- **Institutional and organizational challenges,** which include limited cross-sectoral coordination, institutional silos, outdated administrative structures, bureaucratic complexities, and insufficient funding mechanisms that often hinder adaptation efforts.
- **Complexities of co-production processes**, the inherent complexity of climate adaptation and the diversity of participants' knowledge, expectations and interests can lead to communication issues, misalignment of goals, and difficulty integrating diverse perspectives. In its own turn, this can undermine trust and transparency.
- **Lack of motivation to engage**, many stakeholders lack the means, knowledge or confidence needed to engage meaningfully. Common challenges include limited time, lack of awareness, and inadequate training, particularly for marginalized groups who might lack the support to participate effectively.
- **Resource limitations**: Insufficient funding, human resources, and access to context-specific data significantly limit the success of adaptation initiatives. Local communities and public institutions are especially impacted by resource constraints, which can stall progress and reduce the adaptability of solutions.

However, the report identifies several enablers essential for overcoming these barriers and enhancing adaptation efforts. The key enablers thus include:

- **Developing strong collaboration and communication**, transparent and open communication can mitigate many barriers, including power imbalances and distrust among participants. Structured feedback mechanisms, non-hierarchical interactions, and accessible information channels create an environment where participants feel valued and invested in the adaptation process.
- **Building flexible process design,** flexibility into the co-production framework ensures that adaptation solutions remain relevant and responsive to local contexts, while also supporting knowledge generation and participant learning.
- **Building an inclusive and integrative approach,** ensure that diverse perspectives are considered by involving a broad range of stakeholders. This inclusivity not only strengthens community ties but also enhances the legitimacy and relevance of adaptation strategies by integrating different knowledge forms and values.
- **Fostering citizen and stakeholder motivation,** motivated and informed stakeholders are more likely to engage meaningfully that can be achieved with communication strategies that demonstrate the personal and community benefits of participation.

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- **Increasing knowledge availability and capacity**, providing accessible, reliable data and training resources further empowers participants, building the knowledge base necessary for sustained engagement and innovation.
- **Strengthening institutional support**, dedicated funding and a coherent policy framework are crucial for sustainable adaptation efforts. Clear guidelines, interdepartmental coordination, and political commitment can provide the stability required to co-implement adaptation solutions.

Finally, this report outlines three priorities to foster a conducive environment for stakeholder engagement in climate adaptation:

1. **Improving co-production process design**: By adopting flexible, inclusive, and context-responsive processes, adaptation practitioners can create solutions that are more relevant and sustainable. Clear definitions of roles and responsibilities, early involvement of stakeholders, and iterative feedback loops contribute to a more effective and responsive adaptation process.
2. **Building a supportive governance and institutional framework**: To address persistent institutional barriers, a supportive governance structure is necessary. Key recommendations include interdepartmental coordination, consistent funding schemes, policy frameworks promoting citizen engagement, and streamlined processes to reduce bureaucratic hurdles.
3. **Fostering stakeholder and citizen agency and capacity to engagement**: Enhancing knowledge accessibility and motivation among stakeholders is vital to building resilient adaptation processes. Training and educational programs, clear communication of participants' impact on adaptation outcomes, and practical incentives can bridge gaps in engagement and empower a wider array of stakeholders.

Creating a successful climate adaptation framework requires coordinated efforts across different sectors, with specific attention to stakeholder engagement, institutional support, and resource availability. Effective adaptation co-production is best achieved through tailored, flexible processes that respect local contexts and prioritize inclusivity. This deliverable establishes a foundation for developing actionable strategies and resources to support communities, practitioners, and policymakers in navigating the challenges of climate resilience. In this way, the main lessons learned from this study will feed the white policy paper providing recommendations on strategic actions and governance mechanisms supporting the upscaling of stakeholder and citizen engagement (D4.5) and the climate adaptation citizen engagement digital handbook (D6.2). We suggest that further research should explore systematic methods to measure the impacts of stakeholder engagement processes, allowing for better-informed adaptation strategies in diverse contexts.

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2. Introduction

2.1. Project Background

This is a deliverable of the AGORA project – A Gathering place to cO-design and co-cReate adaptation funded by EU's Horizon Europe initiatives within the Mission on Adaptation to Climate Change. AGORA aims to strengthen European climate resilience by fostering best practices in engaging citizens and stakeholders in climate adaptation and transformative processes. To support climate resilience, the project will identify and evaluate innovative mechanisms and approaches of engaging citizens and stakeholders. Four pilot regions in Germany, Sweden, Spain, and Italy are leveraged as platforms for co-producing climate adaptation solutions and increasing local adaptive capacity. Through a digital hub gathering citizens, practitioners, policymakers and experts, it will support the adaptation community in learning, networking and empowerment. By providing digital tools and capacity building resources, AGORA Community Hub will also support citizens in accessing, understanding and navigating in climate data, information and disinformation leading to climate action.

Ultimately, AGORA will develop a roadmap for transformative change by identifying the priorities leading to the creation of policy and governance mechanisms at regional, national and European levels, which would support the scaling of co-production processes. It will be built on the identification of factors hindering or supporting stakeholder and citizen engagement in transformative change and the analysis of participatory elements in climate change adaptation policies. This deliverable contributes to building the core knowledge to support AGORA's activities and roadmap framing by analysing enablers and barriers to the engagement of citizens and stakeholders in adaptation initiatives.

2.2. Aim

This deliverable addresses the objectives of task 4.1 - *Identify enablers and barriers to co-design, co-develop, and co-implement innovative solutions for climate resilience* - of the AGORA project which are twofold. First, we seek to understand the blocking and facilitating factors encountered by the different stakeholders involved in co-production processes for climate change adaptation. Second, we seek to use this knowledge to identify actions and policy priorities to foster the implementation and scaling of adaptation co-production initiatives. The work carried out in this task focused on identifying the main enablers and barriers experienced by adaptation practitioners in implementing co-production processes. It examined which stakeholder groups are responsible for leveraging co-production processes and analysed how these factors affect the different steps of the co-production process, ultimately leading to specific co-production outcomes. To identify policy priorities, we specifically analysed the barriers for which only a few enablers or means of overcoming them are described in the literature, or available to practitioners and decision-makers.

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2.3. Structure of the deliverable

To identify and characterise the enablers and barriers associated with the co-production of adaptation measures, we conducted three parallel studies combining different qualitative and quantitative data collection methods. Firstly, we carried out a systematic review of the scientific literature to identify the main enabling and hindering factors. Secondly, based on the review results, we designed a survey targeting adaptation practitioners to learn lessons about their direct experiences. Finally, to identify more specifically the barriers and enablers that can impact adaptation public policies, we conducted semi-structured interviews with local policymakers in the 4 pilot regions of the AGORA project. These three joint studies and their results are presented in this deliverable.

3. Background about climate change adaptation co-production

Despite the growing impact of climate change and global recognition of the need to adapt, adaptation of human populations and activities is lagging (IPCC 2022). Several countries adopted ambitious goals and public policies, encouraging regions, cities, citizens, and stakeholders to accelerate the transformation towards climate-resilient communities, particularly in Europe through the EU Mission on Adaptation to Climate Change (MI4ADAPT). However, there is still a glaring implementation gap, and adaptation efforts are still insufficient and fragmented in comparison with the rate of climate change (Berrang-Ford et al. 2021; UNEP 2022). To achieve the Paris Agreement on climate change and 2030 Sustainable Development Goals (SDGs) to reduce people's vulnerability to climate change, it is now necessary to accelerate the implementation of effective adaptation measures on the ground (Haasnoot et al. 2020; IPCC 2022).

Addressing the complex challenge of increasing the capacity to cope with climate change requires the involvement of all those concerned to implement transformative and just adaptation strategies. The IPCC WGII[1] Sixth Assessment Report emphasizes the need for arenas for engagement and action bringing together a diversity of people, institutions, forms of knowledge and worldviews (IPCC 2022). The importance of public participation in climate action has been stressed at the international level repeatedly over the last decades (Hügel & Davies, 2020). Since the Rio Declaration of 1992, governments are responsible for promoting public participation by giving access to information and opportunities to engage in decision-making.

Also, the 2030 Agenda requires States to improve or restructure their decision-making process to ensure greater public participation, with particular attention to vulnerable groups (UN 2015). And more recently, the EU MI4ADAPT has reaffirmed the value of engaging citizens and stakeholders, supporting the actions of its members for successful adaptation planning and implementation

[1] Intergovernmental Panel on Climate Change, Working Group II on Impacts, Adaptation and Vulnerability

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(MI4ADAPT 2023). Consequently, public involvement in the co-production of adaptation solutions is becoming increasingly widespread and is gaining traction on the research agenda (Hügel & Davies, 2020).

Literature refers to a wide diversity of terms and definitions to describe people engagement in decisions and actions, e.g. public participation, co-creation, co-production, participatory process, collaborative process, transdisciplinary, or inclusive democracy (Brandsen, Steen, and Verschuere 2018; Loeffler and Bovaird 2020). In this deliverable we adopt the term co-production of adaptation solutions (Alford 2014; Howarth et al. 2022). We consider adaptation co-production processes from a broader perspective than the working definition adopted for citizen engagement in WP1[2].

According to the definitions of the AGORA project, co-production is associated with the involvement of citizens and stakeholders in all types of adaptation measures, can include all forms of participation and can occur at any stage of an adaptation measure's design and implementation. Thus, we consider co-production as a process that engages citizens and stakeholders in adaptation (e.g., adaptation policymaking, planning, governance mechanisms, on ground measures, climate services, knowledge and innovation, financial mechanisms), in one or all the process steps (i.e., adaptation solution problem reframing, selection and design, implementation, and monitoring and evaluation), engaging various type of stakeholders (i.e., civil society, local communities, citizens, academics, government, media, and economic actors).

Public participation in co-production processes encompass a range of interactions between participants, resulting in several typologies. The best-known is the Arnstein Ladder of citizen participation, describing different degrees of participation from “non-participation”, which we do not consider here, to “Tokenism”, including informing, consultation, and placation forms of participation, and finally to “Citizen power” including partnership, delegated power and citizen control (Arnstein 1969). Another similar typology used in this deliverable is provided by the International Association for Public Participation’s (IAP2, 2018) that have developed a spectrum of public participation. Five degrees of participation are described, inform (i.e., providing stakeholders with balanced and objective information to assist in understanding the problem, alternatives,

[2] Similarly, WP1 provided a working definition of what is encompassed by stakeholder and citizen engagement using 5 main criteria. An engagement process:

- Must include interactions with other citizens and/or stakeholders: actions of talking, discussing, debating, and/or deliberating.
- Must expressly consider “talking” as a form of participation.
- Must focus on local, national, or international issues of public concern which include climate change adaptation.
- Can be linked to civic and political processes.
- Can occur through a variety of media (not only face-to-face exchanges).

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opportunities, and/or solutions); consult (i.e., obtaining public feedback on analysis, alternatives, and/or decisions); involve (i.e., working directly with stakeholders throughout the process to ensure that their concerns are consistently understood and considered), collaborate (i.e., partnering with stakeholders in each aspect of the decision, including the identification, selection and development of the preferred solution); and empower (i.e., placing the final decision-making in the hands of the stakeholders).

It is assumed that, compared to 'top-down' approaches, greater engagement increases climate change adaptation measures' relevance, acceptability, and effectiveness, but also improves knowledge quality, promotes stakeholder empowerment and social justice, and ultimately leads to more sustainable outcomes (Burton and Mustelin 2013; Wamsler et al. 2020; Chambers et al. 2021; Newig et al. 2023; Wagner and Lima 2023). However, engaging stakeholders in action and decision-making processes can be counterproductive when carried out without paying sufficient attention to best practices, it may also lead to undesirable outcomes failing to achieve expected empowerment and societal transformation(Cattino and Reckien 2021).

Stakeholder engagement and co-production processes also face significant barriers. Indeed, they are time and resource intensive, challenging for participants, and suffer from power imbalance and conflict of interest as well as structural challenges due to inadequate organisational and governance structures (Gallagher and Scolobig 2020; Wamsler et al. 2020; Glaas et al. 2022) . Recognition and inclusion of the different stakeholder groups, meaningful engagement and communication at all steps of the decision-making process, power of the participant to shape the decision, and availability of just and comprehensive climate change adaptation options are conditions to meet under which co-production processes can be beneficial (Cattino and Reckien 2021; Newig et al. 2023).

A recent survey conducted by MI4ADAPT among its signatories highlighted that European regions and communities face significant challenges and barriers and need support in engaging stakeholders and citizens in climate change adaptation (Fleischmann, Dworak, and Glößl 2023). It is therefore essential to increase our understanding of the factors hindering and supporting climate adaptation practitioners to effectively engage stakeholders and citizens for creating adaptive, inclusive, and sustainable communities that are better prepared to tackle the challenges of climate change.

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4. Triangulation of a systematic literature review, semi-structured interviews, and online survey

4.1. Systematic scientific literature review

In this scientific review, we identified existing factors that enable or constrain stakeholders' and citizens' engagement in innovative solutions for improving climate change resilience, i.e. adaptation co-production. This task was driven by the following research questions:

- What are the main enablers and barriers to climate change adaptation solutions co-production?
- Who are the key stakeholders involved in leveraging co-production processes?
- How do enablers/barriers impact the different steps of the co-production process and lead to specific co-production outcomes?

4.1.1. Paper collection and selection

First, we conducted a systematic review of the scientific literature using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) methodology (Page et al. 2021) as a sorting tool to identify relevant literature from the Web of Science database (Figure 1).

We used a keyword search to identify and select articles that fell within the scope of our research, with each article containing at least one keyword related to climate change adaptation solutions, climate change, co-production, citizen and stakeholder involvement and factors (enablers and barriers) (Box 1). Given the vast literature on co-production and stakeholder engagement more broadly, it was necessary to restrict the scope of the review to the field of adaptation to climate change. We limited the search to peer-reviewed articles that were: written in English; published before 19 June 2023; and that contained the searched keywords in their title, abstract or keywords.

Based on these keywords, we retrieved 1340 records from the Web of Science database, and we removed only 3 duplicates. Subsequently, we screened the title and abstract of each article to determine if an article described at least one process of co-production of climate change adaptation solutions and the barriers and/or enablers experienced during this process. At this step, we excluded 1190 papers owing to at least one of the following three main reasons:

- The paper did not describe a co-production process;
- the paper did not describe enablers or barriers;
- the paper focused on enablers and barriers to the implementation of adaptation solutions and not on the co-production process.

In this way, we selected 147 articles for content analysis, during which a further 24 articles were deemed irrelevant to our analysis. Following these stages, a total of 123 articles were included in the analysis (a full list of the papers included is available in Annex 1).

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(TS=adaptation AND TS= climate change AND (TS=innovat* OR TS=initiative OR TS=solution OR TS=project) AND (TS= engag* OR TS=co-creation OR TS=Co-implement* OR TS=co-design OR TS=co-product* OR TS=community based OR TS=participat* OR TS=social learning) AND (TS=lever* OR TS=barrier OR TS=enabl* OR TS=catalys* OR TS=opportunit* OR TS=advantage OR TS= incentiv* OR TS=factor* OR TS=synerg* OR TS=lesson OR TS=obstacle OR TS=hinder* OR TS=challeng* OR TS=limit* OR TS= disincentiv* OR TS=mismatch) AND (TS=citizen* OR TS=stakeholder* OR TS=actor* OR TS=local communit* OR TS=policy* OR TS=government OR TS=decision maker* OR TS=civil society)) AND LA=(English)

Box 1. Search string and keywords used to retrieve relevant articles in Web of Science.

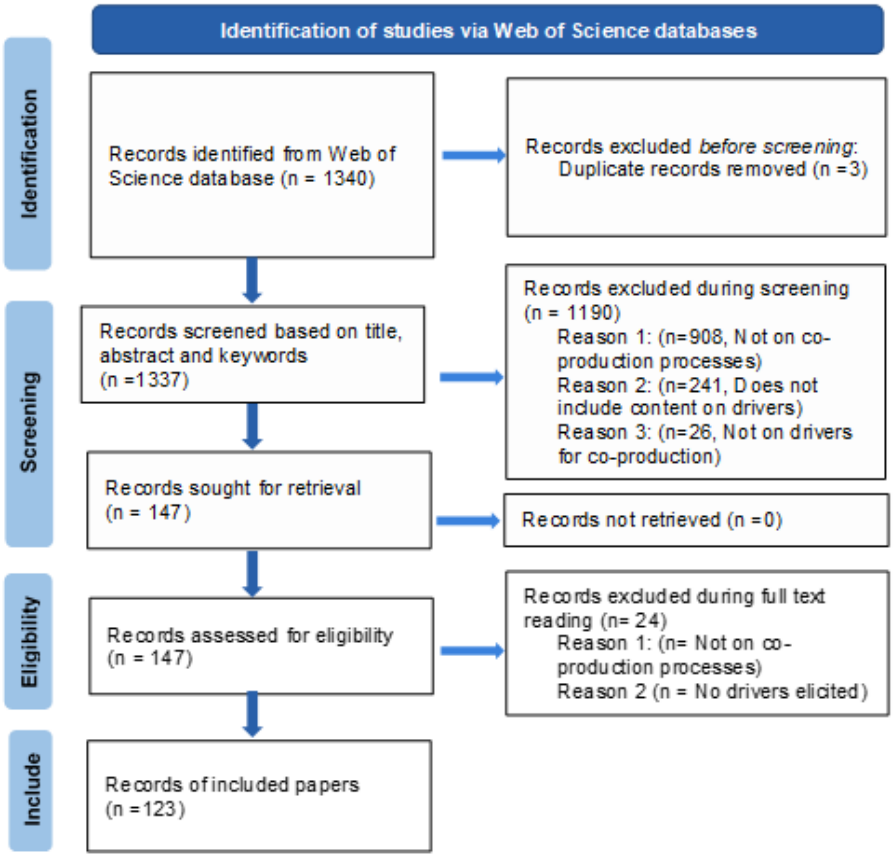

Figure 1. PRISMA diagram reflecting systematic review process

4.1.2. Paper coding to identify enablers and barriers to co-production

We distributed the selected 123 papers among the co-authors for detailed reading and coding. Each article was read by one co-author. If the first reader raised any doubts, a second co-author repeated the reading and coding exercise, and the results were compared and discussed to ensure the robustness of the analysis.

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We began our analysis by developing a coding framework, which we then applied to each paper. The framework was built collaboratively and iteratively to align with research questions and drew on the combined knowledge of the co-authors and their experiences with piloting the framework on test articles. For full details of the process, variables, and parameters used in the framework, please see Annex 2. In brief, we divided the coding framework into four main sections.

- Section 1 collected basic information about the paper (i.e., date, journal, authors, type of study and methods for data collection).
- Section 2 sought to better understand the adaptation initiatives treated in the paper. Here, we analysed 5 variables (the adaptation solutions type, sectors, benefits, scale, and location).
- Section 3 collected characteristics of the climate change adaptation co-production process, including the definition of co-production, the type of the co-production process, its outputs, and the methods used to engage stakeholders.
- Section 4 described the factors that enable or hinder the co-production process and their influence on different aspects of the process. After naming and defining each driver, we recorded the main type of factor, its impact, origin, and spatial and temporal scale of influence; the stakeholders who were responsible for and influenced by the factor, and the impacts on the various steps and outcomes of the co-production process.

4.1.3. Data analysis

Among the articles reviewed, a total of 655 factors were identified, of which 493 were considered as enablers and 173 as barriers to co-production processes (11 of which could act as both enablers and barriers). These factors were ordered according to a general categorisation during the coding process (22 enablers and 5 barriers were outside of these categories and were thus omitted from further analysis). We conducted a qualitative analysis based on the descriptions of all factors to further identify the different types of barriers and enablers described in the literature. We thus identified 11 specific categories of enablers and 7 specific categories of barriers. The dataset generated by this literature review has been made open access on the Zenodo research repository[3].

We conducted a semi-quantitative analysis of the individual factors rather than the papers. All variables were aggregated according to the category of factor to facilitate the analysis and graphical representation of the data. To explore the relationships between the different categories of factors (enablers and barriers) and the different variables studied (spatial and temporal scale, responsible and impacted actors, process steps, and outcomes), we calculated the frequency of each factor

[3] University of Geneva, Institute of Environmental Sciences. (2024). Literature review of the enablers and barriers to stakeholder and citizen engagement in climate change adaptation process (as part of Adaptation AGORA project) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.14265645

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category for each variable independently. We first summed the occurrences of all the variables within each factor category. Then, to ensure results were comparable and were not dependent on the number of factors included in each category, we divided the occurrences of each variable by the number of factors contained in each category (corresponding to the maximum number of occurrences possible). Finally, we performed a cross-analysis to compare the frequencies for each type of barrier and enabler.

4.2. Survey for adaptation practitioners

4.2.1. Survey framing and design

The online survey aimed to capture the key factors supporting or hindering adaptation practitioners experienced with engaging citizens and stakeholders in climate change adaptation initiatives. We built on the results of the survey combined and compared with those of the literature review to identify priority areas to upscale adaptation co-production processes.

We designed the survey following the logic developed in the literature review (see section 4.1) and we divided it into 4 main parts (the complete survey is available in Annexe 3). First, a consent form guaranteeing the respondent's age of majority, answers confidentiality, and their approval for the use of the information collected for research purposes. The second part set the stage to collect experiences about the adaptation and co-production process. We asked the respondents to focus on one experience of the adaptation co-production process for the entire survey.

A series of closed questions aimed to gather information, first about the experience under study (location, type, objectives, sectors) and then about the collaborative process linked to the adaptation initiative (role of the respondent, type of engagement, stakeholders' type in charge and involved in the process, objectives and outcomes achieved). The third part was dedicated to the assessment of the enablers and barriers experienced during the implementation of this process. We used *Likert scales* to assess the importance that each type of enabler and barrier played within the process as a whole. Then, a group of questions aimed to identify which factors influenced the different steps of a co-production process (stakeholders/citizens engagement, climate vulnerability assessment, solutions selection and design, implementation and monitoring). The last two questions sought to identify their motivations and constraints encountered.

Finally, one last section gathered socio-demographic information to monitor the inclusiveness and profiles of the respondents. It included questions about age group, gender, education level, place of residence and sector of activity. The survey was anonymous, but every respondent had the opportunity, via another form, to provide their details and be contacted in the context of the AGORA project.

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4.2.2. Targeted stakeholders

The stakeholder categories that we considered relevant for responding to this survey are European adaptation practitioners, i.e., all professionals in charge of implementing climate change adaptation initiatives, and more particularly, those involved in collaborative processes engaging stakeholders and citizens at the local and/or regional scale. The stakeholders, therefore, may be adaptation project leaders, public authority officials and civil servants in charge of designing and implementing local adaptation policies, or researchers involved in research projects implementing co-production processes for adaptation to climate change.

4.2.3. Survey dissemination strategy

The survey was administered online using Microsoft Forms to reach as many people as possible. It was widely disseminated online from December 2023 to June 2024 through various networks and media with the support of all partners of the AGORA consortium. It was first advertised on AGORA social media several times and then reshared by partner institutions and personal accounts. It was also included in projects and partners' newsletters (Adaptation AGORA, weADAPT, MI4ADAPT, MAIA, Urban Resilience, Energy, ECSA, ICLEI). Further, it was disseminated among adaptation and engagement community of practices' forums (EarthNet, Regions4Climate, MI4ADAPT), LinkedIn threads (National Adaptation Forum, European Climate Change Adaptation, Climate adaptation Practitioners, Community-based adaptation, ICLEI Urban Resilience, UN Climate Change), and during conferences using QR codes (Climate Europe2, EURESFO 2024, Socioecos2024 and the 5th Citizen Participation and Deliberative Democracy Festival). Finally, it was shared with personal emails addressed to UNIGE and partners' relevant contacts, as well as AGORA's project followers. It was decided with partners not to disseminate the survey in pilot regions' stakeholders' groups to avoid over-solicitation and fatigue.

4.2.4. Challenges encountered and lessons learnt

A total of 51 climate change adaptation practitioners responded the survey, a minimum of 100 responses were expected for this study. Collecting online responses has proven more difficult than initially expected. To increase the respondent`s sample, the survey has been first reduced in length (deleting question about factors impacting co-production process specific steps) and translated into three languages of the pilot regions: German, Italian and Spanish. Several reasons have been suggested to explain this low response rate, that we were able to identify thanks to feedback from some of the respondents and partners involved. Among the main reasons cited were the limited number of adaptation practitioners with direct experience on collaborative processes for climate change adaptation, the length of the questionnaire, the language barrier, the complexity of the questions, the lack of time and the fatigue of stakeholders to respond to online surveys.

However, some important lessons can be learned from this experience. It seems more and more difficult to capture the attention and time of professionals to complete online surveys. Ultimately,

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the widely distributed online survey format appears to be much less effective than surveys administered face-to-face (e.g. in the respondent's workplace). Given the time and resources available for this task, it was not feasible to implement this type of collection method for our survey. Moreover, short surveys with simple questions tend to have a better response rate. Our survey was rather complex because of its subject, the format of the questions to obtain precise data, but also the semantics used around co-production, which is still not widely shared. This complexity was reported to us on several occasions, and we reconsidered the length of the survey halfway through by deleting 7 questions that we considered too complex and less important.

Unfortunately, we were unable to track the number of surveys that were started but not completed. This statistic would have been useful to understand whether the low response rate was indeed linked to the survey length. The survey was originally designed in English to ensure broad distribution through social networks, English newsletters, and European stakeholder networks. While distributing it in multiple languages since the beginning could have been more effective, the initial plan did not include targeting local practitioners. Finally, another hypothesis lies in the fact that the term "adaptation practitioners" does not correspond to any one profession per se but encompasses many adaptation-related professions. For example, practitioners in risk management and environmental management might not recognise themselves in the target audience.

4.2.5. Data analysis

The survey received 51 valid answers (100 was expected). The data obtained from the survey were converted numerically to obtain the proportions of responses for each variable studied. Descriptive analyses were performed on these data. The dataset generated by this survey has been made open access on the Zenodo research repository[4].

Based on this survey experience and findings we have developed a protocol providing to researchers or practitioners with guidance to carry out Online survey to identify enablers and barriers to co-design, co-develop and co-implement innovative solutions for climate resilience.

[4] University of Geneva, Institute of Environmental Sciences. (2024). Survey answers to identify barriers and enablers to climate change adaptation solutions (as part of the Adaptation AGORA project) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.14265946

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4.3. Interviews with policymakers

4.3.1. Interviews framing and design

The aim of the interviews was to identify how current public policies support co-production processes implementation (in general, not only for policymaking), but also what changes are needed in the existing instruments to improve policies. Systematic literature review results (see section 5.1) reveal that with a supportive policy framework (i.e. sets of international to local policies, laws, strategies, plans, funding's schemes or planning documents) providing clear guidance, resources and incentives for collaboration, stakeholders and citizens are more likely to engage in co-production activities. Such supportive policy frameworks must enable adaptation practitioners to initiate, engage with relevant participants, implement and facilitate a collaborative process tailored to the local context.

We chose to use semi-structured interview method to gather local policymakers experience and perspectives. The interview protocol has been developed from October 2023 to January 2024. The outline of the interview was based on the systematic literature review results (see section 4.1). To increase consistency between the different activities carried out among the AGORA project partners and WPS, especially WP4 (Task 4.2. *Analyse and compare policy instruments*) and WP1 (Taks 1.2. *Review and analyse existing citizen engagement methodologies and recommendations*), we included also some questions about current engagement of citizens and their access to decision-making in co-production climate change adaptation processes at municipal and regional level. We thus discussed, refined, and validated the interview protocol during an internal review process involving WP4, WP1, and pilot region partners.

We divided the interview protocol into 3 sections and included 15 open-ended questions (see Annexe 4).

- Section (A) gathered information about the respondent's position, role, and experience with policy-making and co-production processes.
- Section (B) focused on examples of co-production processes involving citizens locally, the objectives associated with citizen involvement, and the ways in which participants have been able to influence these processes.
- Section (C) was dedicated to their perspectives on the policy frameworks supporting citizen participation in adaptation processes. It first focused on existing policies or instruments and resources allocated to the co-production process in terms of funding, human resources, legal framework, and institutional support.

Lastly, policy mechanisms or instruments that are still lacking or could be improved to develop more supportive policy frameworks in the future were explored. Two final questions were posed on ways

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to make these policies applicable and to promote their implementation, as well as how citizens can support policymakers in enhancing the policy frameworks.

In addition to the interview protocol, we provided guidelines, a draft invitation email for policymakers, and a consent form in English for translation into local languages to support partners in conducting the interviews. Additionally, bilateral meetings were held with each partner to ensure an understanding of the objectives and alignment of interests. The consent form was designed to ensure the confidentiality of the interviews and obtain the respondent`s agreement for audio recording, the use of anonymized interview content in publications, and the retention of contact details for future activities within the AGORA project.

4.3.2. Targeted stakeholders in the pilot regions

We targeted municipal and regional policymakers in agreement with local partners in the 4 AGORA pilot regions to obtain feedback from the field where the co-production processes for adaptation are being implemented.

We considered as policymakers, members of public authorities and administrations in charge of or taking active part in local/regional policymaking. Another criterion for selecting interviewees was their active participation in climate adaptation co-production processes. We define policymaking as the involvement in any step of the policy cycle from envisioning to design, implementation, evaluation, or monitoring (e.g., local/regional adaptation plans, risk management plans, or landscape planning).

4.3.3. Interview conduction and challenges encountered

Partners in the pilot regions identified a total of 20 respondents, based on the inclusion criteria outlined in section 3.3.1 and ensuring gender balance (Table 1). Five respondents were chosen per region, beginning with policymakers already involved in the AGORA project activities and then expanding through their networks and snowball sampling. Interviews were conducted in native language either in person or online in March and/or April 2024. The interviews content was either entirely transcribed or summarized depending on the tools and time available for the task. The transcribed content was anonymized to protect the respondents' identities.

Table 1. Interview respondent's characteristics

Institution/Position	Country	Gender	Sector
Court deputy	Spain	Male	Territorial development
Regional Government	Spain	Female	Environment and Environmental Quality
Regional Government	Spain	Male	2030 Agenda
University	Spain	Male	Sustainability

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University	Spain	Female	Sustainability and Agenda 2030
Municipal climate office	Italy	Male	Adaptation to climate change
Regional government	Italy	Female	Climate change expertise
Regional network of municipality	Italy	Male	Regional participation regulation
State Property Agency	Italy	Male	Public Property Regeneration
City administration	Italy	Female	Climate and Energy strategy
City administration	Germany	Female	Landscape Management
Private company	Germany	Male	Services supporting participation
Regional development agency	Germany	Female	Civic Engagement
Regional cooperation	Germany	Female	Mobility, sustainable economy, and future of the region
Regional development agency	Germany	Female	Municipal Development Policy
City administration	Sweden	Female	Environmental coordination
Public housing company	Sweden	Female	Environmental strategy
Environmental Administration	Sweden	Male	Environmental strategy
Environmental Administration	Sweden	Male	Blue and Green infrastructure
County Administrative Board	Sweden	Male	Urban planning

It has proved challenging for the partners to identify policymakers with the dual experience of policy-making and co-production processes associated with adaptation to climate change. To anticipate this challenge, we have identified two other potential respondent profiles and defined a procedure for conducting the interview, if appropriate:

- **The respondent has no experience in climate change adaptation:** Ask him/her to talk about what he/she knows, i.e., the same questions could be applied to reduction of GHG emissions, environmental management, water management, mobility, land planning, and urban sustainability.
- **The respondent has no experience with citizen engagement or co-production processes**: Skip section (B). Ask him/her to imagine organizing such engagement processes, what would be necessary to implement them, and what policy support they require, in terms of policies instruments, mechanisms, etc.

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4.3.4. Thematic content analysis

To systematically organise and analyse the content of the interviews, we carried out a thematic content analysis using MAXQDA software. Thematic content analysis followed the six-phase approach outlined by Braun and Clarke (2006):

- Familiarization with the data by reading carefully interview content and making initial notes and observations.
- Searching for potential themes and identify initial codes according to the research questions.
- Initial codes were generated systematically across the entire data set. Each segment of data that appeared relevant to the research questions was coded. This coding was undertaken by a single researcher, to reduce the risk of inconsistencies.
- The themes were then reviewed and refined to ensure they accurately reflected the data. This involved checking if the themes worked in relation to the coded extracts and the entire data set. Themes that were too diverse or lacked sufficient data were either modified or discarded.
- Clear definitions and names for each theme were established to capture the essence of what each theme represents.
- The final phase involved weaving together the analytic narrative and data extracts to produce a narrative from the data, in accordance with the research questions, previous results and literature.

An overview of the themes and final codes used to categorise the interview transcripts are outlined in Table 2 . A key challenge in the analysis related to the brevity of some of the transcripts was that they did not always capture the full details and nuances of the discussions. As such, many tools, policies, or projects were not fully described in the transcripts. Wherever possible, web searches were undertaken to fill in gaps and provide more background information to enhance the analyses. Language was also an issue, as some of the translated transcripts were difficult to understand and could not be directly quoted in the analyses.

Table 2. Overview of the themes and codes used in the thematic content analysis of interviews transcripts.

Main themes	Codes used to the interview transcripts
Interviewee role	Government Academic Private sector
Mode of participation	Obligated participation

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	Grassroots participation Collaborative participation Consultative participation Targeted participation
Scale of activity	National Regional Municipality/local Autonomous
Purpose of participation	Local relevance Mutual learning Transparency and accountability Empowerment and ownership Awareness and behavioural change Holism and integration
Policies, instruments, tools	Policy development tools Citizen-orientated tools Public-private partnerships Transparent governance tools
Barriers	Lack of awareness Weak regulation Fragmentated approaches Representational challenges Resource constraints Priorities and interests
Enablers	Awareness-raising Frameworks Capacity building Governance Inclusive engagement Regulations and finance

Following the same objective as for the questionnaire and with the idea of sharing guidance and lessons learned with our peers and colleagues, we also developed an open access Interview protocol to Identify enablers and barriers to co-design, co-develop and co-implement innovative solutions for climate resilience.

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5. Results

5.1. Systematic literature review

5.1.1. Paper distribution

This section describes how the data collected about the paper's metrics, adaptation to climate change solutions, and co-production process parameters are distributed among the reviewed papers. The collected papers have been published between 2009 and 2023, and the number of papers increased over time, peaking in 2020, demonstrating the growing interest of the scientific community in adaptation and co-production processes (Figure 2). Papers retrieved were published in almost 50 different academic journals; however, the most recurrent are *Environmental Science & Policy* (10 occurrences), *Sustainability* (9), *Environmental Policy and Governance* (7), *Climate Policy* (6), and *Climate and Development* (5).

Regarding the type of study published, most of the papers are based on case studies (68%) or compilations of case studies (11%) describing the adaptation processes experienced, observed, or studied by the authors. Besides these, a rather small percentage of papers are based on literature reviews (9%) or comparative studies (6%). Most of the papers' data collection is either based on mixed methods, often combining stakeholder elicitation, literature, and document analysis (41%), or on stakeholder elicitation through workshops, interviews, or surveys among processes' participants (37%). The remaining papers' data collection is based on scientific (11%) or grey literature (2%) analysis, or on the accumulated experience of authors (7%). These two results suggest that most of the papers collected are based on adaptation and co-production processes that were either experienced or observed by the authors.

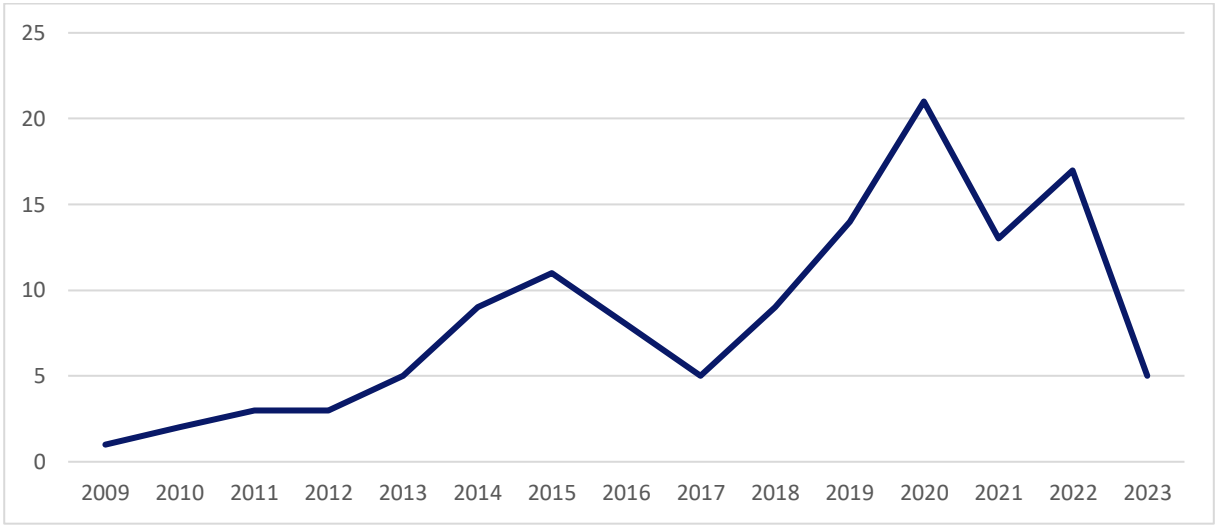

Figure 2. Distribution of paper reviewed per year (n=123).

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5.1.2. Adaptation solutions and co-production processes characteristics

We also wanted to understand the nature and scope of the adaptation solutions for which co-production processes have been implemented. We have therefore characterised the type of climate change adaptation solution (Figure 3), the sector to which it applies (Figure 4), and the associated benefits as well as the scale (Figure 5) and location (Figure 6) of their implementation.

Regarding the type of climate change adaptation solution (Figure 3), a quarter of the solutions reported were institutional, i.e., aimed at creating adaptation policies, programmes, regulations, or strategies. Approximately one-fifth (17%) of the solutions aimed to bring change in social practices, activities, or behaviours. The remaining consisted of knowledge co-production for research or innovation (15%), nature-based solutions (14%), and technical and infrastructural solutions (13%, also called grey solutions). Our data also show that financial solutions remain poorly represented among other adaptation solution types (below 5%).

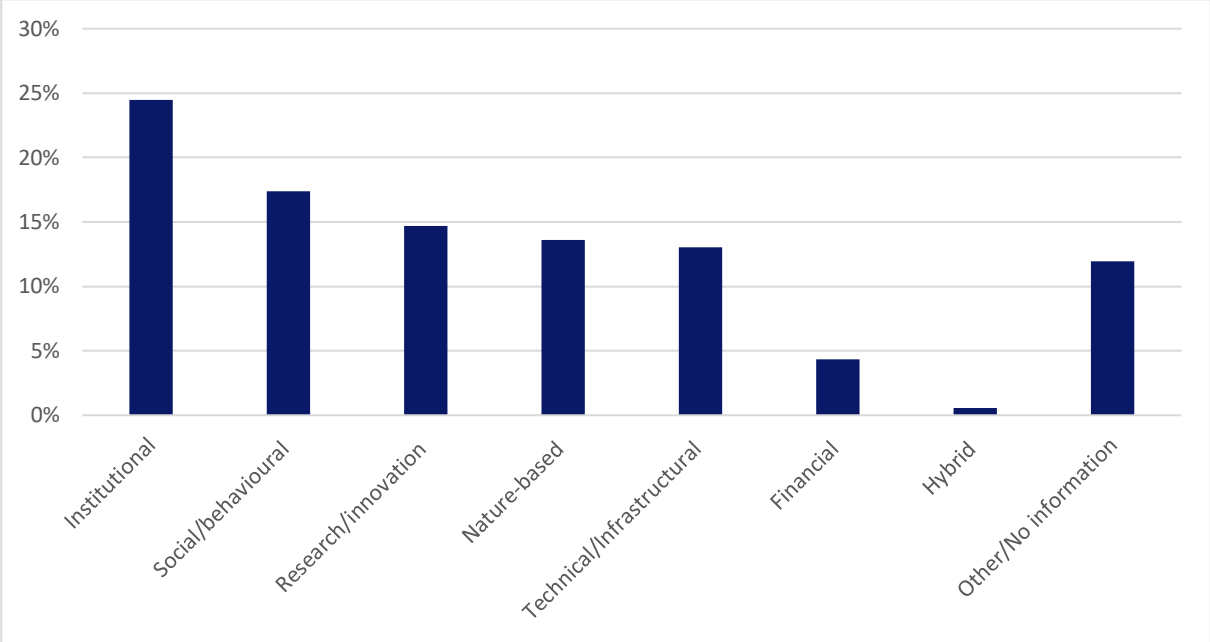

Figure 3. Climate change adaptation solutions by type (multiple choice variable, n=184)

The sectors in which these solutions have been implemented (Figure 4) and their benefits were also recorded. In most articles, the solutions were not linked to a specific sector but rather to climate adaptation in general. Additionally, sectors linked to natural areas, such as water, agriculture, and environmental management were frequently cited. The infrastructure/building, land use planning, and risk reduction sectors are also represented, but to a lesser extent. Interestingly, adaptation solutions in business and industry, cultural, and financial sectors were the least studied. Despite a significant lack of information on the benefits of these adaptation solutions, there is a

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predominance of solutions aimed at addressing the risks associated with disasters, water issues, carbon emissions, threats to people's livelihood, and biodiversity loss.

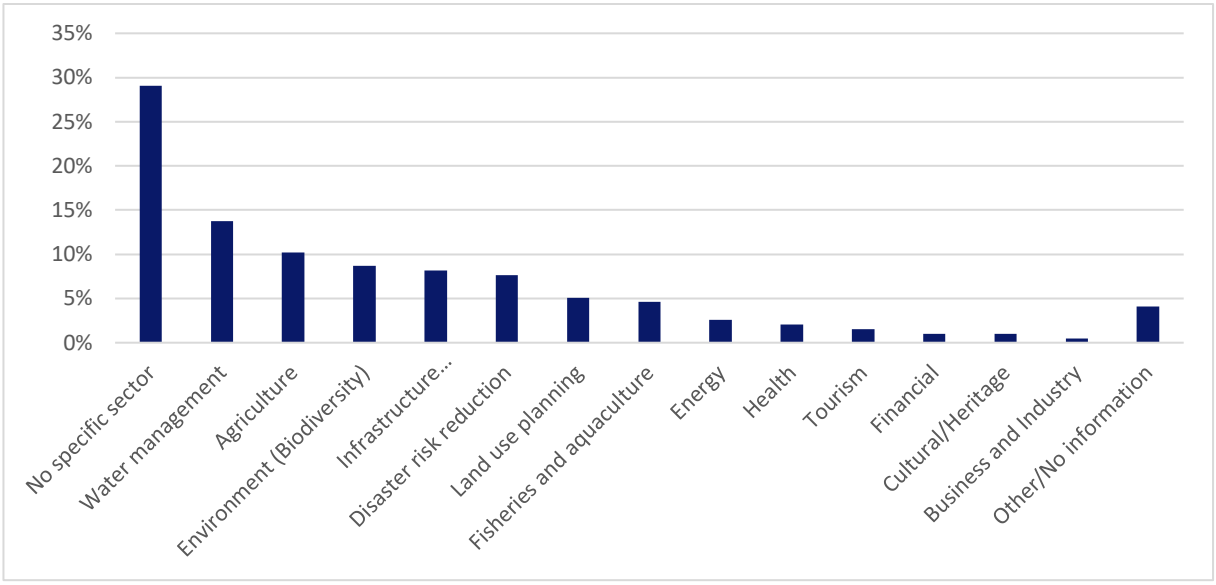

Figure 4. Key Sectors targeted by adaptation initiative (multiple choice variable, n=196)

Our results suggest that climate change adaptation solutions are predominantly implemented locally (50%) and then regionally (21%) or nationally (18%) rather than internationally (6%) (Figure 5), as expected (IPCC 2022). Adaptation solutions reported were mainly located in Europe (30%), which indicates a bias towards adaptation implementation in the EU regions. However, these results fit well with AGORA's focus on the European context. Then, there is a good distribution (between 10% and 18%) of adaptation solutions located in North and South America, Africa, Oceania, and Asia (Figure 6).

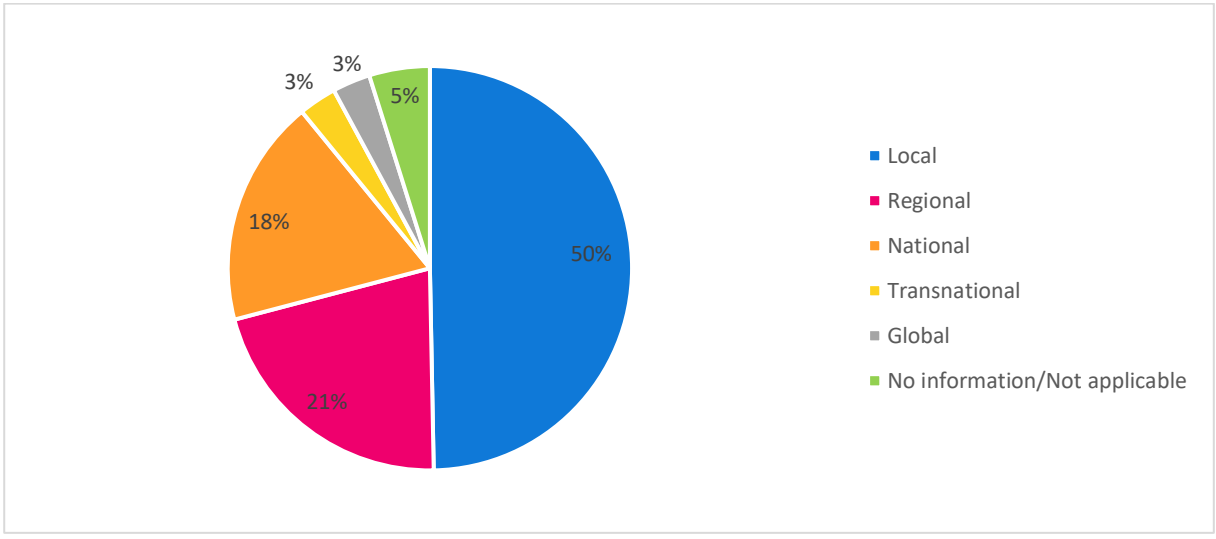

Figure 5. Implementation scale of climate change adaptation solutions (multiple choice variable, n=165)

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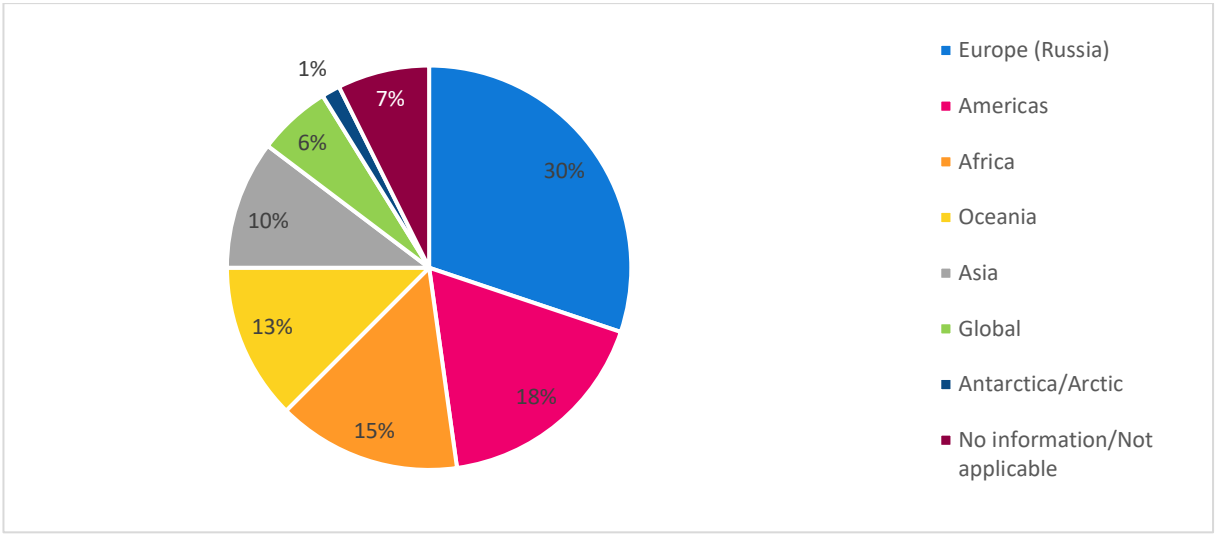

Figure 6. Location of climate change adaptation solutions (multiple choice variable, n=136)

In addition, to reach a better understanding of the co-production processes reported in the peer-review papers, we collected information about the co-production process types and outputs as well as the methods used to engage stakeholders in the adaptation process.

Three types of processes have been identified more frequently (Figure 7). First, the participation of the public in the planning of public policies, that encompasses deliberative participation, public consultation, etc. Second, the participation of the public in the design of a service though different media such as forums or living labs. Third, the involvement of citizens or actors in the implementation or delivery of a service such as peer learning focus group or digital warning systems. Three types of processes were cited in less than 6% of the articles, which involve the management, evaluation, and financing of adaptation services.

It is thus interesting to highlight these activities remain either poorly addressed in the literature or rarely implemented in a co-produced way. However, the substantial amount of missing information may be due simply to the absence of this information in the literature or to the classification used, initially formulated for public services, which may not capture the diversity of types of co-production processes documented in the literature. Besides, co-production processes outputs were divided between five main categories, the most frequent being the co-production of adaptation strategies or plans, (23%), then of knowledge (19%), of actions on the ground (13%), of capacity building (11%) and, finally, of public policies or instruments (9%).

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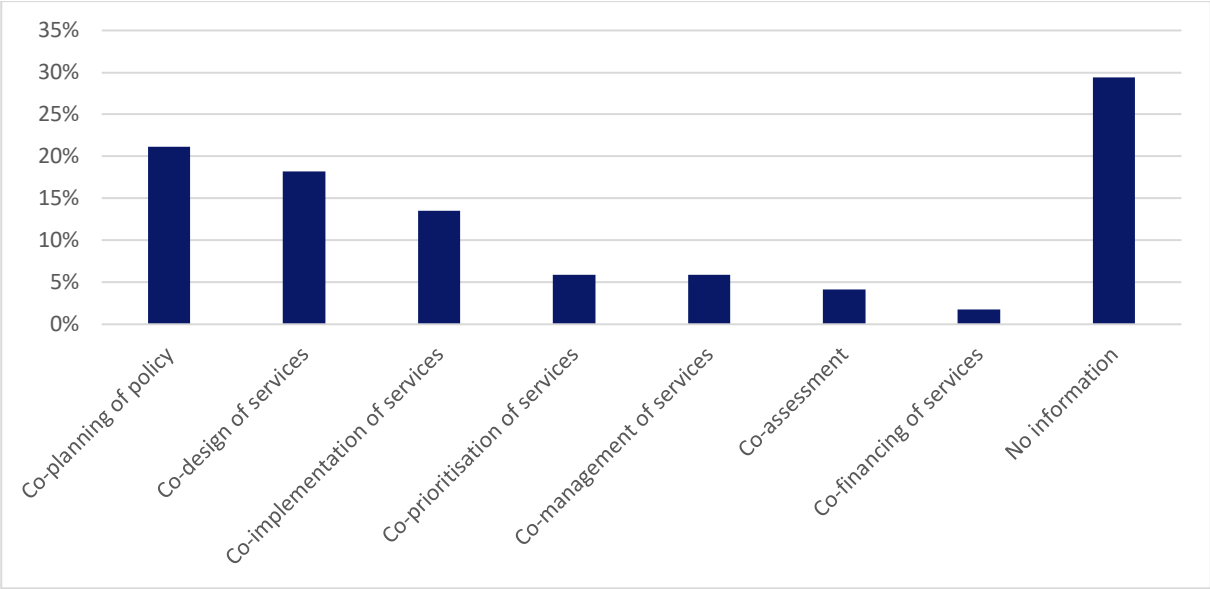

Figure 7. Co-production process type (multiple choice variable, n=170)

Finally, an important diversity in the engagement methods was reported in the co-production process documented in the papers (Figure 8). The most frequent methods used to engage stakeholders are workshops (17%), meetings (11%), surveys (11%), interviews (9%), and focus groups (7%). These results suggest that among the diversity of engagement methods, the most conventional ones are still preferred and used. Still, in about a quarter of the papers, this information was missing, highlighting the need to better report on the methods used in co-production processes.

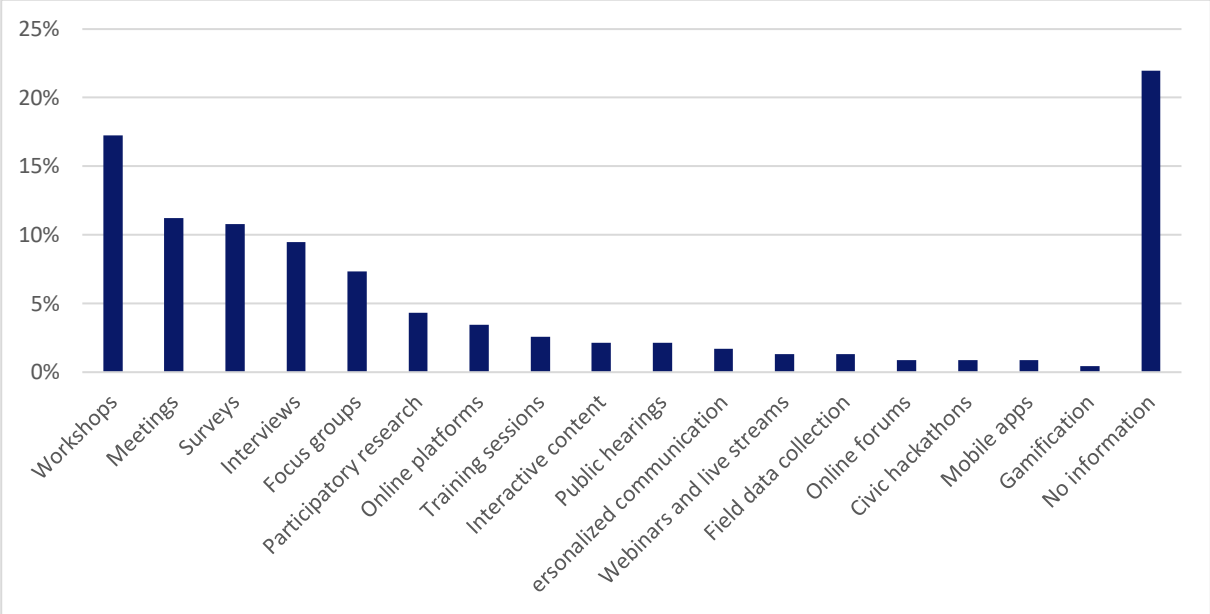

Figure 8. Stakeholder engagement methods (multiple choice variable, n=232)

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5.1.3. Barriers and enablers to adaptation co-production processes

Among the 123 papers included in the analysis, 655 drivers were identified by co-authors, 493 of them were considered as enabling and 173 as hindering co-production processes (11 of them could be considered as enablers or barriers). These results highlight an important gap between enablers and barriers reported in the literature, as a vast majority seems to focus mainly on reporting about the enablers, good practices, and solutions-oriented research (Figure 9).

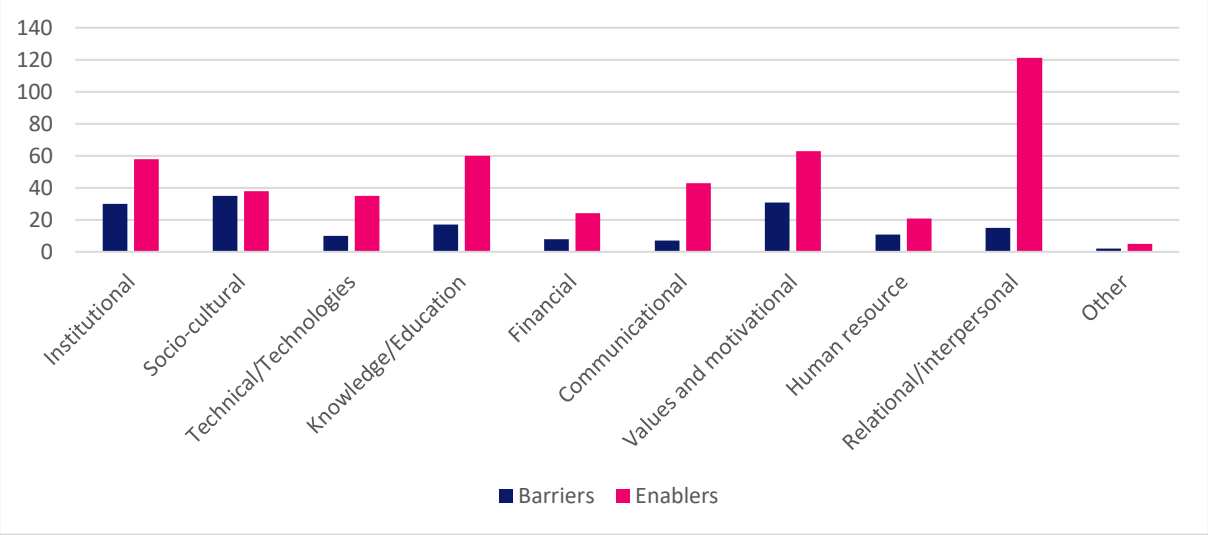

Figure 9. Distribution of the barriers and enablers according to their first attribution to the broad drivers' classification (each factor was attributed to one category, n=666).

If we consider the enablers, according to the broad classification, a quarter of enablers were linked to relational and interpersonal drivers, encompassing drivers linked to networks, partnerships, power and influence relationships, trust building, participatory and collaborative work, or process inclusiveness. Then, institutional (e.g., formal rules such as policies, regulations, and legislation), motivational (e.g., participants' interests, values, priorities, or perceptions), and knowledge (e.g., access to, inclusion, and sharing of multiple forms of knowledge) related enablers each account for 13% of those identified. Socio-cultural (e.g., informal rules such as cultural norms, habits, and attitudes), communicational (e.g., communication media supporting awareness, engagement, or networks), and technical (e.g., technologies, material resources, or technical skills) factors are identified in around 10% of enablers reported. Finally, the less-reported categories (<5%) are linked to financial and human resources enablers.

On the other hand, the 3 main types of barriers - representing around one-fifth (20%) each - were linked to socio-cultural, motivational, and institutional factors. Then, barriers related to relational, technical, and human resource issues each represent between 5% and 10% of the identified barriers. Financial and communicational barriers were the least reported in the literature (less than 5%).

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However, there is a significant gap between certain types of enablers and barriers emerging from the review. For example, the literature documents a large number of socio-cultural barriers, and relatively few enablers to deal with these. This is also the case for institutional and motivational barriers. Conversely, relatively few barriers are identified concerning the relational and collaborative aspects, whereas a very large number of enablers are reported for dealing with them, particularly in relation to the successful design of a co-production process.

5.1.3.1. Barriers hindering adaptation co-production processes

A detailed analysis of the barriers documented in the papers allows us to refine the classification to identify specific types of hindering factors to adaptation co-production process implementation (Table 3).

The most prominent barrier category is related to an inadequate institutional and governance system (Figure 10). Institutional barriers faced in climate adaptation co-production first include internal functioning challenges such as siloed thinking, poor internal coordination and collaboration, bureaucratic hurdles, staff turn-over, or lack of human resources and capacities. Furthermore, it includes external challenges such as inadequate funding schemes, non-supportive political and legal frameworks and tools, poor collaboration with external actors, constraints by higher levels of governance, or lack of mandates about climate adaptation.

The second most prominent category of barriers has to do with the complexities of the co-production process itself. It encompasses challenges related to languages, working habits and practices discrepancies, lack of experience and training, miscommunication among participants, or lack of accountability and monitoring of the process.

Close to the previous barriers mentioned, a third category includes the lack of capacities of people to engage in adaptation processes, e.g., limited financial resources, skills, mobility, agency, education, or self-confidence, but also the lack of knowledge and data on adaptation.

The fourth category relies on different interests and expectations regarding the process and the climate change adaptation solution in terms of objectives, working habits, benefits, involvement, and self-reinforcements of participants.

The last three barrier categories are equally represented, with 18 items each. Thus, the fifth category includes the lack of motivation of citizens and stakeholders to engage, which has to do with low motivation and willingness to participate in such processes. It encompasses co-production fatigue, lack of time to engage in collaborative processes, lack of information and awareness about climate change adaptation, and also the perception of lack of influence on the process's outcomes.

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The sixth category concerns existing scepticism about people's ability to contribute to and the benefits of co-production processes, which is reported to originate mainly from the authorities. This includes neglect of local context and local community's needs, knowledge, and capacities, leading to the exclusion of some groups in the process. This category also encompasses a narrow view of co-production and low integration of knowledge produced in co-production processes in climate change adaptation services or policies.

The last category is about power imbalances and distrust in authorities and processes. It includes the challenges faced by invisible and existing power structures but also the reluctance of authorities to devolve power and control of decisions to the public, leading to low ownership and legitimacy.

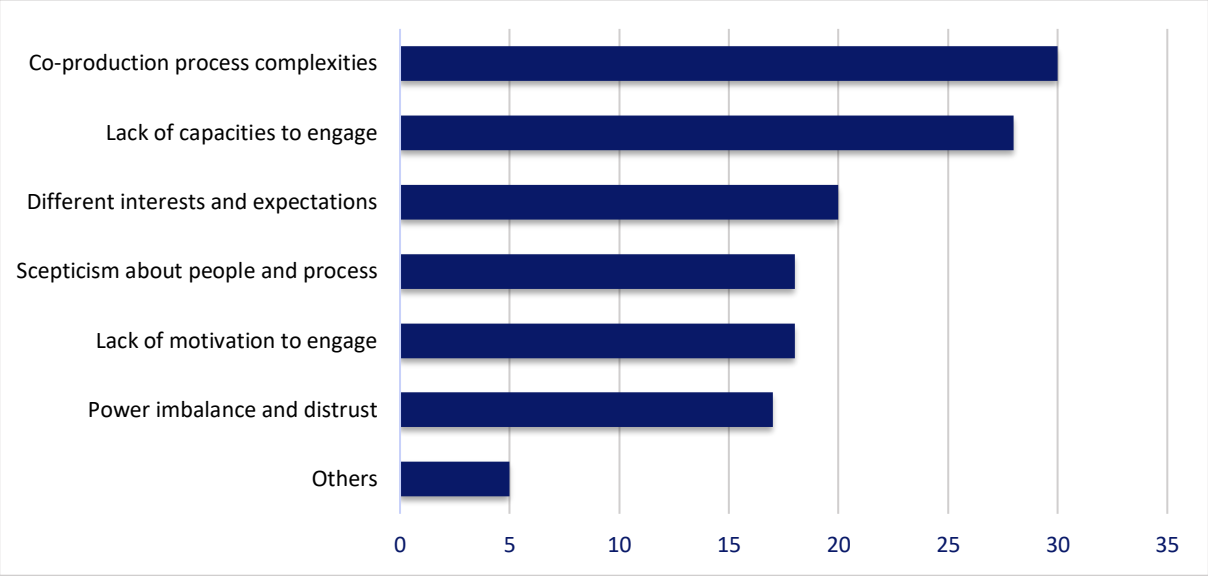

Figure 10. Occurrence of barriers reported for each category (each barrier was attributed to one category, n=168).

Table 3. Detailed mechanisms encompassed behind each barrier's category.

Barriers main categories	Details
Inadequate institutional and governance system	- Internal functioning of institutions (inadequate coordination between sectors, siloes thinking, lack of communication, different interest, non-supportive work habits and structure/s, reliance on different policies, lack of collaborative habits, etc.) - Local authorities are constrained by higher level of governance (regional, national) mainly toward consultation (applied in a tokenistic way) - Adaptation project driven by outsiders without accounting of local context (often link to international funding schemes) - Low degree of collaboration/ interaction/partnership between public, private, NGOs, civil society organisation and researchers - Lack of institutional capacity/ institutional trap/burden, heavy bureaucracy

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	(civil servant fatigue, experience, awareness, resources, habits of promoting engagement, lack of anticipatory habits) - Adaptation is not mainstreaming among institutions, lack of practices maturity about climate change adaptation - Important turnover of staff and elected people, dependence of willingness and interest in climate related issue of leaders and staff - Lack of governance, institutional, legal framework, tools for climate change adaptation and citizen participation - Inadequate funding scheme, lack of fund for human resource
Co-production process complexities	- Different languages and terminologies, concepts, technical and scientific language - Lack of experience and training in the organiser team - Lack of understanding about scientists' practises of collaborative research - Late involvement of participants (after project design) - Ineffective or miscommunication with local stakeholder, inadequate information sharing practices - Lack of monitoring and constant contact with implementors - Different ways of working, habits, practices - Difficulties in defining roles and accountability of partners (fear of responsibilities) - Complex interplay between concepts, assumptions and emotions - Not clear understanding of governance and institution functioning - "Competition" with other topics considered more relevant for policy making (e.g., unemployment)
Lack of capacities to engage	- Lack of capacities and resources to participate (agency, competencies, education, options, self-confidence, knowledge and awareness, incomes, mobility, material) - Lack of knowledge on climate change adaptation solutions, of localized data, of reliable information
Different interests and expectations	- Different expectations and interest alignment around projects (expect more concrete benefits rather than research about policy advancement) - Existing social groups self-reinforcement - Research and practitioners' objectives/working habits differences - Actors playing for their self interest
Lack of motivation to engage	- Participant`s perception of lack of influence of their actions (on policies, on climate change reduction, climate change adaptation solutions, etc.) - Co-production fatigue, lack of time and energy to participate in collaborative processes - Low willingness to participate from citizens - Dominance of individual interests over common goods - Lack of information to participate - Interplay of sense of urgency and climate change/ climate change adaptation subject's complexity
Scepticism about people and process	- Neglect of local context and people's needs (e.g., tangible benefits for local population) - Underestimation of knowledge held by local communities, reinforcing hierarchy of knowledge types

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	- Narrow view of citizen participation and co-production processes: lack of recognition and integration of knowledge and results from co-production - Exclusion of population groups (process requiring high level of education, language issues, skills) - Vision of citizen as consumers not as stakeholders
Power imbalance and distrust	- Invisible power (preferences among certain SH, gender issue, pressure, project appropriation by certain groups) - Reluctance of governments to devolve power and control of decisions to the public - Distrust in authorities and in the process - Existing power structures (linked to education, income, political orientations…) - Low ownership and legitimacy

5.1.3.1.1. Spatial and temporal influence of barriers

Using frequency calculations, we analysed how different types of barriers are reported to influence the spatial and temporal scales of the climate change adaptation processes under investigation. Regarding the spatial influence (Figure 11), most of the barriers have influence at the individual, local (meaning the level of climate change adaptation initiative or the municipality level), and regional scale; some have influence at the national scale, but almost none have influence at supranational or global scale. At the individual scale, the most influencing barriers are linked to different interests, lack of capacities to engage, scepticism about people's ability to contribute and co-production process benefits, and finally, low engagement rate and motivations. At the climate change adaptation initiative or local levels, all types of barriers seem to have an important influence, but power imbalance seems to act specifically at this level. At the regional scale - affecting inter-municipal, departmental, or regional level - we found barriers linked to a lack of capacities of people to engage, inadequate governance systems, and power imbalances.

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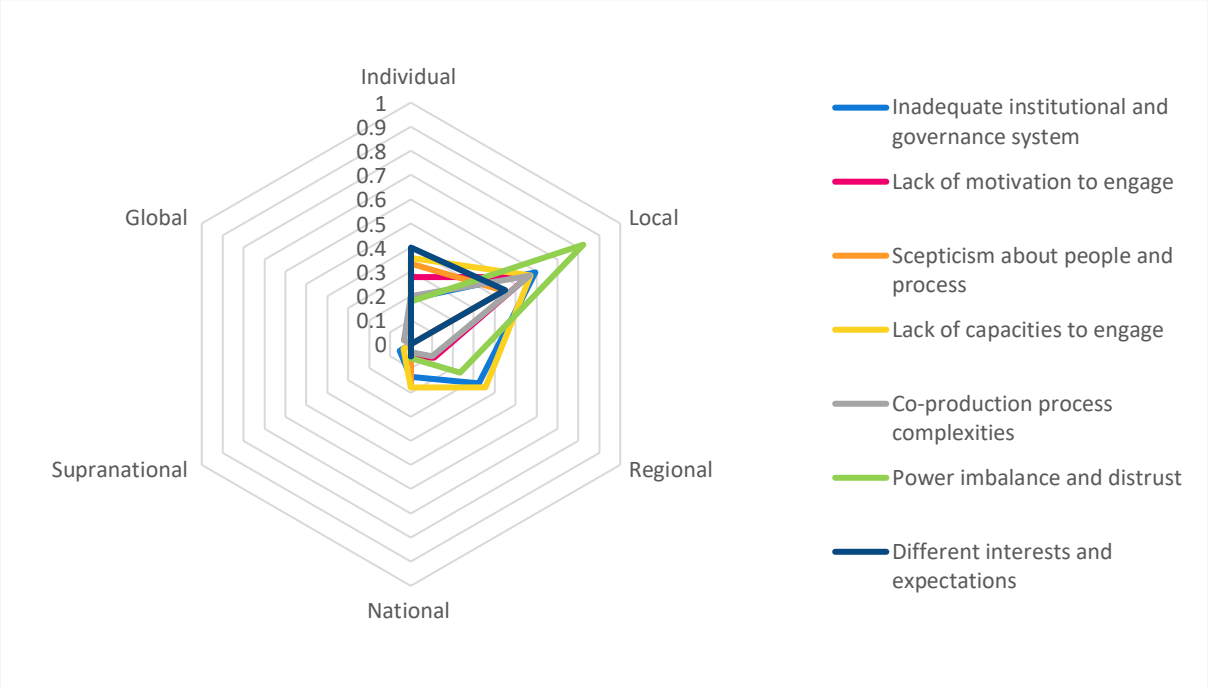

Figure 11. Spider diagram showing *the* frequency of the main barrier categories at different spatial scales (multiple choice variable)

Regarding the temporal influence of the barriers, the results are more heterogeneous (Figure 12). In general, barriers' influence on the process and the stakeholders tends to be in between the immediate (i.e., direct effect), short-term (i.e., effect on the following years after factors activation), and medium-term (i.e., effect up to a decade after factors activation), and barely in the long-term (i.e., effect after a decade after factors activation). Here, we identify four patterns of temporal influence among the different types of barriers. First, the inadequate system of governance influences all timeframes. Second, a group of barriers encompassing power imbalances, co-production process complexities, and lack of capacities to engage is reported to have a strong influence in the immediate and short-term while impacting medium and long-term to a lesser extent. Third, two barriers affect mostly immediate and short-term, encompassing a lack of actors' motivation to engage, as well as different interests and expectations barriers. Finally, a last barrier type, which has an influence only on short and medium temporal scales, stands in the scepticism about people and processes.

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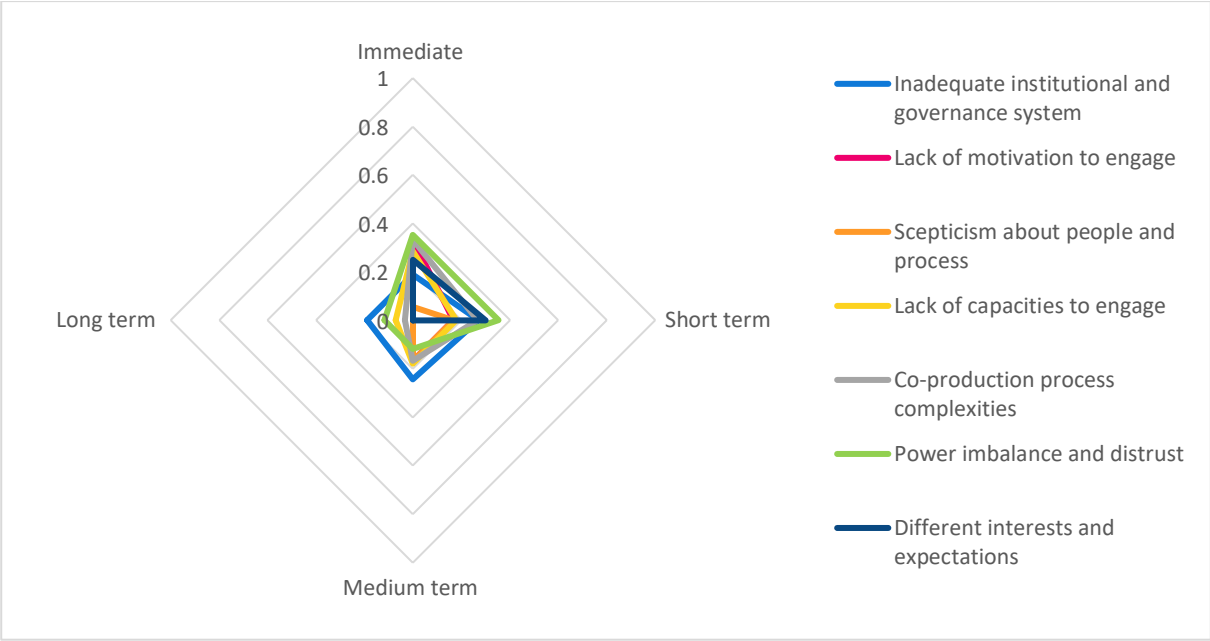

Figure 12. Frequency of the main barrier categories at different temporal scales (multiple choice variable).

5.1.3.1.2. Stakeholder groups influencing and impacted by barriers

To better understand which actors may encounter different types of barriers in the implementation of a climate change adaptation co-production process, it was important to identify the actors that have an influence on and are impacted by these barriers. The results indicate that the types of actors that influence most of the barriers are governments and academics, followed to a lesser extent by communities and civil society (Figure 13). Conversely, the main actors (negatively) impacted are communities, followed by citizens and governments (Figure 14). Results indicate that the co-production processes for climate change adaptation documented in the literature are most often driven and implemented by public authorities and academic actors trying to engage communities primarily, followed by citizens and civil society. Economic actors and, especially, the media are particularly under-represented in this type of process.

If we look more closely, the authorities influence the barriers linked to the organisation and structure of the institutional and governance system but, reversely, also strongly affect them in the implementation of co-production processes. This type of barrier also impacts local communities, citizens, and civil society. The lack of motivation to engage stakeholders in this type of process is influenced by the authorities concerning co-production fatigue and lack of time and energy to participate in the collaborative process. It is also reported to be influenced by the citizens and communities themselves, with a low perception of their influence on the process and a lack of motivation and incentives. The authorities are partly influencing the scepticism regarding people's participation and co-production process, and in particular citizens and communities, to respond to the challenges of adaptation.

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The authorities and academic actors (particularly for knowledge) limit the availability of capacities to engage, and they are also affected by this lack of capacity (human, capacity building skills, and economic resources). Economic actors also influence this lack of capacities. Communities and citizens are affected by this lack of capacity to engage in collaborative climate change adaptation processes. Academic actors and, to a lesser extent, the authorities are reported to have an influence on the complexities encountered in co-production processes. This result confirms that academics and authorities are most often the initiators or facilitators of co-production processes, so the burden of implementing the process and its complexities falls on them. We can also see that the actors affected by this type of barrier are both the participants (communities and citizens) and the organisers (particularly the authorities). The authorities, and to a lesser extent, local communities, appear to have an influence on power imbalances and distrust. If this imbalance seems to be in favour of the authorities, the actors most affected by this barrier are the local communities and citizens. The divergence of interests and expectations that sometimes block the implementation of adaptation solutions are mainly influenced by the academic world and the authorities, but also by economic actors and citizens. Once again, this barrier mostly impacts the communities.

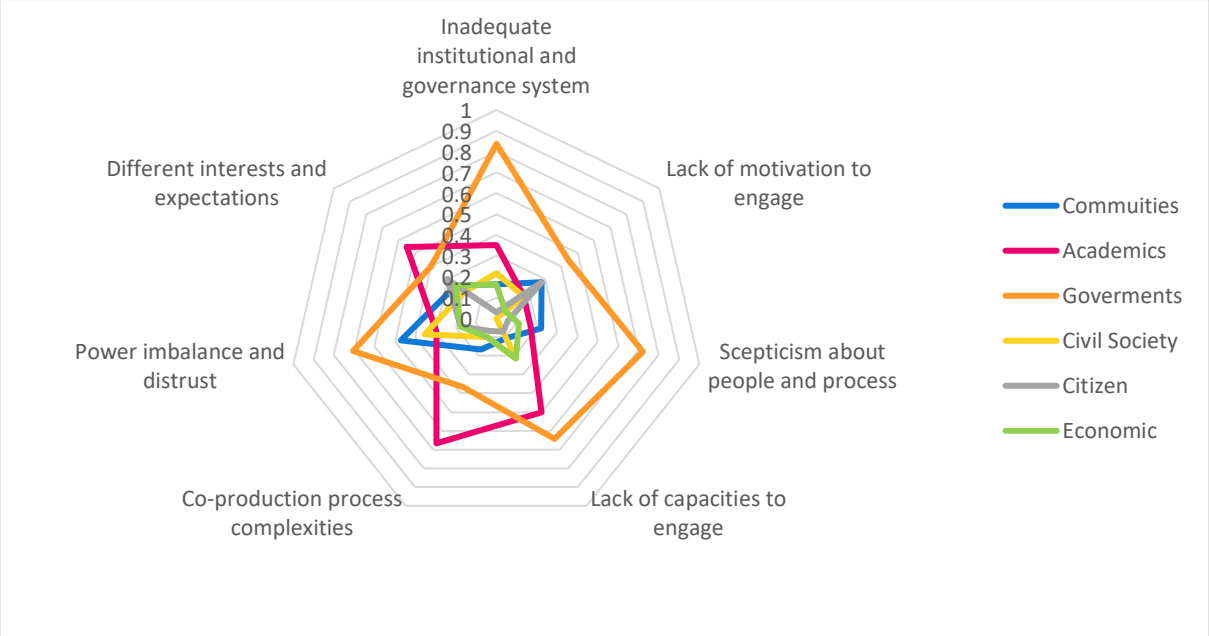

Figure 13. Frequencies of the main stakeholder groups influencing different types of barriers (multiple choice variable).

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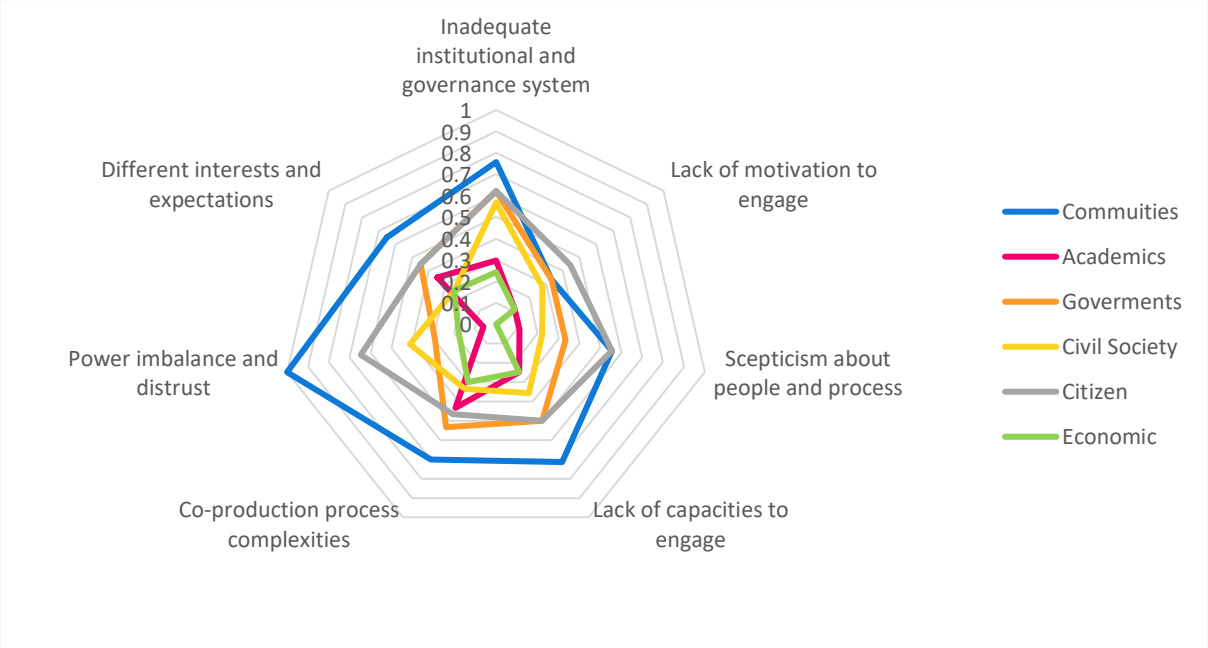

Figure 14. Frequencies of the main stakeholder groups impacted by the different types of barriers (multiple choice variable).

5.1.3.1.3. Barriers' influence on adaptation co-production steps and outcomes:

We also investigated which steps of climate change adaptation co-production processes were affected by barriers (Figure 15). All barrier types have been reported to affect the entire process without any step distinction. The stakeholder engagement phase appears to logically suffer from the lack of motivation of actors to engage in such processes but also from power imbalances prior to the engagement. Two barriers predominantly affect the problem-framing phases, which are linked to divergent interests and expectations from different participants, but also the people's ability and process-related scepticism. These two barriers also strongly affect adaptation solutions option analysis and design steps. Besides, the lack of capacities impacts the implementation of the adaptation initiative. The co-production process complexities are reported to impact all the steps equally. This is also the case for the inadequate governance system, which affects the implementation and monitoring phases less (perhaps by this stage, these barriers have already been overcome). However, there is a significant lack of reporting at the monitoring stage.

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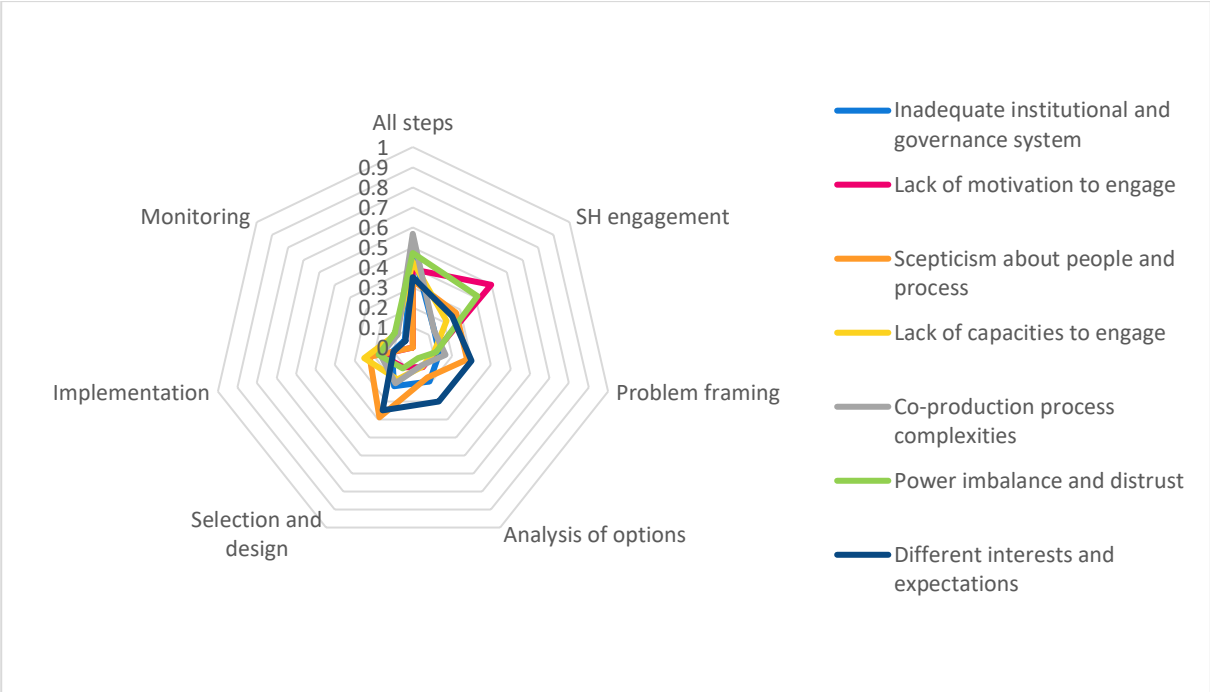

Figure 15. Frequencies of the different types of barriers affecting co-production process steps (multiple choice variable).

Finally, we wanted to explore the influence of barriers on the co-production process outcomes (Figure 16). The results show that some barrier types have different effects on the main outcomes expected from co-production processes. For example, the production and transfer of knowledge between stakeholders are impacted by the existing scepticism about people's ability to engage and process, which leads to less representativeness among participants or neglects a whole strand of knowledge. Knowledge creation is also influenced by the lack of capacities (including a lack of knowledge), as well as by the process complexities, such as language and comprehension issues. Considering process learning outcomes, they are mainly impacted by three barrier types: process complexity, lack of actors' motivation to engage, and different interests and expectations. Interestingly, empowerment and social justice are reported to be limited by power imbalances and distrust. Participant empowerment is also limited by many barrier types, such as the lack of capacities, inadequate governance system, scepticism, and different interests and expectations. The results also show that some barriers limit all the outcomes to a greater or lesser extent, such as lack of motivation, divergent interests and expectations, and inadequate governance system.

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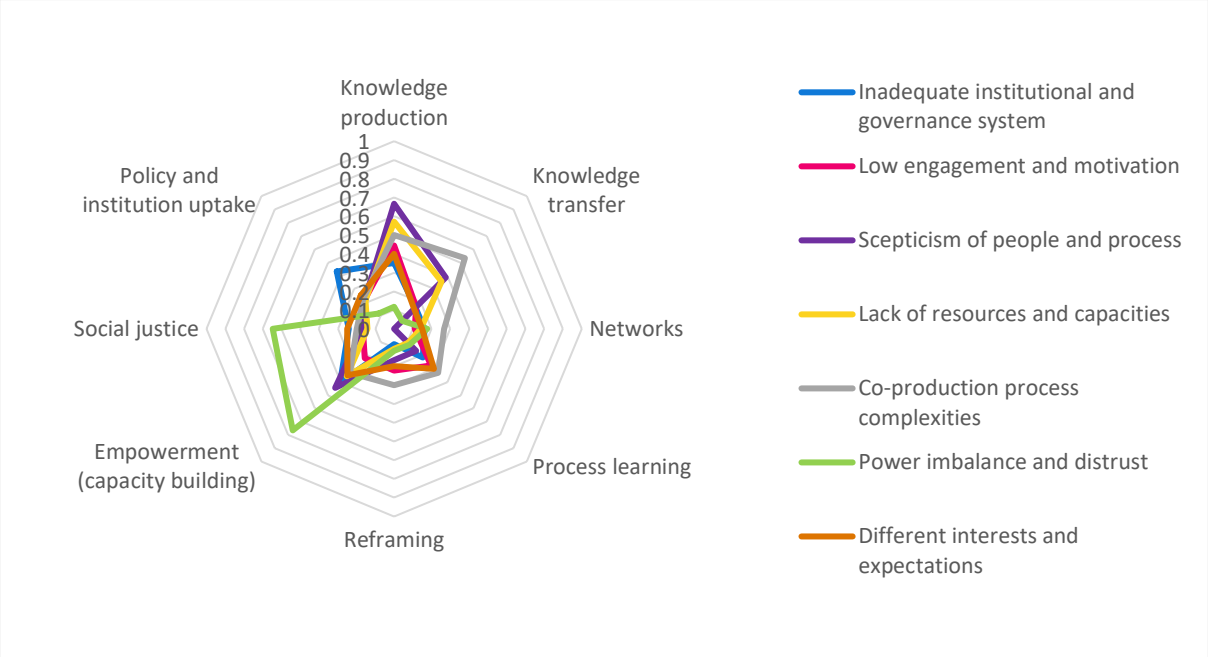

Figure 16. Frequencies of the different types of barriers affecting co-production process outcomes (multiple choice variable).

5.1.3.2. Enablers facilitating adaptation co-production processes

As mentioned previously, many enablers to support collaborative climate change adaptation processes are reported in the literature. These enablers could be grouped into 11 broad categories (Figure 17 and Table 4). We can distinguish two main groups of enablers; the most cited ones can be considered as being internal to the process (i.e. that process organisers can influence) and the others as external (i.e. that the organisers of the process cannot influence).

Within the internal enablers, the most cited category is the flexibility of the process design in addressing climate change adaptation issues and facilitating stakeholder engagement. This involves building a context-based, systemic, reflective, and timely process that leaves room to deal with uncertainty and learning by doing.

The second category is related to collaboration and communication within and outside the climate change adaptation process. It encompasses building a safe place for dialogue, co-creating shared understanding and language, and encouraging iterative, non-hierarchical, transparent, and two-way interactions among participants.

The next two types of internal enablers are strongly linked and relate to the recognition and integration of participants' differences and building an inclusive approach. This means building a process that not only involves stakeholders who are representative of the various existing groups but also recognises and integrates all their knowledge, values, and perceptions. Moreover, such a

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process considers the local context and power relationships. All this is done with the aim of building trust, respect, and reciprocity among the participants.

The fifth internal enablers category deals with sharing the roles and responsibilities among the process organisers and participants, thus helping to address power inequalities. This involves the active engagement of stakeholders at every step of the climate change adaptation process and giving participants a role in the decision-making and governance system.

The last category of internal enablers regards the involvement and support of intermediary actors to implement the collaborative process. This means calling and collaborating with boundary organisations bridging research and policy, experts on co-production processes and climate change adaptation, bringing the skills and knowledge required, but also relying on local champions or influential groups providing motivation and inspiration for other participants.

Among the external enablers, the most frequently cited ones are the motivation of stakeholders and citizens to engage and act for climate change adaptation. People's motivations seem to be driven by perception and willingness to reduce their own vulnerabilities, their level of awareness and climate impacts experienced, the benefits obtained (not only monetary), but also by intrinsic factors such as values, beliefs, or sense of responsibility. Past experiences of co-production also emerge as a driver of motivation to engage in similar processes.

A second main category of external enablers is linked to gaining institutional support. It encompasses, on the one hand, the need for clear policies, regulations, guidelines, planning, and resources to implement climate change adaptation and co-production processes, and on the other hand, the need to involve authorities and obtain political support at different scales for their leadership, capacities, and influence.

The last categories of external enablers are almost equally cited and are, therefore, not very widespread in peer-reviewed articles. The third one concerns taking advantage of existing social capitals and norms, meaning to use, build on and foster existing social norms, influence, connection and networks, but also to foster collaborative leadership and grassroots approach led by communities. It's also about building trust among leaders and communities.

The fourth one refers to the development of supportive funding schemes, pointing the need of innovative incentives, reward and accountability structure to foster the motivation to engage. It also encompasses the need for context comprehensive, long term and sustainable funding schemes that specifically target adaptation and co-production processes and encourage the involvement of the private sector.

The last category concerns the knowledge and capacity available to engage in adaptation co-production processes. This means ensuring that people have access to context-specific, clear,

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tailored, and reliable data and information, as well as capacity building resources to provide access to funding, technology, knowledge and education.

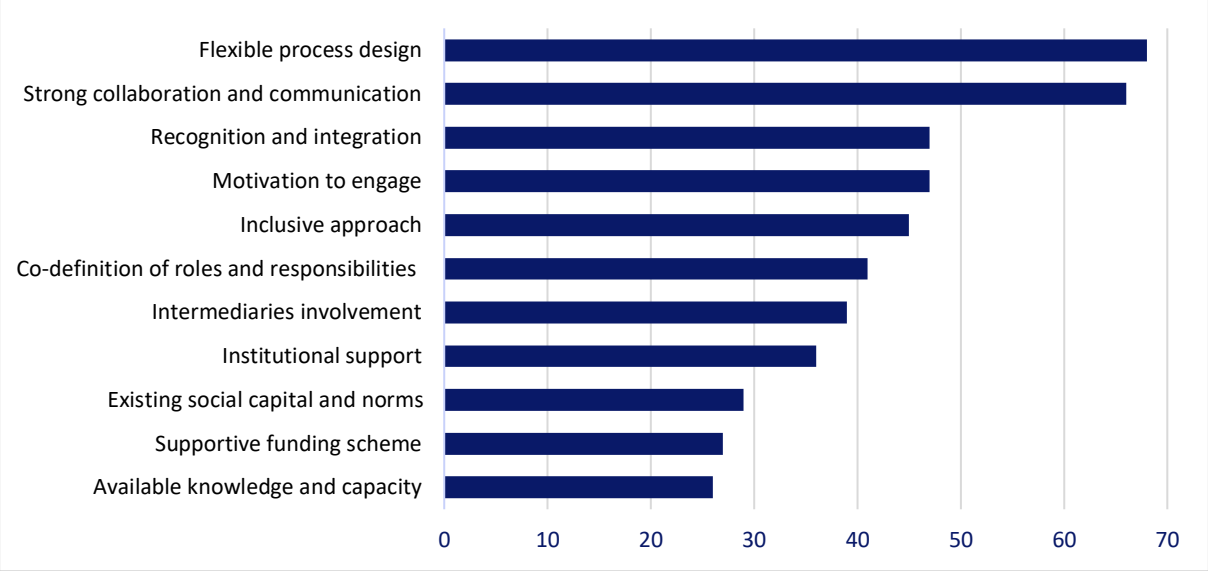

Figure 17. Occurrence of enablers reported for each main category (each enabler was attributed to one category, n=471).

Table 4. Detailed mechanisms encompassed behind each specific enabler's categories.

Enablers main types	Details
Flexible process design	- Process flexibility, adaptability and planning - Acceptance of uncertainties, creation of room for mistakes, learning by doing, safe place for testing - Systems thinking, short- and long-term issues consideration - Context based, tailored scope and scale, locally relevant process while taking external influence into account - Reflective and timely (enough time) approach - Provision of good examples, best practices, user-friendly tools, positive approach - Coordination among external projects - Provision of a flexible enabling working environment
Strong collaboration and communication	- Creation of spaces for dialogue and learning - Direct (in person/group discussion), collaborative, iterative, transparent, sustained interactions, two-way communication (use of workshops, focus groups, interviews, etc.) - Co-Creation of shared understanding and language (non-technical) - Non-hierarchical interactions - Clear and transparent information throughout the process - Trust-building among participants - External communication adapted to different publics

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Motivation to act and engage	- Perception and willingness to reduce own vulnerability/risk (at individual, household, neighbourhood or municipality level) - Level of awareness and perception on climate change risks and adaptation benefits - Experiencing and acknowledging climate change impacts (past or recent experience) - Intrinsic/personal factors influencing motivation (values, worldviews, beliefs, principles, knowledge, attitudes, interest, place attachment) - Experience of co-production processes - Sense of responsibility toward environment and future generations - Benefits reward (learning, impacts, social innovation, contribute to commons) - Perception of utility
Recognition and integration	- Recognition and integration of different sources of knowledge (scientific, practical, informal, traditional) - Recognition and integration of different worldviews, perspectives, values, and perceptions - Integration of local context parameters - Consideration of power issue - Vertical and horizontal integration, cross-sectoral collaboration - Knowledge, best practices, and experiences sharing - Trust building, respect and reciprocity
Inclusive approach	- Involved a representative sample of the population/stakeholders, (e.g. communities, citizen, private sectors, vulnerable and marginalized groups, governments, researchers, Youth, civil society, NGOs) - Inclusiveness concerning (e.g. gender, vulnerability, intergenerational, responsibilities, marginality, cross-sectoral, social groups) - Accessible platforms and processes
Co-definition of roles and responsibilities	- Stakeholder role in decision making and governance systems - Participants involvement in the problem framing, vulnerability and risk analysis, design and implementation of the project - Clear organization, monitoring, division of responsibilities, roles and tasks - Leadership sharing - Balance of expert's role - Early stakeholder engagement - Identified contact point
Intermediaries' involvement	- Stewardship by intermediary organizations (consultancies, community organisation, boundary organisation between research and policy) - Trained facilitators, experts in community engagement - Collaboration between experts of CPP and experts of adaptation/climate bringing skills and knowledge required - “Knowledge brokers” ‘big-picture thinkers’ - ‘Innovative experts in their fields’ ‘passionate individuals’ who were committed to eliciting change - Local leaders/champions/Influential groups/peers (provide inspiration, motivation, engaging)

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	- Support of international organisations/expertise - Long-lasting links through bridging organizations
Institutional support	- Local authorities/governments involvement for their leaderships, capacities, influence or mandates - Fundraising by institutions (e.g. municipalities) - Political and institutional support = Clear guidelines, policies/regulations, resources, and incentives for collaboration and for adaptation - Intra and inter (scale) municipal collaborations - Reliance on ongoing planning and engagement - Proactive institutions staff/civil servant - Strong national regulation on adaptation and co-production
Existing social capital and norms	- Reliance on existing social connection and network - Trust building among leaders and communities - Collaborative leadership approach - Social norms, networks and communities' ties influence - Bottom-up and grassroot approach lead by communities
Supportive funding scheme	- Innovative reward/accountability structure, incentives, reward, recognition, benefits as a motivation to participate (could be material, intrinsic, social or normative motivations) - Locally/context comprehensive funding opposed to international and national source of funding - Long term funding, continuity and sustainability (ensuring learning and monitoring) - Funds to support participants practically - Private sector engagement, income diversification - Funding mechanisms targeting adaptation and co-production specifically
Available knowledge and capacity to engage	- Availability and access of data and information - Use of available knowledge, skills and abilities - Clear, tailored, harmonized, system wide, reliable, context specific data and knowledge - Capacity building to give access to resources, funding, technology, knowledge, education - Highlight relevance and saliency of adaptation for the different stakeholder groups.

5.1.3.2.1. Spatial and temporal influence of enablers

The reported enablers affect primarily the local level, meaning at climate change adaptation initiative or the municipal level (Figure 18). They also all tend to impact individual and regional scales but to a lesser extent, while having very little impact at the national level. The enablers identified in this research do not appear to affect the supra-national and global scales.

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Regarding specific enablers effects, we observe that motivation and available knowledge and capacities to engage impact strongly individuals. On the contrary, institutional support enablers have no impact at individual level, but rather very strongly at local, regional and national level.

Figure 18. Spider diagram showing frequency of the main enablers categories at different spatial scales (multiple choice variable)

Similarly, most of the enabler types follow a common path by having a reported influence predominantly at the short-term, followed by medium- and immediate- term (Figure 19). However, long-term effects of enablers are difficult to analyses and are rarely recorded, monitored, or evaluated beyond the short term, thus explaining the lack of information on this timeframe. Considering specific enablers influence, we observed that existing social capital and norms, supporting funding scheme, intermediary's involvement and institutional support have a greater influence at medium- and long- term.

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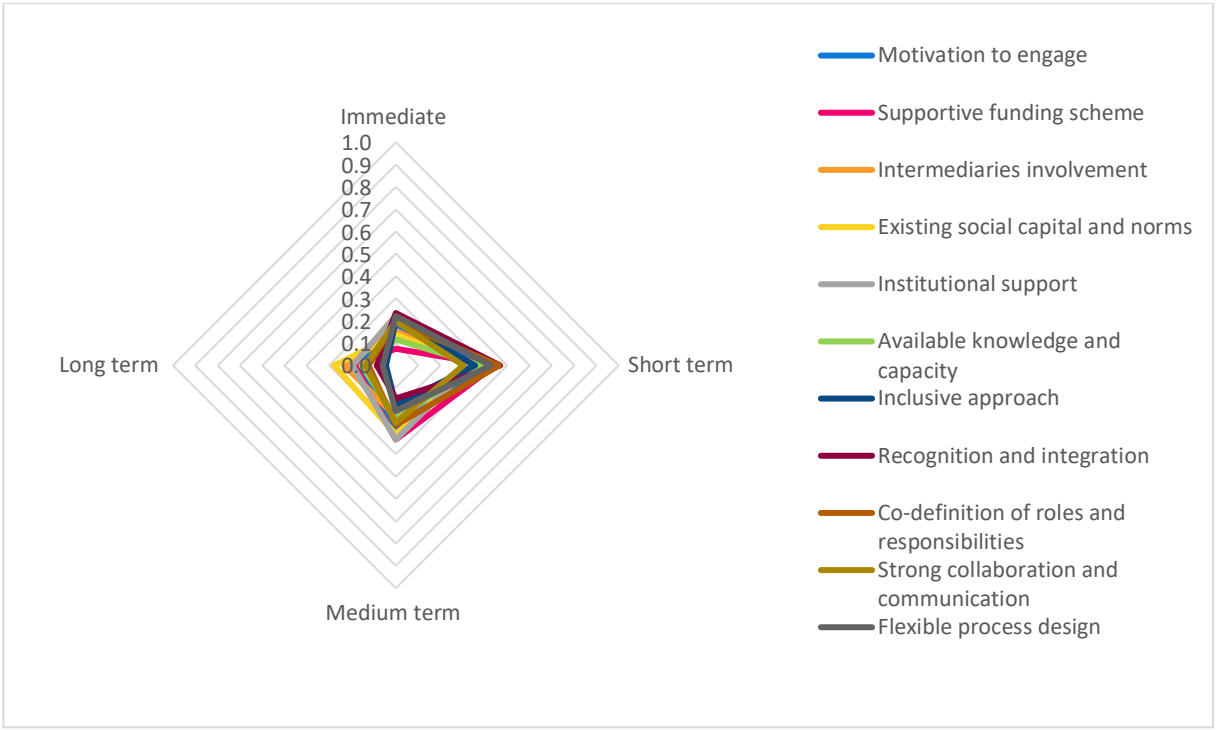

Figure 19. Frequency of the main enabler`s categories at different temporal scales (multiple choice variable)

5.1.3.2.2. Stakeholders influencing and impacted by enablers

As highlighted for barriers analysis, the main stakeholder groups influencing the activation of different types of enablers are authorities and academics, and those impacted are communities, citizens, civil society, and governments (Figure 20 and Figure 21). Motivation to engage appears to be a shared responsibility among the different types of actors. However, this type of enabler specifically targets citizens and communities. Providing supportive funding schemes is influenced by authorities and economic actors, but it also impacts them as well as communities. Institutional support enablers are primarily related to government authorities. Many stakeholders are impacted by these barriers such as communities, civil societies, and, to a lesser extent, citizens. Academics are considered having an influence on intermediaries' involvement and on making knowledge available as they often play the role of intermediaries and knowledge brokers in such processes. These two enablers in turn target all stakeholders, in particular, communities, and governments. Communities and, to a lesser extent, civil society and citizens are activating existing social capital and norms; they are also among the most impacted by this enabler category. Citizens seem to be targeted or impacted by all enablers to a higher or lesser extent. They are particularly targeted by enablers linked to motivation, social capital and norms and available knowledge and capacities.

For enablers such as co-production process flexible design, strong collaboration and communication, definition of roles and responsibilities, integrative and inclusive approaches, academics and authorities play - as expected - a critical role. Civil society influence the enablers

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linked to the distribution of roles and the inclusiveness of the approach. These five enablers are reported to have an impact on all types of actors, especially communities, but also on civil society and governments, particularly in terms of the distribution of roles and responsibilities and the inclusiveness of the process. Finally, economic actors are reported to be targeted logically by supportive funding scheme enablers, but also by intermediaries' involvement and available knowledge and capacity.

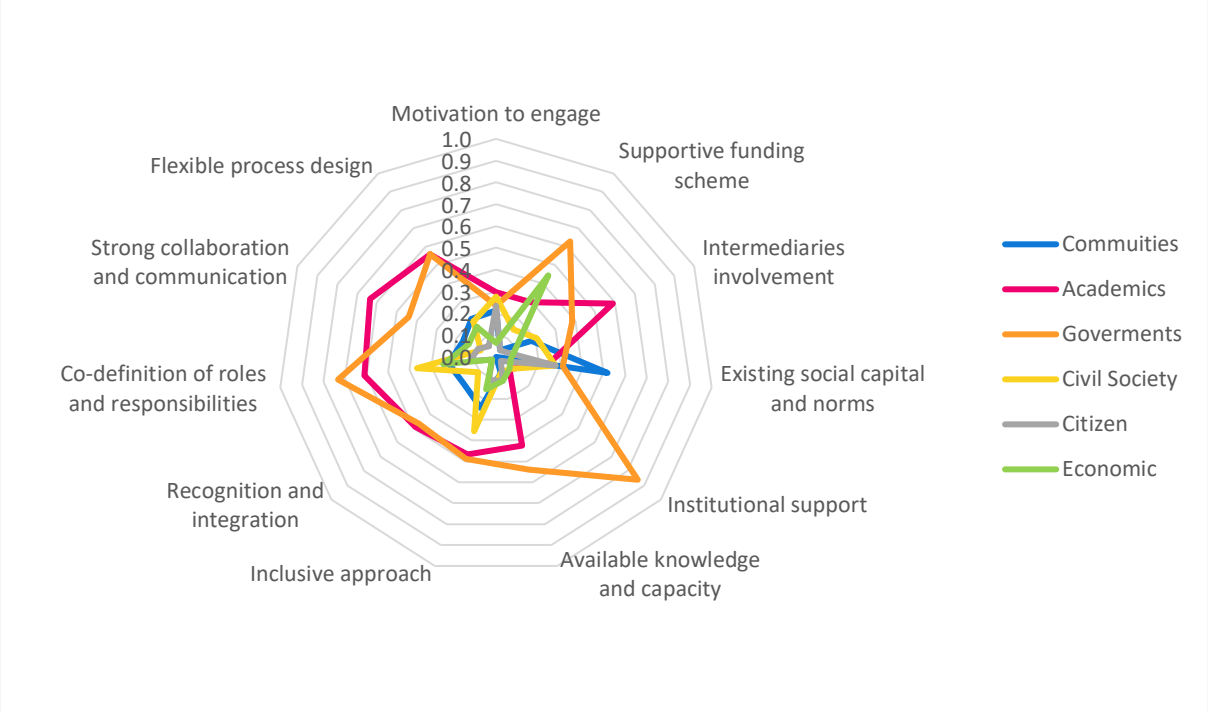

Figure 20. Frequencies of the main stakeholder groups having an influence on different enabler types (multiple choice variable).

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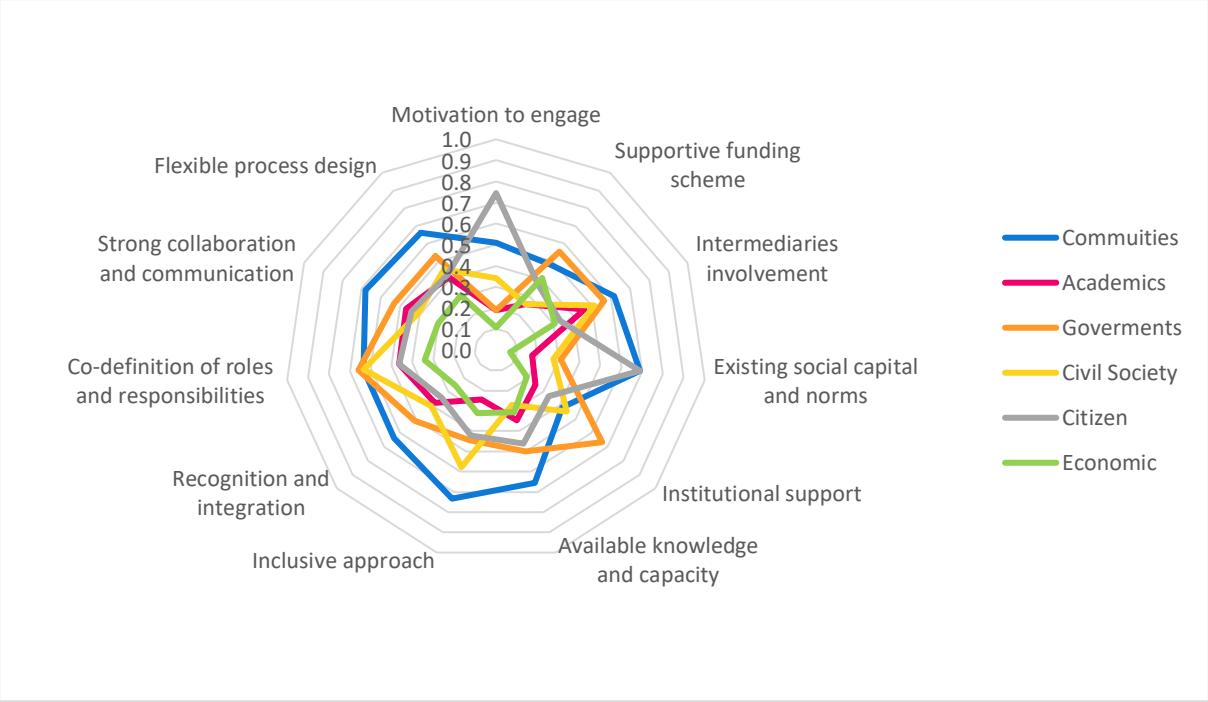

Figure 21. Frequencies of stakeholder groups impacted by the different enabler types (multiple choice variable).

5.1.3.2.3. Enablers influence on climate change adaptation co-production steps and outcomes

The analysis of climate change adaptation co-production process steps impacted by the different enablers revealed that most of them are reported to have an impact on all the steps and not just one in particular. However, some enabler types have an impact on specific steps (Figure 22). Motivation to act and engage, existing social capital, and available knowledge/capacity play an important role to foster stakeholder engagement in such climate change adaptation co-production processes. These enablers rely on existing motivation, skills, awareness, knowledge, and capacity but also on existing networks and relationships. Strengthening these aspects could really help to first engage actors in co-production for adaptation.

Problem framing is mostly impacted by some of the process design enablers such as recognition and integration of differences, approach inclusiveness, and flexible process design, but also by the motivation to engage.

The following steps, namely climate change adaptation solutions analysis, selection, and design, are affected by most of the enablers related to the process design and development, particularly by process design flexibility, approach inclusiveness, and integration of differences. These process steps are also affected by institutional support and intermediaries' involvement.

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Interestingly, climate change adaptation co-implementation and monitoring are impacted by supportive funding schemes, available capacity, and knowledge, but also by co-definition of roles and responsibilities.

Institutional support seems to be equally important for all the process steps. Again, as observed for barriers, there is a lack of enablers reporting on adaptation solutions monitoring and assessment.

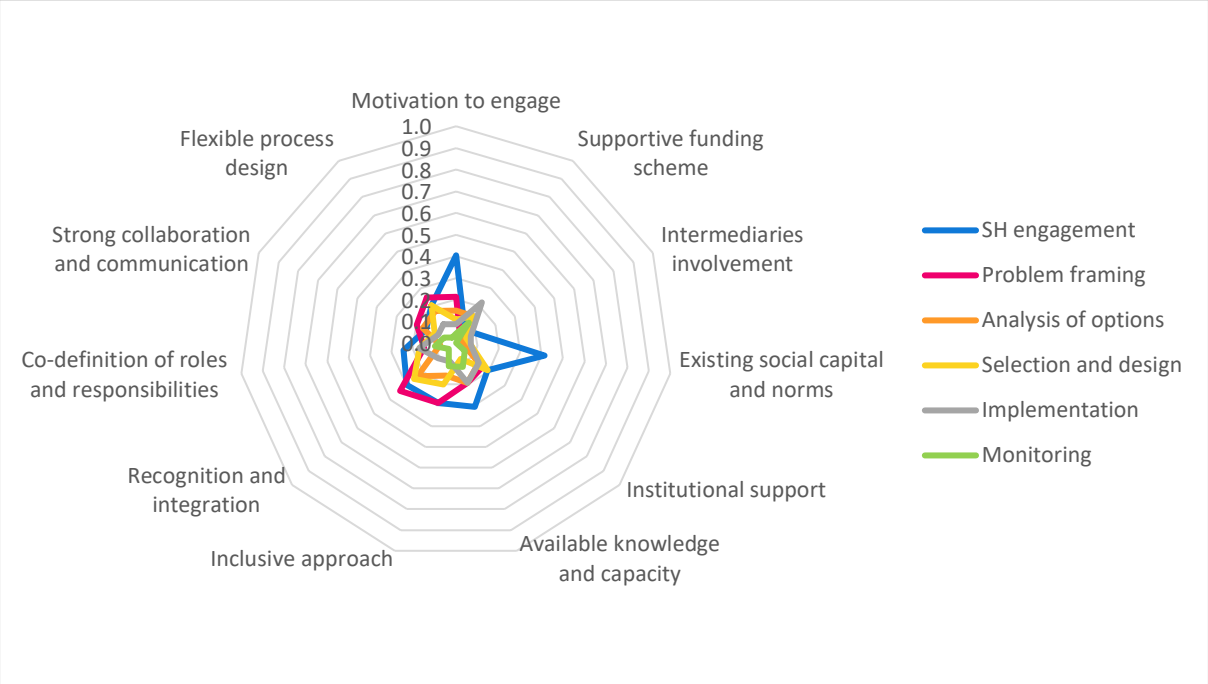

Figure 22. Frequencies of the different types of enablers affecting co-production process steps (multiple choice variable).

Analysis of co-production processes outcomes revealed that all the enablers documented lead to several outcomes, but that some of them seem to be favoured by specific enablers (Figure 23). Knowledge co-production and transfer outcomes are logically reported to be enhanced by available knowledge and capacity. These two outcomes are favoured by enablers that are associated to the process design and development (e.g., flexible design, strong collaboration and communication, inclusive, integrative, and role definition) but also by stakeholders' motivation to engage. External enablers such as institutional support or existing social capital play a less important role in achieving these outcomes, except for a supportive funding scheme.

Social justice and participants' empowerment outcomes are strongly supported by an inclusive approach, co-definition of roles and responsibilities, and existing social capital. However, empowerment, as well as process learning, are generally enhanced by all the different types of enablers. Some outcomes rely on more specific enablers, such as policy uptake favoured by institutional support and economic outcomes enhanced by supportive funding schemes.

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Network and relationship-building outcomes are enhanced by existing social capital, definition of roles and responsibilities in the process, involvement of intermediaries, and also institutional support. Reframing related outcomes are favoured by strong collaboration and communication and integration of different knowledge, skills, and worldviews during the adaptation process. Finally, enablers linked to improved management practices or economic and ecologic outcomes were less reported than others.

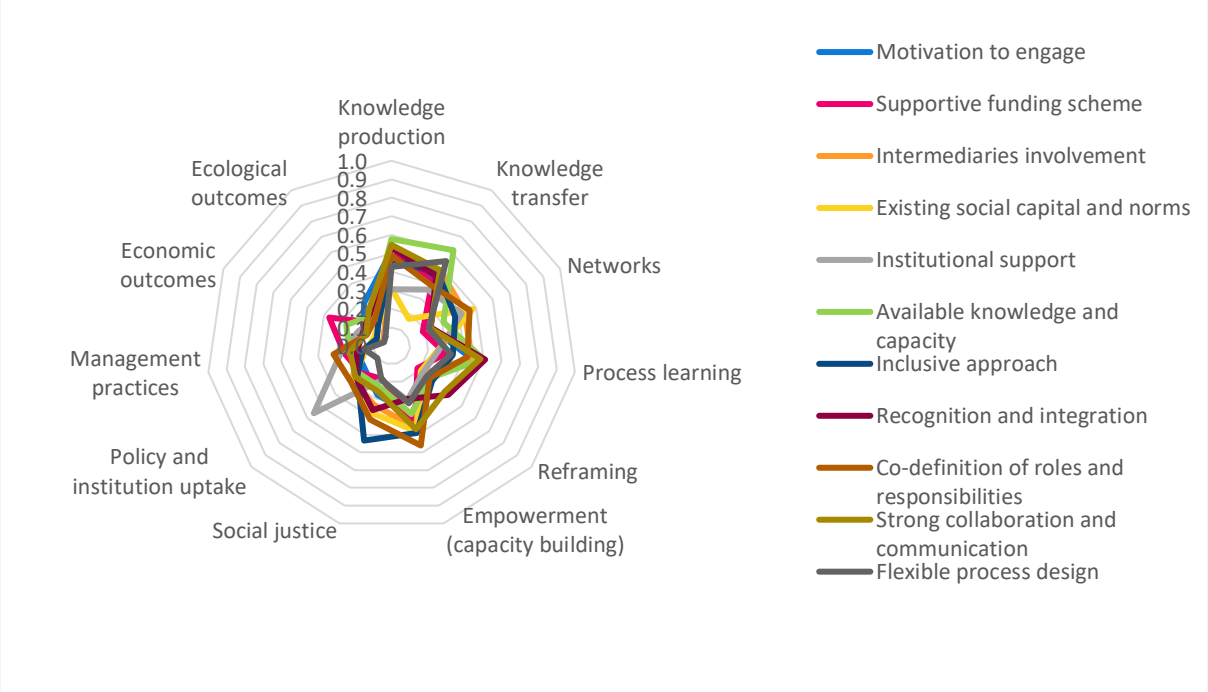

Figure 23. Frequencies of the different types of enablers affecting co-production process outcomes (multiple choice variable).

5.2. Survey for practitioners

We conducted an online survey aimed to capture the key factors supporting or hindering adaptation practitioners experienced with engaging citizens and stakeholders in climate change adaptation initiatives. A total of 51 climate change adaptation practitioners responded the survey.

5.2.1. Profile of respondents

We first describe the profile of the climate change adaptation practitioners who responded our survey (n=51). First, we identify the stakeholder groups to which respondents belong (Figure 24). Almost half the respondents were from the academic and/or research sector. Next come members of the authorities and government representing more than a third of respondents, followed by local communities and civil society. Finally, a very small percentage of respondents were members of citizens' groups or economic actors and investors, and none from the media. We did not obtain a balanced participation between the different types of actors involved in co-production processes. However, this can be explained, on the one hand, by a distribution bias, the networks of the

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academic partners of the AGORA project reaching mainly academic actors and local authorities. On the other hand, this result is consistent with those highlighted in the scientific literature review, which portrayed academic actors and authorities as those presently mostly in charge of initiating co-production processes for climate change adaptation.

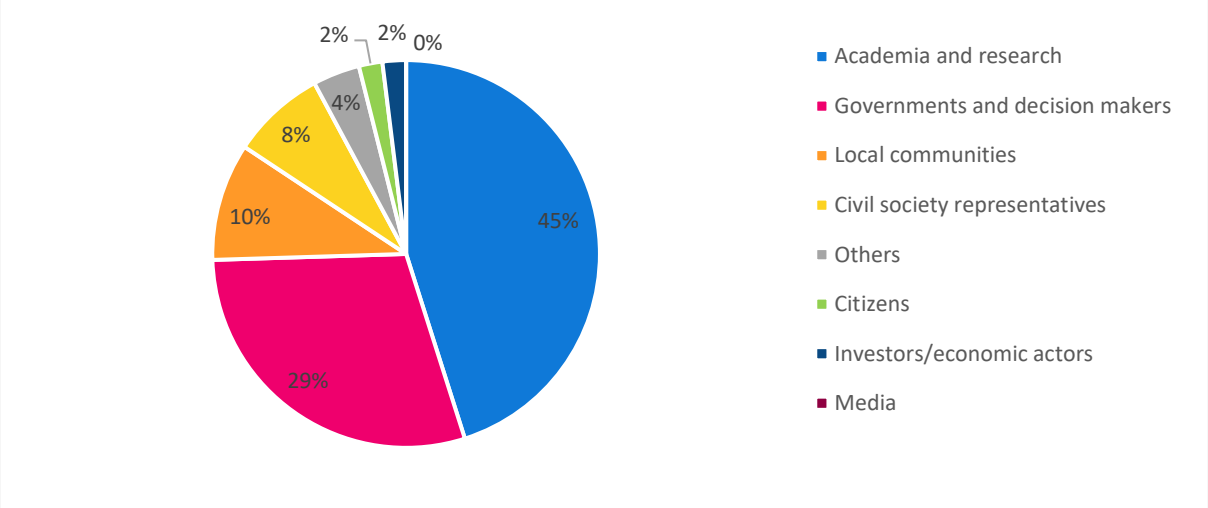

Figure 24. Stakeholder groups to which respondents belong (single choice question, n=51).

Second, to assess representativeness, we collected information on age, gender, level of education, and location of respondents. In terms of gender, the balance has not been completely achieved, with a slight predominance of women (59% of women and 41% of male). Age groups are relatively well represented and tend to focus on working "age", with 80% of respondents between 25 to 65 years old, with a good balance between the 4 age groups it comprises. However, we received very few responses from respondents aged over 66 (6%) and none from young people under 25, who are probably not often involved in this type of process.

Almost 90% of respondents originate from European countries, with a predominance of Italy and Spain, which is in line with our targeted stakeholders within the AGORA project. The remaining 10% come from Africa, Asia, and South America. Regarding education, our group of respondents is strongly biased towards people with a high level of education, with 45% having a PhD, 47% having a Master's or an Engineer's degree, and 6% having a Bachelor's degree. Only one respondent had a high school diploma. However, this seems to correspond to the level of education required to work as a climate change adaptation practitioner (e.g., researchers, decision-makers, and co-production professionals).

Finally, we were interested in their role in the described co-production process (Figure 25). Knowing that they could have several roles within the process, more than 30% of the respondents had the role of organiser, 25% acted as a facilitator, and 25% were involved an expert during the process. Only 12% described themselves as participants and 5% as consultants. Only one respondent acted

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as a funder. This result shows that respondents' experience coincides with the targeted audience, with most of them having been significantly involved in the implementation of a co-production process and being able to assess the strengths and weaknesses of the process.

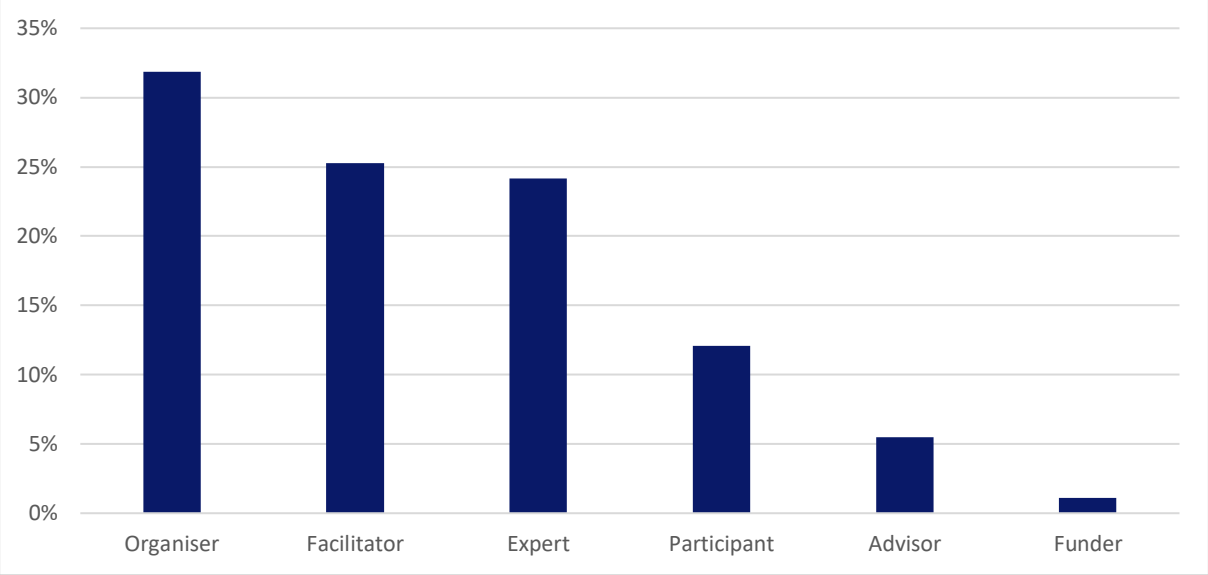

Figure 25. Survey respondents' role in the adaptation co-production process described (multiple choice question, n=91)

5.2.2. Climate change adaptation solutions co-produced

To better characterise the context associated with the barriers and enablers experienced by practitioners in implementing co-production processes, we have collected information on the type, objectives, sector and location of climate change adaptation measures that have been co-produced.

The adaptation measures reported by respondents fall into multiple categories pursuing different objectives (Figure 26). The most common categories of measures relate to “research or innovation” (26%), followed by “institutional and policy” (21%) measures. Then, two other types of measures stand out equally, “on ground” (18%) and “social and behavioural” (17%) solutions. Two other types of measures are listed to a lesser extent, namely “technical and infrastructural” measures and “climate services”. Financial solutions were only cited once demonstrating the poor uptake of this type of measures to support adaptation.

The main objectives of the measures implemented by respondents are “knowledge co-production” (31%) and contributing to “climate change adaptation/risk strategies” (28%) and are specifically related to some type of measures linked to “research and innovation”, “institutions and policy”, “on ground solutions” and to the other categories but in a lesser extent. Effective “implementation of a measure” objective is specifically linked to “on ground solutions”. Objectives of “capacity building” are shared among the different measures categories and policies. Again, the type and objectives of the reported climate change adaptation measures correspond to the profile of respondents, mostly academics and public authorities.

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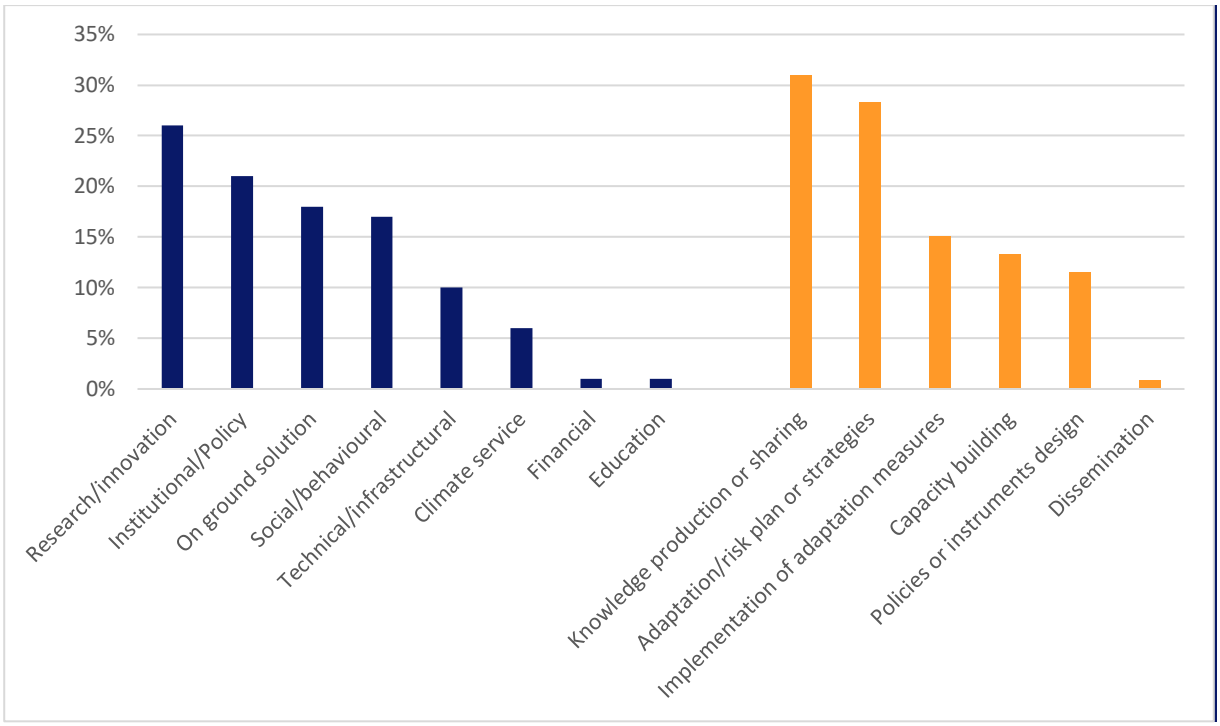

Figure 26. Type of adaptation measures (in blue, n=100) and objectives of adaptation measures (in orange, n=113) reported by respondents in the survey (multiple choice question).

Five main sectors of application are concerned by the climate change adaptation measures, as described in

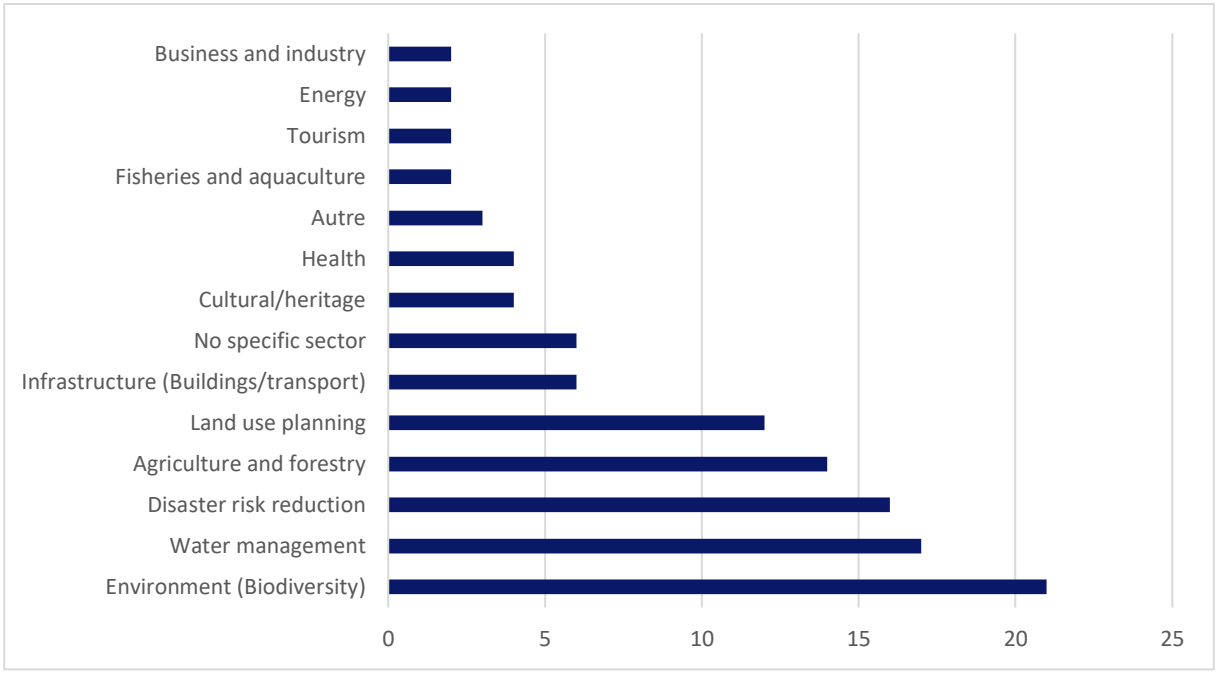

Figure 27. Firstly, with more than 20 occurrences, the environment and biodiversity, then with more than 15 occurrences, water management, disaster risk reductions, and, finally, with more than 10 occurrences, agriculture and forestry and land use planning. These results show that most of the

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climate change adaptation measures concern natural environments or resources, and very few concerns social or economic issues such as industry, energy, health and/or tourism. Regarding their location, 80% of the reported measures are located in Europe, fitting with the contact and target of our study.

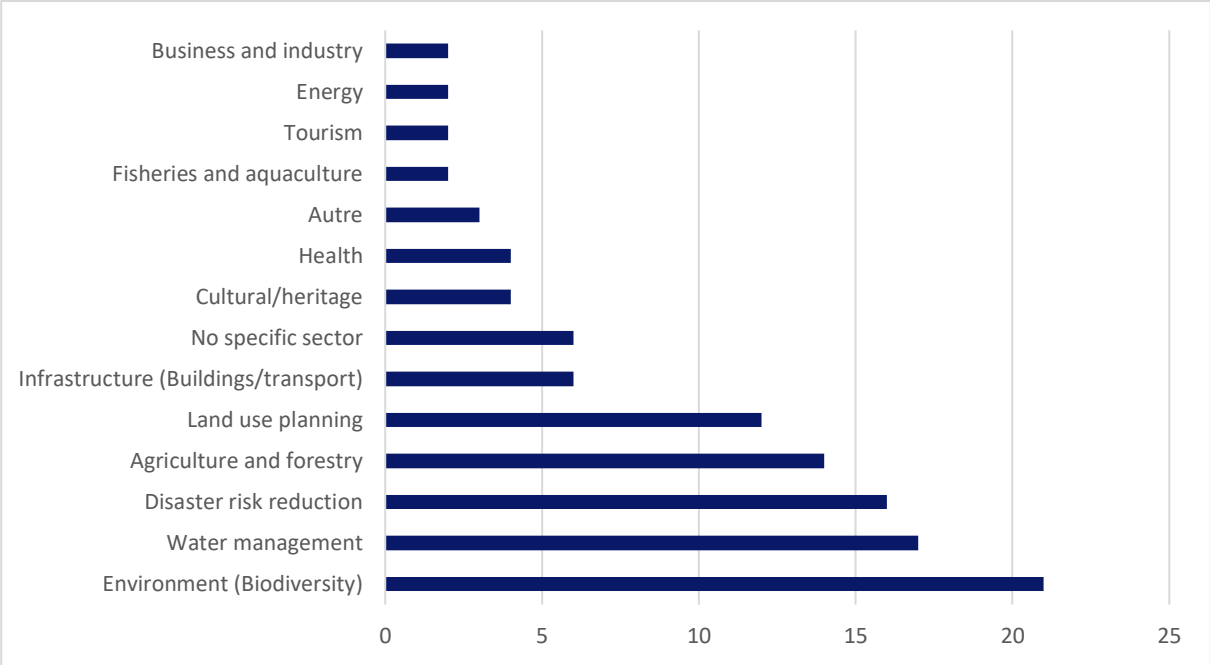

Figure 27. Sectors of application concerned by the reported adaptation measures (multiple choice question, n=111).

5.2.3. Co-production processes characteristics, success, and outcomes

Before digging into the barriers and enablers experienced during the co-production processes, we collected information about their characteristics, success and outcomes. First, the type of stakeholder engagement applied to co-production. The two most frequent types are forms of active stakeholder engagement (33% each). This involves to “collaborate”, meaning to partner with stakeholders in each aspect of the decision, including the identification, selection and development of the preferred solution, and to “involve”, meaning to work directly with stakeholders throughout the process to ensure that their concerns are consistently understood and considered. Then, 16% of the reported processes aimed to “inform”, meaning to provide stakeholders with balanced and objective information to assist in understanding the problem, alternatives, opportunities, and/or solutions. Of the last three options, two are among the least engaging form, i.e. extract and consult, each accounting for 6% of responses, and one is the strongest form of engagement, i.e. empower,

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also accounting for 6% of respondents. We were also interested about the origin of the process, and it appears that the vast majority of the process reported to be on a voluntary basis (82%) rather than on binding mechanisms or legal requirement (8%).

Then, we focused on the stakeholder groups that were in charge of organizing and implementing the climate change adaptation co-production processes and those that were participating (Figure 28). It is not rare for only one group of actors to oversee the process and generally between 1 and 2 groups collaborate in this task. As suggested by the scientific literature review and by the profile of respondents, co-production processes organization and implementation is dominated by members of academia, research, governments and decision makers followed by local communities and civil society representatives. Still, a small percentage of responses shows that citizens, economic actors and media could also be involved in the implementation of co-production, however, they are always accompanied by other groups cited above.

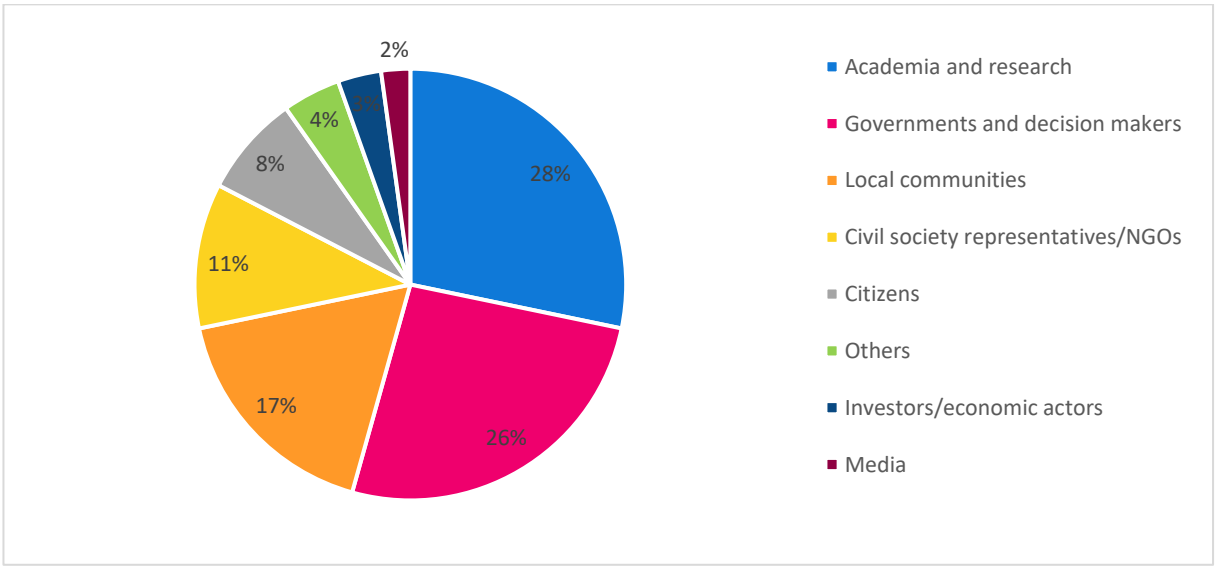

Figure 28. Actors' groups reported to be in charge of organizing and implementing the adaptation co-production processes (multiple choice question, n=92).

Concerning the actors participating in the processes, the groups are more balanced (Figure 29). In general, between 3 and 4 stakeholder groups take part in the process, showing the attempts to include the different knowledge and perspectives needed for climate change adaptation. Academics and research, and governments still dominate, but there is also greater participation by local communities, civil society and citizens. Once again, economic actors and the media are often under-represented in this type of process.

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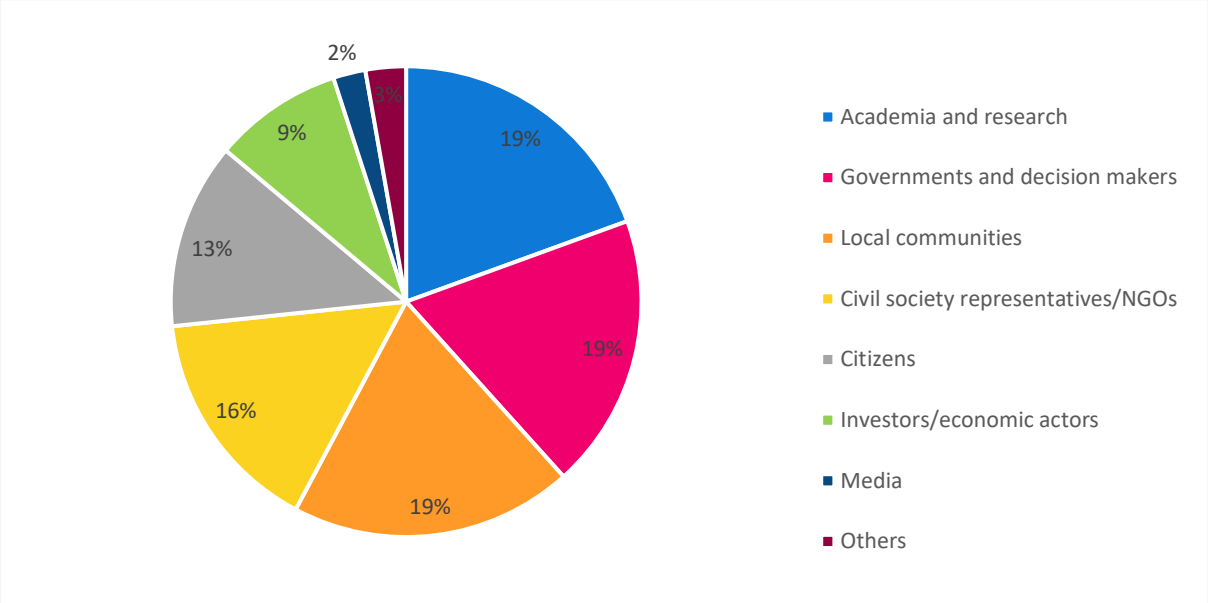

Figure 29. Actors' groups reported to participate to the adaptation co-production processes (multiple choice question, n=180).

Finally, we collected respondent perspectives about the success and outcomes of the coproduction processes implemented using Likert scale. Overall, it seems that the co-production processes reported have mostly achieved their objectives according to the opinion of the respondents. Almost half of the respondents answered that most of the objectives had been achieved, a third thought that some objectives had been achieved, and 4% that all of them had been achieved. However, a significant proportion of respondents (18%) were unable to answer this question at the time of the survey, probably either because they don't have the information or because the process is still ongoing.

The participants were then asked about the outcomes achieved during the co-production processes on a five-point Likert scale (1 meaning no achievement and 5 maximum achievement) (Figure 30). Overall, in most of the cases all outcomes were achieved or partially achieved. Process learning, meaning that participants mutually learned from the process and from each other, have been fully (53%) and partially (43%) achieved in almost all cases. This is also the case for developing strong communications and mutual respect, trust and healthy relationships, with very few cases where these outcomes were not achieved.

More precisely, many cases have partially achieved these outcomes (~60%). Strengthening partnerships and networks, co-defining problem framing, developing a context-based solutions, and building participants capacity are three outcomes that have been fully achieved in 30 to 40% of cases. Finally, two outcomes seem to be less frequently delivered, namely inclusiveness/guarantee diversity of participants involved, and the equal opportunity to participate in the decision-making process, i.e. empowerment. This result is in line with the estimated success of the processes

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reported by the respondents, but it also shows that, despite this, certain outcomes remain more difficult to achieve, such as the inclusion and recognition of all the relevant actors and knowledge.

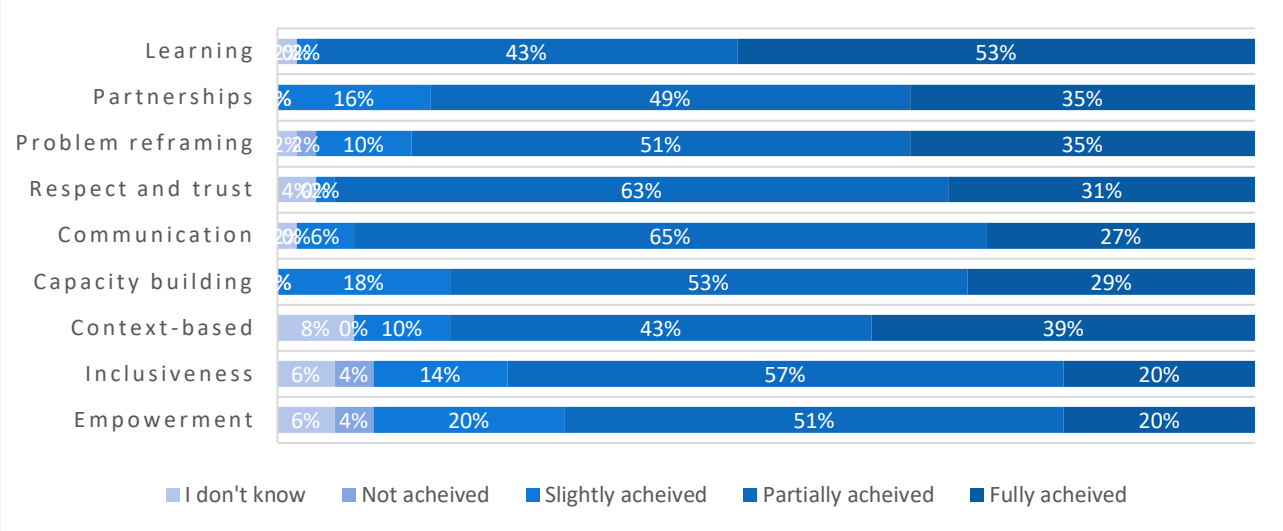

Figure 30. Frequency of achieved co-production outcomes ranked from highest to lowest score (Likert-scale, n=51)

5.2.4. Barriers and enablers to the co-production process

We first wanted to understand which barriers had been experienced and what role they had played during the co-production process. To do this, we asked participants to define the importance that each barrier played during the process reported on a five-point Likert scale (1 meaning none and 5 very important roles) (Figure 31). In at least a quarter of cases, all the barriers reported played an important to very important role, and conversely in at least one-third of cases these barriers played a minor or no role at all. These results show that there is no consensus on this issue, as the barriers encountered depend strongly on the context in which the process took place. However, certain types of barriers had a medium, important, or very important effect in most cases (at least 60%).

These are institutional barriers (e.g., lack of constraining legal framework) and lack of resources (e.g., lack of human resources), which both play an important or very important role in 45% of cases. This was also the case for dealing with process complexities (e.g., sophisticated language and data used) and lack of motivation to engage (e.g., lack of time, cultural barriers), which were considered important or very important in almost 40% of cases. Certain barriers have been reported as being able to play the different roles more or less equally within the processes, i.e., inadequate organisation, inadequate internal coordination, and lack of capabilities. Four types of barriers were described as having a minor or no role in around 45% of cases, namely lack of capabilities (e.g., socio-economic barriers), conflicting interest (e.g., entrenched thinking), power imbalance (e.g., hidden power) and lack of recognition of actors' knowledge and needs.

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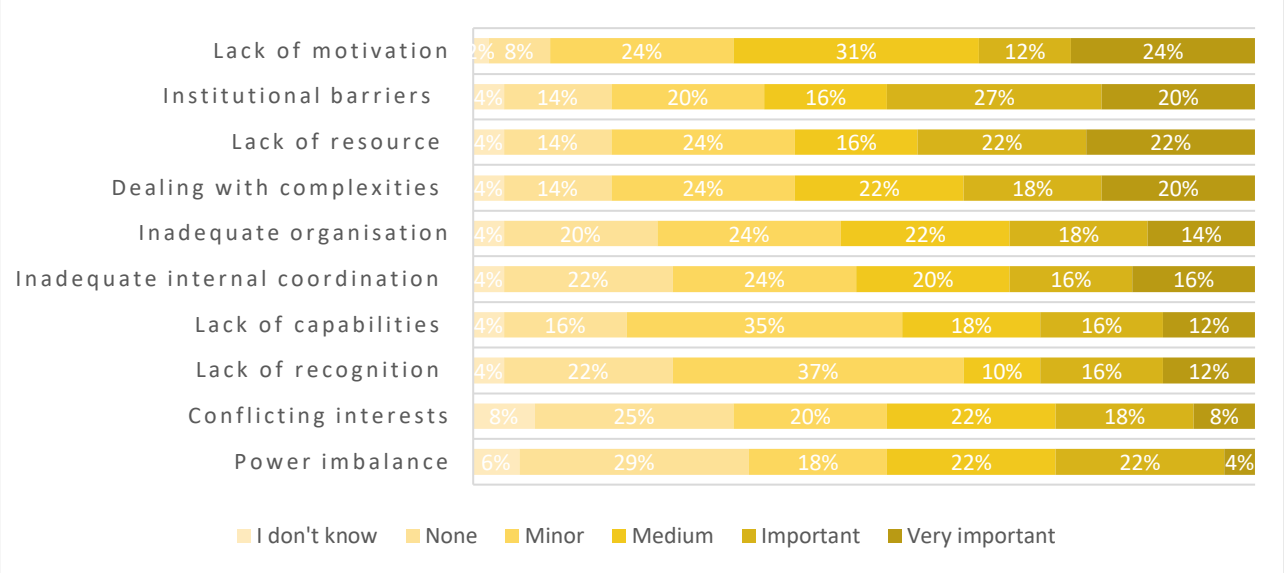

Figure 31. Frequency of the importance of the role played by different types of barriers during the co-production processes reported by respondents ranked from highest to lowest score (Likert-scale, n=51).

These results are aligned with those of the literature review on the importance of barriers. However, while institutional barriers, lack of resources, and complexities associated with the process are also among the most reported in the literature, conflicts of interest, lack of recognition of stakeholders, and power imbalances are certainly less frequently identified but are nonetheless significant according to the literature (Figure 10). Moreover, lack of motivation to engage is more experienced by practitioners, and inadequate organisation plays a less relevant role than depicted in the literature.

As with the barriers, we asked respondents about the importance of the enablers experienced during the co-production processes. We divided the questioning into two parts, one relating to internal and the other to external enablers. In general, we found that all types of enablers supported the processes described, affecting most cases (on average more than 63%), thus validating the typologies established by the literature review.

Regarding external enablers to the process (Figure 32), people's motivation to engage (e.g. experience of climate impacts, sense of urgency) played a major role in more than half of cases (55%) and an important role in a third of them (33%). This is also the external enabler most often cited in the systematic literature review (see section 5.1.3.2). The availability of knowledge (e.g. knowledge accessibility, usability, saliency) also played a very important role in a third of the cases (35%), although this enabler was among those least cited in the literature review.

The next three enablers obtained similar scores: the support of intermediary actors (e.g., facilitators or experts' involvement), the mobilisation of existing social capital (e.g., networks, long-lasting

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relations), and people's capacity for engagement (e.g., incomes, education, awareness). They were rated as very important and moderately important in about one-fifth of the cases. The enablers that played a less important role were, on the one hand, institutional support (e.g. government commitment, legal framework), which was often considered to be important and very important in nearly 60% of cases but was also considered to have played only a moderate, minor or even no role in 36% of cases. On the other hand, financial support (e.g. reward structure, long-term funding) seems to be lacking in many processes, as it was reported as being of no, minor or average importance in 39% of cases.

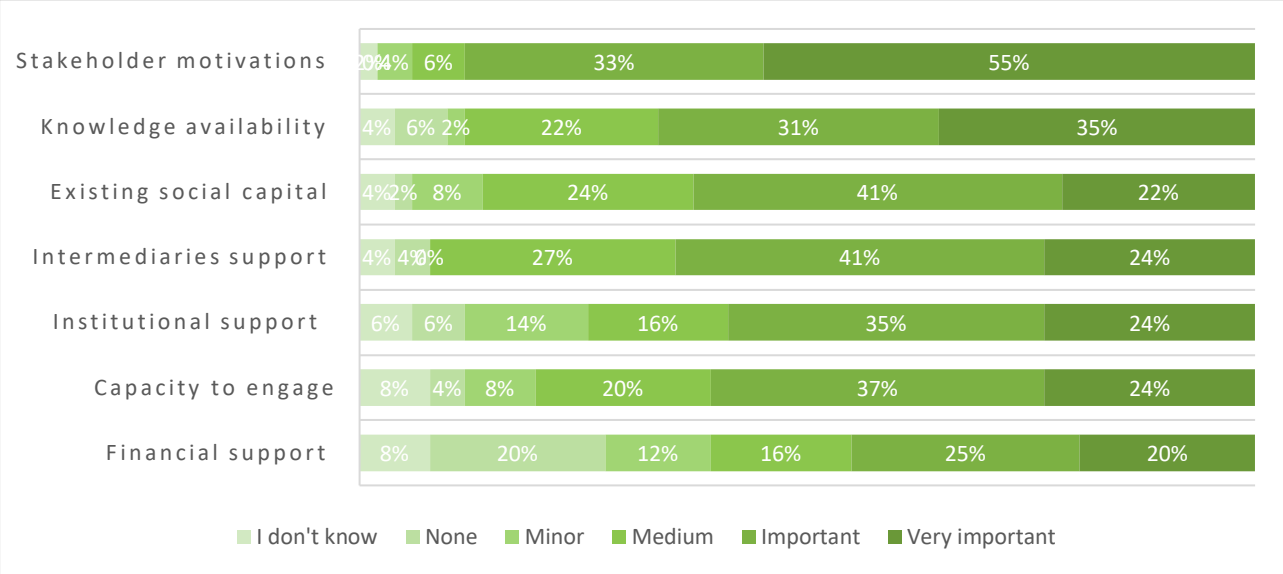

Figure 32. Frequency of the importance of the role played by different type of external enablers during the co-production processes reported by respondents ranked from highest to lowest score (Likert-scale, n=51).

Internal enabler types, i.e., those controlled by the process organizers, played an important to very important role in more than half of the cases (Figure 33). This was particularly the case for building strong communication (e.g., dialogue space, transparency), building an integrative approach (e.g., recognition of different values, contexts, worldviews), and building a relevant process (e.g., flexibility, system thinking) considered important and very important in between 60 to 80% of cases. These three internal enablers were also the most cited in the systematic literature review (Figure 17). Relying on people (e.g., local champions, boundary organisation) and co-defining the role of participants (e.g., equity, shared responsibilities) were similarly ranked, with around 60% of cases rated as important or very important. In line with the achieved outcomes (Figure 30), building an inclusive approach (e.g., inclusiveness of gender, social groups) is the category of enablers that has sometimes played a less important role in certain processes.

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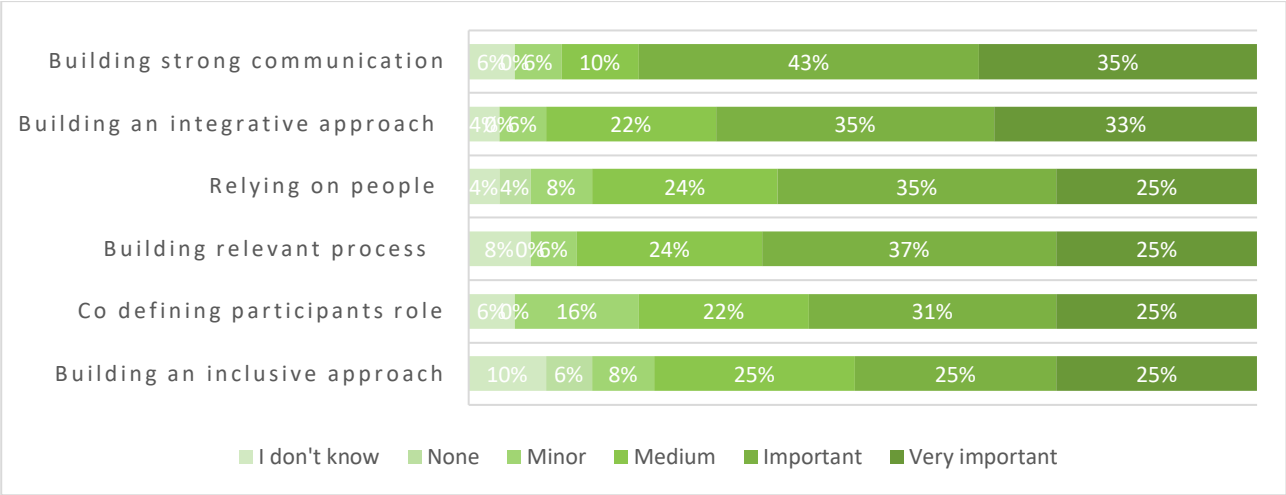

Figure 33. Frequency of the Importance of the role played by different types of internal enablers during the co-production processes reported by respondents ranked from highest to lowest score (Likert-scale, n=51)

5.2.5. Influence of factors on the different steps of climate change adaptation co-production process.

We explored the factors influencing the different steps in a co-production process for climate change adaptation (Figure 34, n=46). Respondents were asked to identify up to three factors that have the most influence on each step. Certain factors seem to play a more important role in supporting the implementation of all of them. Overall, participants' motivation is essential for the implementation of all the steps. "Stakeholder engagement" requires logically strong motivations and capacity to engage, but also support from institutions. The same factors have been associated with this step in the systematic literature review. However, existing social capital and knowledge availability were often associated with the "stakeholders' engagement", which is not so strongly reflected in the survey.

"Problem framing" and "Solution selection and design" require access to different types of knowledge, involvement, and support from experts or intermediaries and the capacity to engage. Concerning "Solution implementation", four important needs appear, which are strong institutional and financial support, followed by stakeholders' motivations and human and material resources. For these three steps, the results are also in line with the findings of the review. Finally, "Solution evaluation and monitoring" mostly require financial support and human and material resources.

This step also requires, to a lesser extent, knowledge, expert and intermediary involvement, and institutional support. A very low amount of information was available in the scientific literature concerning the "Monitoring and evaluation", these results thus constitute an important add-on. A few respondents rated existing social capital as an important factor compared to others, the description of this factor was perhaps not clear enough. Conversely, knowledge availability was

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scored high for almost all steps, this result may be biased due to the high percentage of researchers in the sample.

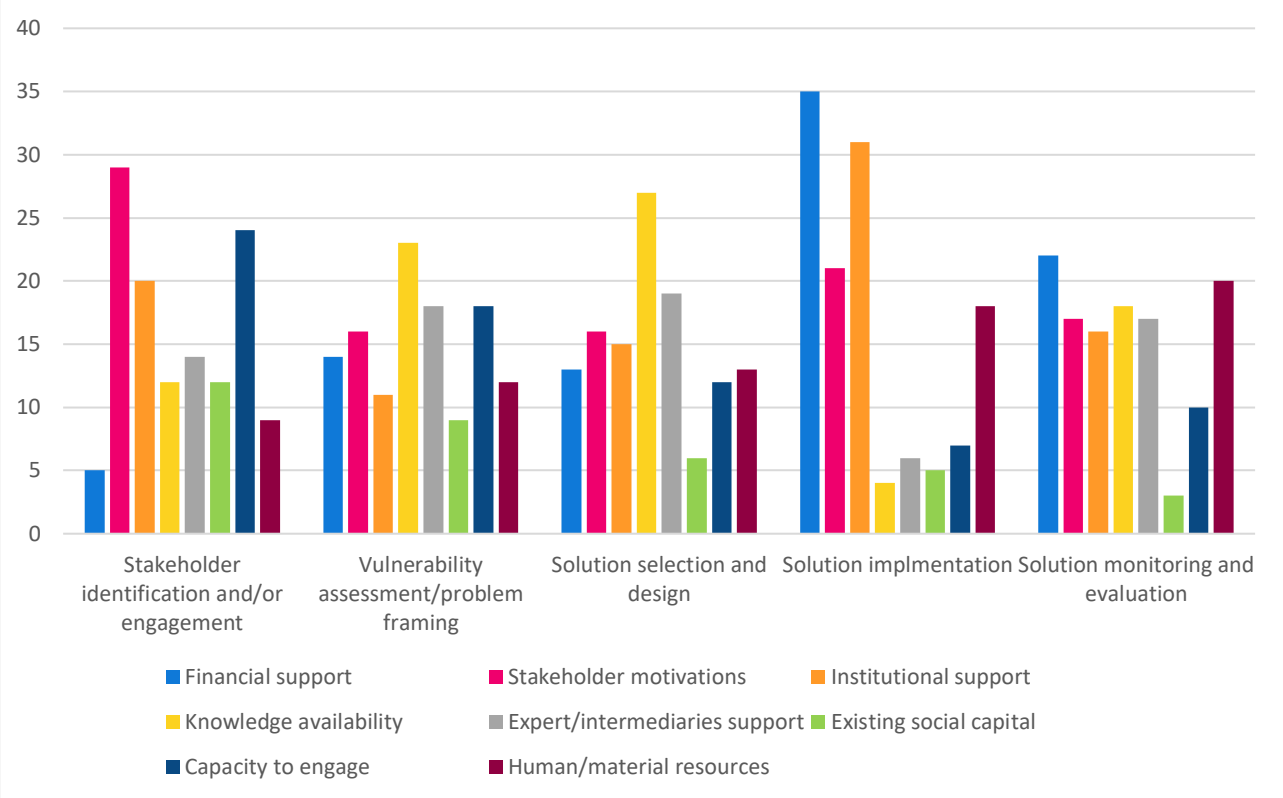

Figure 34. Influence of factors on the different steps of adaptation co-production process according to respondents' experience (Multiple choice questions).

5.2.6. Motivations and constraints expressed by practitioners

Two open questions were dedicated to capture the motivations and constraints to stakeholder engagement experienced by the respondents. The motivations expressed by half of respondents are linked to increasing the climate change adaptation solution relevance and effectiveness toward the local context (26 respondents). Then, to promote mutual learning and knowledge co-production (20 respondents) and to foster strong collaboration between participants (13 respondents). The principal constraints reported are primarily the lack of resources to implement stakeholder engagement (26 respondents), then the lack of time to dedicate to this type of process (21 respondents), and finally the complexity of the decision-making framework and the lack of capacities and skills to conduct co-production (16 respondents each).

5.3. Interview with policymakers

We conducted 20 semi-structured interviews with local policymakers working on climate and environmental issues to better understand existing practices of co-production but also to identify

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how current public policies support co-production process implementation and how to improve policy frameworks. The results of these interviews are reported in sections 5.3.2 – 5.3.6. Extracted quotes from the interview transcripts have been translated from the original language of the interview.

5.3.1. Profile of respondents

Basic information on the profile of respondents has been provided in 4.3.3 and is expanded here to include details on the interviewee's roles. The 20 municipal and regional policymakers who were interviewed covered a range of roles primarily within civic organisations but also within private companies. Few were directly engaged in climate adaptation, but rather more broadly in environmental planning and administration (Figure 35).

Figure 35. Word cloud based on interview segments describing respondents' roles and responsibilities.

Several respondents indicated experience in participatory action across multiple scales (Figure 36), but in terms of their primary focus, 2 operated at the national scale, 7 at the regional, 9 at the level of municipality or city, and 2 operated autonomously. At the national scale, the respondents included a Managing Director of a software company that makes platforms for participation, a Manager for Public Property Regeneration, and a Sustainability Plan Office Representative within the State Property Agency (Ministry of Economics and Finance). At the regional scale, all respondents were working within regional government roles, under which their roles included:

- Commissioner for the 2030 Agenda;
- Spokesperson for Environment and Tourism, Livestock and Food; Territorial development and depopulation policymaker;
- Directorate of Environment, Energy, and Sustainable Development, and Energy Transition Service;
- Technical Director of the Network for Research and Innovation;
- Administrator on County board working on climate and water issues;

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- Coordinator in the Office of City Strategy, International Affairs, and Citizenship, in the department of Civic Engagement;
- Head of Environmental Planning Service, Waste Collection Planning, Municipal Waste Management.

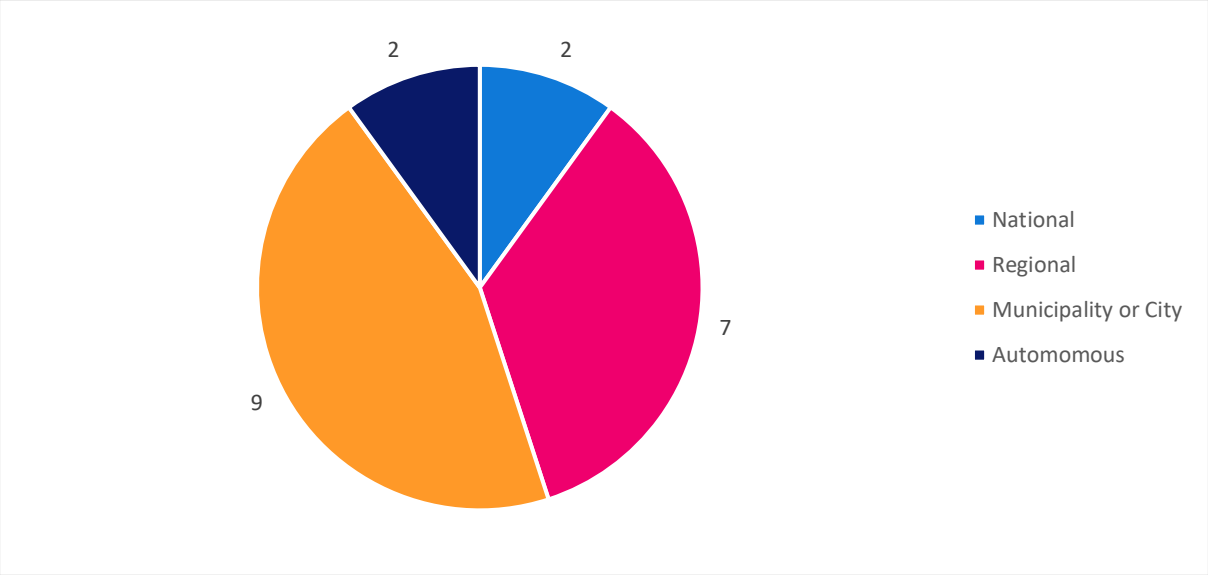

Figure 36. Primary scale at which the respondent described their experience with participatory action.

Respondents engaged in participatory processes and actions at the level of a municipality or city, were primarily employed within the Environmental Administration of local government. Here, roles included:

- Coordinator of climate adaptation and resilience projects;
- Coordinator or supply and availability of blue and green infrastructures;
- Director of an urban Climate Office;
- Drafter/policy developer for Metropolitan Strategy for Climate and Energy;
- Software developer and climate researcher.

Municipality-level roles in other government departments included a coordinator for municipal development, and a coordinator within an office of City Strategy, International Affairs, and Citizenship. In addition, one respondent served as a Property and Environmental Developer within a Public Housing Company.

Respondents from two Autonomous University administrations were interviewed, with one responsible for Works and maintenance, strategic planning, sustainability, and Agenda 2023, while the other served as an Environmental coordinator.

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5.3.2. Citizen engagement processes in place

Citizen participation in public policy design and implementation is seen as a key aspect of inclusive governance. Indeed, it is seen as crucial in identifying needs, strategies, and solutions, particularly in sensitive or complex issues. The involvement of various stakeholders, including citizens, experts, associations, and institutions is emphasized. The goal is to have people closely engaged with the administration and the decision-making processes. Participation is conceived as a transversal element, integrated into various aspects of public administration, from digital tools to events. The interviewees further highlight the importance of motivating, facilitating, and providing incentives to achieve broad and unbiased participation.

The interviewees describe diverse participation methods, such as surveys, workshops, and anonymous voting, aimed at gathering wide-ranging perspectives and avoiding political biases. Participation is often facilitated through platforms, observatories, and follow-up mechanisms to ensure continuity and ongoing engagement. The role of elected politicians in setting goals and priorities on behalf of citizens, which are then interpreted and implemented by city officials, is also discussed as a way for citizens to indirectly influence policy. Overall, the interviewees emphasize the significance of citizen participation in shaping public policies and initiatives, with a range of approaches and mechanisms employed to foster an inclusive and collaborative governance.

Several citizen engagement processes forms, types and origins have been described by the interviewees in different ways. Here below we list the main elements that have been identified to compare and contrast different forms of participation.

a. Voluntary vs mandatory participation

The majority of interviewees highlight various citizen engagement processes they have been engaged in, ranging from voluntary to mandatory approaches. Voluntary forms of participation are most common, encouraged through incentives, trust-building, and inclusive actions, fostering an atmosphere of collaboration. Mandatory participation occurs as part of an official role or responsibility, or as mandated by law or constitutions. Participation was described under one interview as being “an obligation” due to the individual's position of responsibility or role as a "social actor" representing a group—whether political, institutional, or part of an association. In these cases, while there is no formal legal requirement, participation is implicitly expected as part of the representative role.

Another important aspect is the obligation of politicians to listen to and act upon the voices of their constituents. This obligation came most strongly from the Malmö respondents, who emphasised the representative role and responsibility of elected politicians.

“Citizens come first because they elect the politicians representing them. If we had a direct democratic structure, citizens would set goals, decide what we do, etc. But we have transferred that

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responsibility to the municipal politicians who set goals. We (city officials) interpret how to achieve the goal". Malmö

"Citizen participation is promoted by the Government of Aragon, especially the executive part (the legislative part reaches the deputies for debate). On the one hand, there is the Transparency Law, on the other hand there is the legislative debate, where parliamentary groups speak with experts and debate whether or not to accept the proposals launched". Aragon

b. Consultation

Another key element is citizen agency, i.e. if and how citizens are involved and can provide feedback (review, comment on, and influence) on policies and other climate adaptation initiatives. As highlighted in several interviews, it is often required by law for policies, plans and instruments to undergo a period of public consultation, so thereby the authorities have the responsibility to advertise such opportunities, but then it is a voluntary process by which citizens finally chose to engage, review, and comment. It was noted that the requirement for and the magnitude of public consultation is determined by the importance of the project, either in terms of financial costs or in terms of potential impacts on society.

"In the planning of the city densification, there has been a lot of dialogs with residents. This is precisely because it is an important project, and it will change the city quite significantly. They have probably spent three days with models showing the plans and politicians have been there. It's the size of the project that decides how much you involve citizens." Malmö

An inherent limitation of such processes is the need for participants to be self-motivated or driven by personal interests and concerns, and there is a general requirement to have at least a baseline level of familiarity with the topic.

"In the spatial planning process, consultation, and review, the municipality must present it to its stakeholders. If you're going to develop an area, you have to present your plans […] In the past, you had an exhibition. The plan was exhibited in the town hall on the ground floor: The plan hung there or it was displayed graphically in some way and citizens could come in and say: "but this feels very strange", "I want to point that out", "I want to make a small comment about it". And now it may be done digitally, I think most municipalities have it on their website. And then you, as a citizen, have the right, in both of these steps, to make comments […] you come in with a comment and then it must be taken up in the next steps by the municipality." Malmö

Beyond the mandated requirement, authorities have also voluntarily initiated consultative processes, particularly when sensitive or complicated issues are at stake.

"Then you go out and have a dialog about it. It's not just because the law requires it." Malmö

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c. Collaborative participatory processes

Collaborative participatory processes are more inclusive than consultation and involve partnering with citizens in each aspect of the decision-making. These processes are facilitated by authorities with the aim to co-design and co-create policies, initiatives and improving decision-making. The words "trust and inclusivity" emerge frequently in relation to such processes.

"In an atmosphere of trust and collaboration, it is easier to be inclusive" Aragon

In Aragon, such participation is described as something transversal with the aim of bringing people "closer to the administration every day".

Action plans developed under the CDF have been established under a co-design process, supported with the development of a platform that brings together all data.

Participatory processes can be enhanced through the use of incentives – that is, where voluntary participation is encouraged through rewards, or facilitated through support and resources. This is considered particularly important if participation is to be extended beyond those having a direct and vested interest in the subject matter.

"It is very important to motivate, facilitate or provide incentives beforehand in order to achieve a broad and unbiased participation, or at least sufficient participation". Aragon

d. Grassroots participation

Grassroots voluntary participation is often facilitated via associations, such as agricultural or women's development associations, or may be supported via organizations. A common motivator of grassroot participation is a deep-seated personal interest and/or concern in the given environmental issue.

"Normally participation is linked through the organizations in which they participate, not individually but through social organization" Aragon

As one example, the non-profit organization Agenda Tevere is responsible for implementing the Tiber River Contract (Contratto di Fiume Tevere CDF). The non-profit organization requested the organization of committee assemblies - approximately every 2 months - to evaluate the actions to be undertaken under 3-year time frame. The community is very active in this regard as several issues are central to the Tiber River: cleaning riverbanks, hydraulic risk, etc. A structured database has been set up and made available directly with the support of citizens (e.g., describing ease of access, areas to be cleaned).

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e. Targeted participation

Targeted participation processes are focused on specific groups or communities and are typically aimed at addressing particular issues or needs. Participation in these cases has been facilitated through specific outreach and engagement activities.

An example is the "*life green infrastructure project*" with the Zaragoza city council (Aragon). The project involved emotional assessment of green infrastructures recognizing people's perception of the environment may be different (for example in terms of accessibility or noise). Hence the assessment was carried out with different population target groups such as young people (children) and elderly people.

Similarly, in Rome activities undertaken with Tor Vergata University focused on young people.

"A participatory process was initiated with high school students in agriculture on the strategic theme "Food and architecture". We started with sectoral analyses (such as environmental and climatic ones) and then determined with the students, which strategies could be implemented in this context." Rome

5.3.3. Purpose of citizen engagement

According to the interview data, citizen participation is considered crucial for effective climate adaptation and urban development processes. It serves to raise awareness, promote changes, and make solutions more relevant to the local context. Participatory processes aim to inform, sensitize, and involve citizens, as well as make them feel co-responsible for climate change adaptation processes. This allows decision-makers to better understand citizens' concerns, knowledge, and experiences, leading to more tailored and successful measures. Participatory approaches involve diverse stakeholders, including technical experts, citizen associations, and interested citizens.

They provide platforms for mutual learning, collective consensus-building, and stronger collaboration between citizens and authorities. Citizen participation is important to ensure solutions work in practice and reflect local needs and knowledge. In particular, property owners were recognized as having responsibility in climate adaptation, so engaging them is considered essential. Transparent reporting on progress and obstacles is crucial to allow politicians to steer the process effectively. The administration often acts as an intermediary, bringing in opinions from citizens and customers to inform decision-making, even if not all suggestions are accepted. Incorporating diverse perspectives, including on aspects like safety, comfort, and practicality, is key to developing holistic, well-functioning solutions.

Within the private sector, maintaining a satisfied customer focus and continuously improving based on feedback is recognized as a guiding principle. Overall, the purpose of citizen engagement is to create more relevant, accepted, and effective climate adaptation and urban development

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measures, while also promoting mutual learning, just representation, and stronger collaboration between citizens and authorities.

"In all the processes I have mentioned, the contribution has been valuable and useful. There are several different contexts and approaches, that have served to set objectives, to share experiences, to propose solutions or ways to overcome challenges, to feel more strengthened, to promote change and necessary adaptations because it is very difficult to achieve and break inertias […]. It is not possible to generalize because I have participated in many types of processes, but in all cases, it has made people more aware and more involved in the issue being dealt with, and experiences and options for solutions have been shared. In some cases, it has helped decision-makers to make decisions, in others it is difficult to know, but at least that possibility is offered." Aragon

The purpose of citizen engagement is further elaborated below using examples from the interview transcripts under 6 themes:

a. Relevance to local context

The main purpose of citizen engagement is to ensure plans, policies and actions are tailored appropriately to the local context, thereby addressing the specific needs and challenges of the local area. This is achieved through participatory process that incorporate local knowledge and perspectives into the planning and decision-making processes and ensures that adaptation measures are finally aligned to the unique characteristics and priorities of the community. In this regard, participatory processes ideally aim to give voice to a wide range of perspectives and lived experiences.

"Knowing what people think and feel, what most concerns and motivates them, and what they know and experience in their real lives, is essential to be able to make decisions and design the gradual and "tailor-made" adaptation process for each territory, with a greater chance of success and, of course, in a fairer and more egalitarian way." Aragon

b. Mutual learning

True participatory processes enable mutual learning, fostering bidirectional exchange of knowledge and experiences between citizens and authorities. This is closely linked with the previous theme (a), leading to shared understanding and co-creation of solutions aligned to the local context. Mutual learning enhances collective awareness and capacity for climate adaptation, as exemplified in the 500-tree project in Malmö.

"We did a tree inventory and then tree experts selected 500 sites where it was most suitable for tree planting. They recommended species that can last 100 years. If an area was to plant 20 trees, they were given 30 proposals, and the administration then had to choose. It was important for us that it was at the grassroots level, i.e. the administration, which is in dialog with the customers. Like, "here it's hot" or "here was a tree that was removed". So, it was the administration that was able to choose the location in dialog with the citizens, because they have the local knowledge [.....]". Malmö

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"Everyone's experience and knowledge are very important. They know where it is coldest, warmest or most difficult or unsafe. So, all their views are super important to develop something that works, and something that they enjoy in terms of safety, comfort and practicality". Malmö

c. Transparency and accountability

Citizen engagement also facilitates transparency and accountability in relation to environmental management and adaptation processes. Even where participation may be low, the allowance for feedback loops and the provision of opportunities for citizen inputs and oversights facilitates an environment of trust and promotes accountability and responsiveness towards citizen concerns and priorities.

"In the government where I work, participatory actions are a strategic move so that citizens demand long-term participation and are on the same level […]. It is to bring citizens closer to public policies to benefit society. This strategy was affected by COVID-19 crisis but the Transparency Portal open to citizens was widely used. For example, The Visual Gob program was an application that brought together the SDGs and provided transparency where all policies and public budgets were available". Aragon

d. Empowerment and ownership

Engaging citizens in participatory processes enables them to actively shape and take ownership of the adaptation process. Several interviewees in positions of responsibility highlighted the importance of participatory processes, in striving for just and democratic decision-making processes. Such processes create a sense of empowerment and build agency within the community to drive climate action. Participatory processes foster a sense of shared responsibility and commitment to adaptation that is not possible under top-down processes.

"Citizen participation by the administration usually happens because it increases the acceptance of measures, and these can also be better designed/implemented according to the demands and needs of the citizens". Dresden

"To make people co-responsible for the adaptation process in order to be more sustainable in the context of climate emergency and social challenges […] informing, sensitizing, involving and making people feel involved is essential for projects to have a better chance of success". Aragon

e. Awareness and behavioral change

Almost all of participatory actions described by the interviewees share the common goal of raising awareness about climate change impacts and the need for adaptation, while others go further, and strive for deep-seated changes in behaviour to "create a better, greener, and more humane society".

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For example, promoting behavioral shifts and lifestyle changes to support climate resilience, and cultivating a culture of environmental stewardship and collective action. Such ambitions for behavioral shifts are well described for actions underway at the University of Zaragoza, in Aragon:

"The main purpose is to raise awareness to promote changes, for example improving the campuses, they are an important part of the city […]. We want greener campuses with less pollution. […]. On the Ebro River campus we are going to remove more than 3ha of cement and we are going to set up two forests with more than 650 trees. We are also promoting Campus San Francisco permeability so that it becomes a reference centre in the neighbourhood, the purpose is to generate a lung in one of the most densely populated neighbourhoods of Zaragoza". Aragon

One respondent went so far as to suggest that a behavioral change is a prerequisite for a true, participatory process:

"It is necessary to clarify that, at present, citizen participation in a specific event is often considered participatory when it should not be. Real and innovative participatory processes are those in which citizens have access to actual voting (as seen in the definition of de-paved areas in Rotterdam or the definition of bike lanes in Buenos Aires). A citizen who participates but continues to park in front of their house is not truly participating. If participation does not lead to genuine changes in individual behavior, it is not "true" participation. Participation should be evaluated based on the actual behavior of the individual at the conclusion of the process." Rome

f. Holistic and integrated approaches

A final purpose or consequence of citizen engagement is that it enables holistic or integrated approaches to environmental management and climate adaptation, though capturing the interconnected social, economic, and environmental dimensions of adaptation. It facilitates the integration of adaptation plans within broader urban development and planning strategies, of which citizens tend to have an existing and higher level of engagement. Whereas traditional "hard" adaptation options might have dominated adaptation planning, participatory processes bring in a more systematic perspective to address the complexity of climate changes and the interlinkages with urban development.

"It is a very engineer-, science-, architect-dense corps that works with climate adaptation, which also does not reflect the perspectives that citizens may have on issues […] every hammer sees a problem as a nail. But now we have started talking about social policy as a form of adaptation. Resilience in society is very much about people themselves. Then we may get more bang for the buck through social interventions instead of changing the physical design of a street." Malmö

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5.3.4. Supporting policies and tools

The interviewees discussed various policies and instruments used under participatory approaches in different cities and regions to address sustainability, climate change, and urban development challenges. While specific policies and tools were often not identified, or discussed in any detail, prominent examples included:

Spain: The Aragon Noble Foods Agri-Food policy involved co-designing action strategies through a "CocinaLab" with diverse stakeholders. The city of Zaragoza has an open government platform providing data and geographic information to promote transparency. Surveys and participatory processes have been used within the University of Zaragoza to gather input on investment priorities and environmental issues. The regional government of Aragon promotes citizen participation, especially through the executive branch and the Transparency Law. A participatory process was also launched to address the Xylella plant disease, involving various stakeholders.

Italy: Examples from Italy included the "Piazze Aperte" (Open Squares) project in Milan, which aimed to pursue urban regeneration and sustainable mobility goals through community engagement. In Rome, the Sustainable Urban Mobility Plan (PUMS) involved organized participation of associations, especially those related to mobility. The Tevere (Tiber) River Contract initiative in Rome also had active community involvement through regular committee assemblies. The University of Tor Vergata in Rome initiated a participatory process with high school students on the theme of "Food and Architecture."

Sweden: Malmö is exploring the use of citizens' councils and scientific advisory councils to support climate adaptation planning. The city has also initiated projects like "Make Room for Water" to engage residents in stormwater management. Malmö has a citizen proposal initiative where ideas can be submitted and voted on by the public. The city is also exploring public-private adaptation contracts with property owners, and some municipalities are moving away from detailed policy documents towards more flexible roadmaps and action plans to allow for greater adaptability.

Germany: Dresden is showcased for its Future City initiative, where residents developed ideas and projects together with scientists. For example, the “Edible District of Plauen” project investigated which food plants could be used if the district’s self-sufficiency was to be increased. The “Zur Tonne” project was able to operate a “mobile restaurant” using only discarded food. The “Shaping School Living Space Together” project asked how schools and their grounds could be sustainably developed and used as a shared living space.

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Supporting policies and tools for citizen engagement described by the interviewees are further elaborated below under 4 categories:

a. Participatory policy development

Participatory policy development primarily occurs via workshops, meetings, and information sessions, albeit with increasing use of interactive and modern tools. For example, under the Agri-food policy called "Aragón Noble Foods", a lab was created where approximately 8 meetings were held with various agents (industry, research, etc.), based on laboratory dynamics in a kitchen to promote innovation to co-design action strategies (called "CocinaLab" in Spanish).

In Rome, since 2018 a community of practice has been structured and launched within the Municipality of Gallipoli with the aim of finding solutions to address the issue of Xylella (a bacterial disease which affects olive trees, among others). This community of practice has allowed the participation of various citizens, owners of agricultural companies, employed farmers, universities, the Council for Agricultural Research and Economics Analysis (CREA), and other entities. This was done to ensure that a demand for innovation to tackle this issue could lead to answers.

"Often, there is a belief that problems can be solved through academic solutions. However, while this can be helpful, it is not sufficient unless community engagement processes are activated, where the community actively works with the specific issue." Rome

It is noted that evidence from Malmö suggests flexible policy instruments, such as roadmaps and action plans, can better meet the challenges of climate adaptation than rigid, concrete policy documents. While the link to participatory processes was not explicitly made by the respondent, roadmaps and action plans with the potential to be updated and revised as new data becomes available, would seem to best fit to the transparent and inclusive nature of co-development processes.

"Earlier policy documents were made for every issue that was prioritized in the municipality, but then you end up with a lot of political decisions that are set in stone and often contradict each other. So here and in other municipalities there has been a move towards roadmaps and action plans that are less set in stone. […] So, when it comes to heatwaves, we will probably not produce a policy document, but instead work with the relevant departments and see what they can do. Instead, we will develop roadmaps, action plans and approaches that do not go up to a final political decision." Malmö

b. Citizen-orientated tools

Citizen-orientated tools highlighted in the interviews included online surveys and platforms to gather citizen feedback, citizen proposal platforms to submit ideas for city improvements, and citizen councils, juries and advisory bodies to provide input on adaptation strategies. Under the Malmö initiative, for example, citizens can make proposals for changes in the city. It is used quite frequently, and has a fairly low threshold, with proposals only needing 100 votes for it to go all the

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way to the politicians who vote whether to implement it or not. In Dresden, local contexts have been held to enhance and award roof and facade greening.

A novel tool used in Malmö was the recruitment of a community design council to develop adaptation measures:

"When we were involved in "Clever Cities", which was a EU Horizon project, the Greater London Authority recruited a community design council that was given an imaginary budget and was to come up with various measures and be involved in the entire design and decision-making process. It was very much about greenery and nature-based solutions for climate adaptation". Malmö

c. Collaborative public - private partnerships

Few examples of public-private partnerships were raised in the interviews, but tools to facilitate such partnerships were showcased for Malmö. Under the project *Climate Adaptation Together*, city authorities collaborate with some private property owners with the aim to sign private-public agreements or contracts to carry out joint adaptation measures.

d. Transparent governance

Participatory tools that facilitate transparent governance include open government platforms providing data and geographic information, and mechanisms such as citizen councils that facilitate direct citizen engagement in decision-making processes. On a legislative level, participatory processes, at least in terms of mandated consultation, are integrated into regional laws and regulations.

The Zaragoza city council (Aragon) has an open government platform with data, and they also provide intuitive and comparative geographic information. From a technical and scientific point of view, these working systems are useful in helping citizens to understand, in an exercise of governance and transparency. Citizen councils are highlighted as being one mechanism with significant potential to enhance engagement in policy-making and decision-making processes.

"For me it is probably citizen councils that have the most potential. To be completely honest, the level of knowledge and experience is very low when it comes to adaptation. Adaptation is a very future-oriented issue, you may have experienced a major cloudburst once. I don't know if this experience necessarily translates into better policies or solutions. We therefore draft a proposal, and then ask citizens "will it work for you?", "Yes/no", "What can we do differently?" and then somehow secure the popular mandate on the issue by complementing the political decision-making bodies and saying "this is how we think we should work with heat; these are the risk levels we consider acceptable; these are the strategies we propose". Malmö

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5.3.5. Barriers to citizen engagement in adaptation

The interviewees highlight several key barriers to effective citizen participation in climate adaptation processes. Organizational and institutional barriers include outdated administrative structures, lack of funding and operational capacity, and insufficient physical spaces to facilitate participation. There are also ideological barriers, such as changes in government and distrust between different administrative levels. Communication and accessibility issues are prevalent, with citizens often unaware of existing participatory tools and processes. Participation is often limited to the same engaged individuals, excluding vulnerable groups and underrepresented demographics. Continuity in participatory processes is lacking due to shifting political priorities, making adaptation efforts seem more like a trend than a necessity. Regulatory frameworks exist, but their implementation is hindered by a lack of incentives and a need for more focused, streamlined policies. Funding for citizen engagement in climate adaptation is scarce, and there is a lack of dedicated resources and internal expertise within public administrations to facilitate meaningful participation. Lastly, there are challenges in balancing citizen input with the need for technical expertise and broader public interest, as individual citizens may have conflicting priorities that cannot all be accommodated. Overall, the interviewees emphasize the need for a more comprehensive, inclusive, and sustained approach to citizen engagement in climate adaptation, addressing both institutional and societal barriers.

Identified barriers to citizen engagement as described by the interviewees are further outlined below under 6 categories:

a. Lack of Awareness

A reoccurring theme emerging from the interviews is around the lack of awareness that citizens have for the existing and available participatory processes and tools. This implies that information is not reaching or communicated to the public effectively, and suggests at least in some cases, a disconnect between the political class and the public. Awareness needs to be raised, and engagement initiated early in any process, not merely in a consultative mode once decisions have already been taken under a top-down approach.

"There are many existing tools that citizens do not know about. One of our jobs is to bring together associations and people who have demands, but most people are unaware of the processes. The initiatives are always sent to the same people and organizations. More than a problem of lack of tools, it is the social ignorance of their existence. The problem is that the information does not arrive, this must be improved. […] Something bidirectional is needed, the administration must promote the information and citizens must be interested." Aragon

"Tools such as the Valutazione Ambientale Strategica (VAS) (Strategic Environmental Assessment) exist, but in the way these plans are currently structured, citizens are rarely involved because there

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is little interest and awareness in participating in these decision-making processes. When participation does occur, it is often passive rather than active." Rome

b. Weak regulatory environment

Two challenges emerge with respect to the regulatory environment for participatory processes. On the one hand, the problem is not the lack of regulations, but rather the lack of specificity and focus within the regulations. The regulations (e.g., in the case of Malmö) mandate that citizen feedback must be taken into account in policy-making processes, but it's not legislated how people's views should then be taken into account and, in particular, how to deal with extreme views.

A second view, expressed in the case of Rome, is that the existing regulations are too excessive and lack incentives for municipalities and communities to engage in participatory processes.

"Making policies without incentives makes the process difficult and slow. […] To date, there is no regional law (like the one in Emilia-Romagna) that finances participation processes. For this reason, the resources available (e.g., funds and human resources) are limited." Rome

c. Fragmented approaches

To ensure that participation is genuine and not merely superficial, it is necessary and imperative to maintain continuity in the process. This aspect is often lacking due to changing political positions and priorities, resulting in a fragmented approach that is not conducive to meaningful citizen engagement in adaptation processes. A lack of awareness, sensitivity, systematic vision, and leadership from positions of power and responsibility is seen as a key barrier, along with distrust and detachment between different levels of administration.

"If there is no sensitivity among officials on these issues, figures in charge of co-facilitation are completely lacking. […] Sensitivity among directors and managers is lacking. Therefore, more awareness-raising practices could be useful for this purpose." Rome

"Currently, climate change is not at the forefront of the issue but is considered a secondary effect in terms of priority. Therefore, there is a rather significant issue of political underestimation. There is no systemic vision regarding climate change, but rather many individual actions without a clear vision." Rome

In Sweden, ideological barriers exist, as a deep-rooted sense of trust in official representatives acting on behalf of citizens is counteractive to engagement in participatory processes.

"We have still built it on the idea that politicians should represent the people and the people's interests, but this should be balanced by the expertise and competence of the city officials. […] But other countries have a different approach to this. It doesn't come as naturally in Sweden to co-create with residents. I'm not saying we shouldn't do it. It's just that culturally, the way our institutions are built, it's not as natural." Malmö

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d. Representational challenges

Participation tends to be dominated by organized groups and associations, including extremist or ideological groups. Certain demographics, minority and marginal groups, tend to be underrepresented in voluntary participatory processes.

"The example of the Municipality of Bologna (called "Climate City Contract") involves broad-scale participation of citizens (100 random people, of which 80 based in the City and 20 outside). However, often the same individuals participate, typically those interested and engaged in the city's green developments. Conversely, when it comes to participation related to transformative interventions, individuals affiliated with extremist movements also emerge. In general, older adults and the younger population are increasingly underrepresented in participatory processes related to climate change issues. The representation of those over 60 and those under 25 is significantly disproportionate to other age groups, with the majority of participants characterized by moderately high incomes.

This is also one of the reasons why participation today cannot be freely conducted but must be ensured by a fair proportion to guarantee gender and generational representation (e.g., random selection). A leap towards fair representation is necessary." Rome

Specifically mentioned groups underrepresented in participatory processes included the elderly, children, disabled, migrants, and those in jail.

"I see it as the children have no right to vote, they have no chance to be heard. So, there I see that we have a greater obligation to listen to and understand their reality." Malmö

e. Capacity and resource constraints

As noted under category (b), regulatory frameworks tend to exist but matching financial and operational capacities are needed in all cases. This includes, at least in the case of Aragon, a lack of physical space to facilitate participation.

"I would like to have some funding, a team and more institutional support (apart from the good words) to advance more effectively in the process of adaptation to climate change and to be a good example of governance achieved with greater collaboration. […] We are trying, we are making some progress but much more slowly than I think would be necessary and among other things it is due to the lack of human resources and funding to promote this process well." Aragon

In Malmö, the government does not specify how municipalities should engage with citizens with regards to adaptations, and as such, there are no targeted resources for involving residents in climate adaptation. Citizen consultations are taken into account in the budget of the municipality planning office, but there are no resources for citizen involvement directly related to climate adaptation, and each municipality is free to decide if and how to structure any engagement processes.

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f. Conflicting priorities and interests

A final group of barriers relates to conflicting priorities and interests, for example, arising from the tension between corporate interests and community needs. An example was given of the Rural Development Plan (RDP) in Puglia, Italy. The RDP is seen to have the potential to facilitate processes of co-design and co-participation. However, the RDP seems to lag significantly in this aspect, as it caters to corporate needs that do not foster such a process (i.e., toward co-design actions).

Authorities and decision-makers also face the challenge of balancing diverse citizen demands and trade-offs in adaptation measures.

"From a preparedness or resource perspective, if you go out and talk about an individual issue, people may become involved in that particular issue and say that this is a very, very high priority. But municipalities must constantly consider a huge number of interests. And when we use money for an issue, we take it from somewhere else. But it is not obvious that our overall resilience will increase if we spend all our money on heatwaves prevention." Malmö

A relatively new and emerging threat that can influence priorities and interests, is the spread of fake news that is disrupting democratic processes.

5.3.6. Enabling factors and recommendations for policy influence

The interviewees discuss various enablers for citizen participation and engagement in the context of climate adaptation and sustainability initiatives. There are often well-developed legal frameworks enabling citizen participation, but political will and clear communication are needed to activate these. Specific policies, regulations, and funding mechanisms can mandate or incentivize participation. Beyond finances, successful participation requires dedicated resources, personnel, and coordination across different government departments and levels.

Municipalities play a crucial role, but the regional/metropolitan scale may be most appropriate for enabling adaptation actions. Awareness-raising, education, and "literacy" campaigns to build knowledge about processes and opportunities are needed to empower citizens and build trust in institutions. In terms of approaches, diverse participatory tools like citizen assemblies, environmental councils, and co-creation processes can enable meaningful engagement, but the "rules of engagement" must be clear. Connecting to citizens' everyday concerns and experiences is important while engaging specific sectors, communities, and local stakeholders (e.g., businesses, associations, vulnerable groups) can help tailor initiatives to their needs and leverage existing knowledge and networks.

Finally, strong political leadership and a clear, shared vision for sustainability are crucial to drive participation. Participation should be seen as a means to an end, not as an end in itself. Overall, the interviewees emphasize the multifaceted nature of enabling citizen participation, requiring a

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combination of legal, financial, institutional, and social-cultural factors to create an environment conducive to meaningful engagement.

Enabling factors for citizen engagement and recommendations for policy frameworks emerging from the interviews are further outlined below under 6 categories:

a. Visioning and awareness-raising

Raising citizens' awareness on climate related risks and challenges they face is seen as a first step towards motivating their engagement in participatory processes. Particularly in the era of misinformation and fake news, it is more important than ever to ensure citizens have robust information in front of them. Visualization methods, including virtual reality are increasing being used in education programs around climate change, and could be utilized to engage citizens on issues that directly impact their lives, including showcasing of possible adaptation measures.

"It would be helpful to present the current state of the problem under analysis, present possible solutions to the problem, and then discuss them with citizens. This is to raise awareness and understand what the real solutions might be. Anything that impacts the lives of citizens engages them (such as urban heat island effects or transportation in general). Understanding the problem is the beginning to propose solutions that may initially cause inconvenience, but could have long-term benefits (e.g., transforming impermeable areas into permeable ones). Citizen engagement should be presented as something that benefits the community." Rome

It is also important to communicate an overall vision and long-term benefits to citizens and foster a sense of community and motivation to achieve common objectives.

"There is a bad habit of not discussing the overall vision, but rather focusing on daily problems. This causes citizens not to understand why certain choices were made. We need to have a vision! It is necessary to foster a sense of community to achieve objectives, as a motivational approach. Communication approaches are lacking even when plans are in place. There is often a lot of talk in general about the climate crisis, but what individuals want to do and why is missing from the debate. It remains a vague topic, and for this reason, citizens cannot verify what a municipality or administration is doing concretely". Rome

b. Participatory frameworks

Strong participatory frameworks are required to facilitate participatory processes. This includes a well resource political-administrative system that enables citizen participation. Insights can be taken in this regard from the Municipality of Rome, where the Climate Office collaborates with the Participation Department and receives support from the Communication Office of the Municipality. Additionally, a local company has been involved specifically to support citizen participation in the Adaptation Strategy process (e.g., organizing meetings and developing materials). In this context, the role of the Municipality's Participation Department is to map out relevant stakeholders to enhance and streamline engagement processes.

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A strong participatory framework also provides tools and mechanisms for dialogue such as citizen assemblies or environmental councils (involving citizens and association categories). The citizen must find a political-administrative system that facilitates their participation.

In addition, the provision of incentives for municipalities and communities to engage in participatory processes, as well as establishing mechanisms for monitoring the impact of participation, could help drive more meaningful and sustained citizen involvement in adaptation and other policy domains. However, as one respondent noted, incentives can be a delicate subject, as the unintended consequence can be the professionalization of participation.

"Making policies without incentivization proves difficult. There is a need for municipalities and the community to have incentives to mobilize in this direction. This would facilitate the mobilization of resources towards integrating participatory processes into environmental choices and/or adaptation to climate change". Rome

c. Capacity building and knowledge sharing

Concrete suggestions for improving policy influence and citizen engagement in decision-making processes included the creation of better platforms and opportunities for citizens, especially those not typically involved (e.g., older adults without school-age children), to be informed about and participate in important discussions on topics like climate change.

"If there is greater knowledge of the planning process, how it works, I think citizens would be able to exert more influence." Malmö

Likewise, knowledge exchange extends to exchange between municipalities, regions, and even international contexts. For example, the Environmental Administration of Malmö is a resilience hub in the UN initiative "making cities resilient" and is part of the EU mission on climate adaptation – in both cases providing opportunities to learn from other cities and share what is being done in Malmö.

d. Integrated Governance

Adaptation to climate change and other complex challenges clearly require a more holistic, cross-cutting approach that integrates citizen participation across different policy areas and administrative levels, rather than siloed efforts. Policies and incentives need to be aligned to support citizen participation and common environmental goals. Hence, addressing organizational and cultural barriers within administrations is critical. This includes increasing the diversity of staff expertise (e.g., more naturalists in environmental agencies), raising awareness among leadership, and fostering a more transversal, cross-cutting approach to climate change adaptation that involves multiple policy domains.

Finally, political will and the commitment of leaders needs to be cultivated to enable the continuity of participatory processes.

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"The legal framework is more than developed, but there must be political will. And sometimes, due to political polarization, it becomes necessary to change words and redefine the weight of terms, mostly those that are crossed out with a political colour. This way, we can still be in a sustainable, accessible world". Aragon

e. Inclusive and equitable engagement

Enhancing the credibility and transparency of participation processes is key to building trust. Designating staff to handle citizen input, ensuring genuine (not superficial) engagement, and involving diverse perspectives, including those with dissenting views, are important steps. Engagement tools need to be tailored to local context and community needs, while monitoring of the impact of participation is also necessary to understand its influence on decision-making. Particular focus needs to be given to the inclusion of marginalized and under-represented voices within participatory processes.

For example, inclusivity and equality are strongly rooted in policies of the University of Zaragoza, and guide the participatory projects undertaken by the University.

"The policy of the UNIZAR government has been sensitive towards diverse or vulnerable people in all aspects. There is a very important commitment to the equality of men and women and towards the LGTBIQ+ group and particularly the transexual sector. It is the group that is most vulnerable today. And, ethnic-cultural diversity […] The need to live with people who have other values is emphasized even if that is not a personal decision, but within the university everyone must work within coexistence and the principle of equity." Aragon

f. Regulatory and financial support

Improving the regulatory framework and political will is crucial for enabling participatory processes. While the legal foundations may exist in several countries, there is a need for stronger implementation, cross-sectoral coordination, and a willingness to adapt language and approaches to overcome political polarization. Strategies like creating stakeholder pacts, establishing mandatory participation requirements for municipalities, and utilizing flexible, long-term planning tools (e.g., metropolitan territorial plans, river contracts) could help address this.

"There are no tools that obligate municipalities, which are the spatial target from which to start/act. A useful method could be to create a Pact among stakeholders and develop a specific framework of resources to draw upon, with established timelines. A flexible tool is needed, one that adapts, looks long-term, but takes short-term actions." Rome

The issue of funding and sustainability for citizen engagement initiatives must also be addressed. Often, only innovative projects receive funding for a limited time, making it difficult to maintain momentum and continuity. Providing more stable, long-term funding and resources, including

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training for both citizens and administration staff, would help strengthen these efforts. At the level of individuals, there needs to be equal access to resources and support for citizen-led initiatives.

"If you talk about property owners, there are several policies that need to be put in place. There are national funding opportunities for climate adaptation measures, but only municipalities can apply while property owners have a responsibility to protect themselves. Just something as simple as individual property owners being able to apply for such funds is very important." Malmö

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5.4. Results synthesis

5.4.1. Adaptation solutions co-production context

Taken together, the results of the literature review, the survey and the interviews allow us to better understand the context in which co-production processes for climate adaptation operate, but also to better characterise the different types of factors enabling and hindering stakeholder engagement, which are the stakeholders involved and how this influences the development and outcomes of co-production processes.

Regarding the reported adaptation solutions engaging with stakeholders, these are mainly institutional solutions aimed at co-developing adaptation policies or strategies, and solutions linked to the co-production of knowledge through research and innovation processes. These also include on-ground solutions such as NBS, or solutions aimed at bringing change in social practices, activities or behaviours. However, financial solutions were barely represented among other solution types demonstrating their limited uptake to support adaptation.

In the literature review, a large proportion of the solutions described concerned adaptation to the climate in general and not a specific sector. However, the most common sectors of application for adaptation solutions are related to the environment and land planning (i.e., biodiversity, water management, disaster risks reduction, agriculture and forestry and land use) and very few concerns social or economic issues such as industry, energy, health and/or tourism. We also examined whether the barriers and enablers identified were more prevalent in certain sectors, but we did not find any significant relationship. However, as some adaptation sectors may face specific challenges in implementing co-production processes (such as agriculture or disaster risk reduction), it would be interesting to study these specificities in further research

Regarding their location, as this study focuses on European issues, it is logical that most of the solutions described are in Europe, for those reported by practitioners and policymakers, and for 30% of the cases reported in the literature. In addition, most solutions were implemented at the local or regional scale.

Concerning the co-production processes, both practitioners and policymakers reported that many of the processes have been implemented on a voluntary basis. However, in some cases, participation is encouraged through a mandate or incentives, fostering collaboration. The interviews provided further details on engagement processes and type of participation in place. In addition to mandatory processes, whether by law or by responsibility (especially public consultations), several bottom-up forms of participation were reported based on the collective interest emanating from local associations or communities, and forms of participation targeting specific groups or communities aiming to address particular issues or needs.

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According to the survey and interview data, motivations and objectives associated with stakeholder engagement relate primarily to making solutions more relevant to the local context, leading to more tailored and effective implementation. Then, it relates to promoting mutual learning through the knowledge co-production and sharing, bringing together diverse expertise and skills to raise awareness, induce behavioural changes and build capacities among the participants. Engagement in adaptation aimed also to foster stronger collaborations and trying to achieve a just representation of concerned stakeholders in the decision-making system, thus increasing the sense of responsibility, ownership and contributing to the empowerment of participants.

Different forms, methods and tools of engagement were depicted. According to adaptation practitioners the two main forms of engagement are collaborations, where stakeholders participate in several aspect of the decision, and involvement, where stakeholders work directly throughout the process. Another common form of engagement depicted by the interviewees involves public consultations, where citizens can review, comment on, and influence decision. Methods frequently used to engage stakeholders are workshops, meetings, surveys, and voting implemented through platforms, digital tools or observatories. It suggests that among the diversity of engagement methods, the most conventional ones are still preferred and used, albeit with increasing use of interactive and digital tools.

Two main stakeholder groups are reported to be in charge of organizing and implementing the adaptation co-production processes according to our results: members of academia and/or research, of the governments and decision makers in general. They often collaborate toward this goal, as well as with other types of stakeholders, such as local communities, private companies and civil society. Besides, there is a wide diversity of actors participating in the processes, a result confirmed by the interviews. Even if academics and governments still dominate, several groups usually take part in the process, showing the attempts to include the different knowledge and perspectives and to achieve broad and unbiased participation needed for adaptation. Thus, if there is greater participation of local communities, civil society and citizens, economic actors and the media are still under-represented in this type of process.

5.4.2. Co-production enablers and barriers characteristics

From the literature review, we categorise and characterise many barriers and enablers (see

Figure 37 and Figure 38), that also have been experienced by practitioners and policymakers during the implementation of co-production processes for climate change adaptation. Results reveal that the main barriers encountered in the implementation of these processes are, in decreasing order: inadequate institutional and governance systems, low engagement and motivation, scepticism, lack

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of resources and capacities, process complexities, power imbalance and distrust, different interests and expectations of stakeholders involved.

Overall, the enablers reported in the systematic literature review are more akin to good practices or areas for improvement than concrete measures to support climate change adaptation practitioners in engaging stakeholders and citizens. More precisely, the list of enablers includes flexible process design, strong collaboration and communication, motivation to act and engage, recognition and integration, inclusive approach, co-definition of roles and responsibilities, intermediaries' involvement, institutional support, existing social capital and norms, supportive funding schemes and available knowledge and capacity to engage.

Most of the factors identified operate at the local level and in the short term, which corresponds to the scale at which most climate change adaptation initiatives are implemented. The barriers appear to have a more immediate influence, while the enablers have a short- and medium-term influence, requiring more time to achieve the expected results. Some of the enablers, such as existing capitals and norms and intermediary's involvement, can take place over the long term. It therefore seems necessary to anticipate both the barriers encountered and the enablers to be activated to ensure the success of the co-production process.

Importantly, some of the enablers and barriers (e.g. low motivation and engagement, existing social capital and norms) are valid not only for climate adaptation but for any type of participatory processes. Thus, strengthening enablers or addressing barriers will depend also on general policies more or less aimed at supporting the development of democratic systems.

So far, the literature on enablers mainly focuses on best practices to design and implement a co-production process (with inclusiveness, flexibility, knowledge integration…) and less on how to tackle important institutional, motivational and structural barriers. Indeed, these internal enablers, besides reducing the inherent complexity of this type of process, help to reduce the impact of important barriers, such as divergent interests and expectations through the integration of different forms of knowledge, values and worldviews; power imbalances through the redistribution of roles and responsibilities among participants, and the scepticism regarding people's capacities to participate through inclusiveness and integration.

It could also help to strengthen motivation to get involved and act for the climate. However, for some external barriers very few concrete enablers to overcome them have been identified. This is the case for the type of barrier most reported in the literature and highlighted by policymakers during interviews - the inadequate institutional and governance system. Some institutional support enablers provide some avenues for action, such as providing clear guidelines and resources for co-production and fostering intra and inter municipal collaborations that would help to improve internal capacities, but do not present any concrete actions to deal with these structural barriers.

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This study also identified the stakeholder groups responsible for, but also those affected by, the different types of barriers and enablers. Authorities and academics are the stakeholder groups most often identified as being responsible for many of the barriers and enablers. As mentioned above, this result seems logical in the sense that these two stakeholder groups are most often at the origin of the co-production processes. This does not mean, however, that they do not share responsibility for the process, and this must be nuanced. Indeed, academics seem to be mainly responsible for the barriers and enablers linked to the implementation of the process and the provision of knowledge, while the authorities are also responsible for factors external to the process. The stakeholder groups most affected by barriers and enablers are local communities and citizens, followed by all other stakeholder groups. This result helps to determine which stakeholders to involve and solicit to act against a barrier and in favour of an enabler, but it also helps to better understand which stakeholder groups will be impacted by these actions.

Although the factors identified have an overall influence on the whole process, some have more influence on specific steps, allowing action to be targeted at each step of a co-production process. The results highlight, for example, the difficulties encountered in engaging stakeholders, which is the first step of these processes. Indeed, some barriers appear to have an immediate and individual-level influence, particularly on communities and citizens. For example, power imbalances, lack of resources and capacity, and divergent interests and expectations can directly reduce the willingness to get involved. This suggests that a particular effort must be made to target these stakeholders to increase their participation and their recognition. On the other hand, working to develop the motivation of stakeholders, their capacity and resources, and the knowledge available appear to encourage engagement.

The problem framing, solution options analysis, selection and design steps are affected by similar factors. They suffer from the expression of divergent interests and expectations, and a lack of recognition of people's knowledge and capacities. Conversely, both literature review and survey results show that they are supported by the enablers linked to inclusiveness, integration of different perspectives, strong communication, relevant process design and the availability of knowledge and capacity to engage. The implementation step of climate change adaptation solutions is greatly impacted by the lack of resources and capacity and logically supported by institutional support and funding schemes, but also by the distribution of roles and responsibilities.

According to practitioners this step is particularly supported by financial and institutional enablers as well as available human and material resources. This reaffirms the need to allocate resources and human capacity for the implementation of climate change adaptation, but also promotes the empowerment of participants. However, very limited data has been collected concerning the monitoring and evaluation of adaptation solution, a process step that is rarely carried out and documented. Practitioners pointed to the need for knowledge and intermediaries' involvement to support this step. It was also noted in the interviews that participatory processes themselves are

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poorly monitored, such that the value and benefits of engaging citizens in decision-making processes and project implementation are not known to those involved.

Finally, certain types of barriers have a strong impact on specific outcomes, such as inequalities of power which affect the capacity for empowerment and social justice, or the lack of recognition of stakeholders' capacities and the process complexity affecting the production and sharing of knowledge. On the other side, the majority of enablers favours many positive outcomes. This is particularly the case for all the categories of enablers linked to the process design and development, which promote the production and sharing of knowledge, process learning, empowerment and social justice. This makes it easier to identify how to promote certain outcomes depending on the objectives associated with the climate change adaptation solution and the implemented co-production process.

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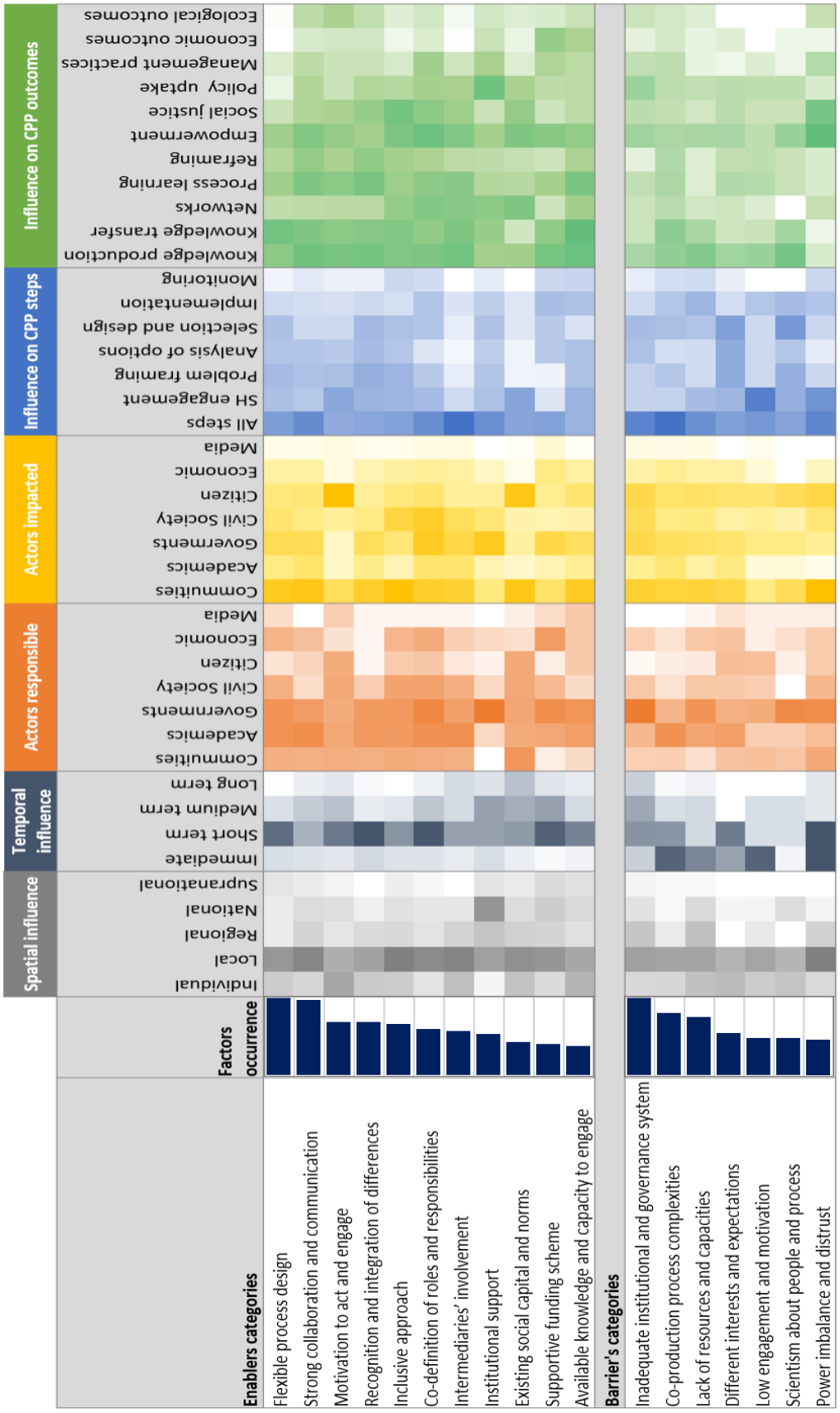

Figure 37. Overview of the influence of enablers and barriers identified in the literature review on the main variables under study (the darker the colour, the more each enabler or barrier is associated with the variable studied).

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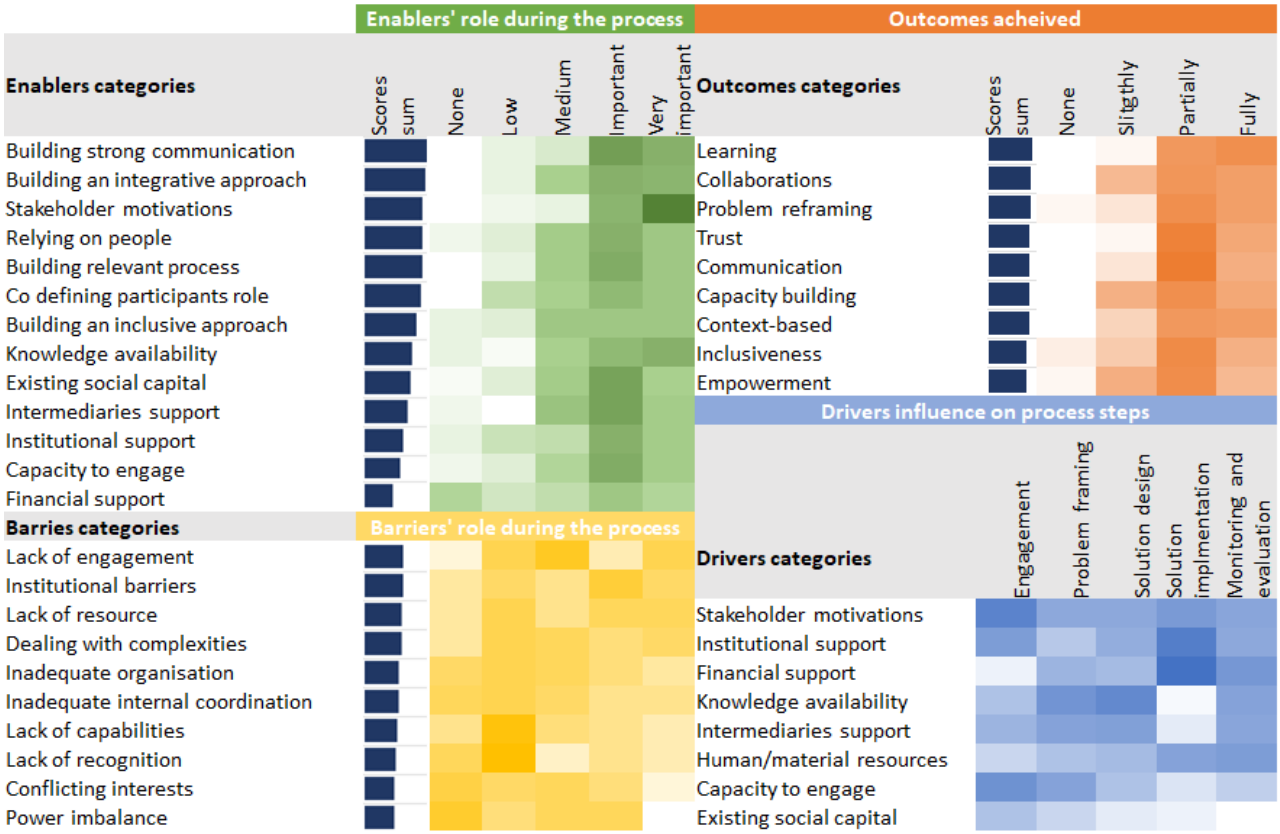

Figure 38. Survey results overview of frequencies of enablers and barrier's role and influence on the process and process outcomes achieved (the darker the colour, the more each type of factor has been associated with the variable studied).

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6. Priority areas and recommendations

This deliverable aims to identify priority areas on which to concentrate to support adaptation practitioners and policymakers to engage citizens and stakeholders in the co-production of innovative solutions for climate change adaptation.

This work, based on scientific literature and the experience of adaptation practitioners and policymakers, highlights that creating a conducive context for stakeholder engagement in adaptation requires to leverage a combination of internal factors related to the design and development of the process, as well as external organizational, institutional, financial, and socio-cultural factors. The results inform us about the different categories of barriers and enablers, the stakeholders potentially involved and affected by them, and the influence of different enablers and barriers on the process steps and outcomes. By combining these results, we can draw action recommendations to support practitioners and decision-makers with engagement practices. However, for some key barriers, we cannot identify enablers or concrete means of overcoming them. This is a major gap on which to focus attention to identify effective ways and new ideas to overcome the barriers

Among the main categories, we identified 4 key barriers and 6 key enablers which emerge as priorities both in the literature and for the stakeholders consulted. We also identified associated actions to be prioritized, aiming to improve co-production processes design (Key enablers 1,2 and 3), to foster stakeholder's agency to engage (Key enablers 4 and 5) and finally to build a supportive governance framework (Key enablers 6 and 7) (see Figure 39).

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Figure 39. Key enablers and barriers to citizen and stakeholder engagement in climate adaptation process identified from the systematic literature review, adaptation practitioners survey and policymakers' interviews.

6.1. Key barriers hindering stakeholder engagement in adaptation

Key barrier 1: Institutional and organizational barriers

The implementation of adaptation co-production processes is highly dependent on institutional frameworks and commitments. However, important institutional barriers can be encountered at two levels. On the one hand, while the policy and legal foundations may exist in many countries *(Link to D.4.2),* adaptation practitioners are still facing the limited applicability of these measures, especially because of the lack of cross-sectoral coordination, operational tools and inadequate funding schemes supporting adaptation and citizen participation. On the other hand, local administrations face many internal functioning challenges to support or implement stakeholder engagement. These challenges include poor internal and external coordination, lack of awareness and support from leaders, outdated administrative structures, siloed mentalities, heavy bureaucracy, and high staff turnover, as well as a lack of trained human resources and operational capacity.

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These barriers create significant obstacles throughout the adaptation process, particularly in the initial stages of planning and stakeholder engagement, but also during the implementation of the solution. Lack of institutional capacity, poor internal communication and fragmented governance systems hinder the integration of adaptation practices into institutions, limiting the effectiveness of co-production efforts. These obstacles also affect the sustainability and continuity of adaptation initiatives due to shifting political priorities and changes in leadership. Government authorities at local, regional, and national levels, public institutions, and funding agencies are primarily responsible for overcoming these barriers.

These organizational and cultural barriers within administrations can partially be addressed by:

- strengthening coordination mechanisms within and across institutions to break down silos and foster a more integrated approach to adaptation (***Key enabler 6***);
- enhance institutional capacity by providing training, resources, and tools that support co-production processes (***Key enabler 6***);
- improving the regulatory and policy framework that facilitate participatory processes (***Key enabler 6***);
- enhance political will and commitment ensuring that adaptation efforts are sustained despite shifts in political priorities (***Key enabler 4 and 6***).

Key Barrier 2: Co-production process complexities

The inherent complexities of the co-production process present significant barriers to effective stakeholder and citizen engagement. These challenges include language and terminology differences, the great complexity of adaptation issues, conflicting working practices, the lack of experience and training of organisers, and miscommunication between participants. In addition, the late involvement of participants, lack of transparency in roles and responsibilities definition, and competition with other political priorities further complicate the process. Progress can also be hampered by the intricate interplay of concepts, assumptions and emotions within the co-production process.

These complexities impact all steps of the adaptation co-production process, from initial engagement to its implementation and monitoring. They can lead to ineffective collaboration and a failure to integrate diverse perspectives and knowledge. This not only undermines trust and transparency but also reduces the effectiveness and expected outcomes of the co-produced solutions. The burden of managing these complexities falls primarily on academic actors and authorities, who are often the initiators or facilitators of these processes. However, the impacts are felt by all participants, including local communities, citizens, and civil society organizations.

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Many enablers can help to address these barriers:

- Develop communication strategies and training for both organizers and participants to ensure that all voices are heard and understood (***Key enablers 1, 2 and 3***);
- Prioritize early and inclusive stakeholder engagement, with clear definitions of roles and responsibilities (***Key enablers 2 and 3***, enabler: *Co-definition of roles and responsibilities*);
- Establish monitoring and evaluation mechanisms to track the progress and outcomes of the co-production process (***Key enabler 2***).

Key Barrier 3: Lack of motivation and capacity to engage

This key barrier encompasses two barriers' categories strongly interlinked that affect people's engagement in adaptation co-production processes. It arises from low willingness and motivation but also from the lack of capacities among citizens and stakeholders to engage. Factors affecting motivations are first linked to a lack of time and energy to participate and sometimes to co-production fatigue. This barrier also includes a lack of information on the participation mechanisms and a biased perception of participants influence on the process and outcomes. Besides, many participants lack the necessary agency (e.g. options, mobility issues, low incomes to dedicate time) and capacities (e.g. skills, education, self-confidence) to effectively engage in these processes. This can be particularly true for marginalised and typically under-represented sectors of society (elderly, children, disabled, migrants, etc).

Lack of motivation and capacity to engage primarily affects the initial steps of stakeholder engagement, which is essential for the success of the whole co-production process. If participants are not aware of the climate threats they face, feel that their contribution is insignificant, are simply unable to participate, or if they are unaware of the existing participatory tools, the whole adaptation process will be affected. The absence of broad and diverse participation, particularly from vulnerable and under-represented groups, results in less inclusive and effective adaptation solutions. In addition, the learning outcomes of the process are diminished when participants are disengaged or unequipped to make a meaningful contribution.

Co-production process organizers are largely responsible for addressing this barrier by providing adequate information, creating incentives, and ensuring that engagement processes are inclusive, accessible, and meaningful. Additionally, marginal groups may be further marginalized if this barrier is not addressed. However, influencing people's values, motivations and perceptions remains a highly complex and a societal challenge.

To progress toward these motivational and agency issues a few enablers are identified:

- Improve communication strategies to ensure that information about engagement tools and processes reaches all segments of the population (***Key enablers 1, 4 and 6***);
- Develop diverse type of incentives to encourage broader participation;

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- Propose training and educational programs to enhance the skills, knowledge, and self-confidence of potential participants (***Key enabler 4***);
- Consider practical issues that hinder engagement and offer support to address these constraints (**Key enabler 2**);
- Clearly state the impact of participants inputs on decision-making and adaptation outcomes from the beginning (**Key enabler 4**).

Key barrier 4: Lack of resources

Adaptation practitioners often lack access to essential resources, including funding, human resources, knowledge, and data, which represents a significant barrier to effective stakeholder and citizen engagement in adaptation processes. This barrier manifests in various ways, such as limited budgets for trained human resources, insufficient funding for long-term initiatives, and a scarcity of reliable information and expertise required for implementing a sustainable and meaningful engagement.

Resource limitations impact multiple steps of the adaptation process, particularly the implementation and monitoring phases. The lack of financial support and human resources makes it difficult to maintain momentum in citizen engagement and adaptation initiatives. Moreover, the scarcity of localized knowledge and data hinders the ability to develop adapted and context-specific adaptation solutions. Public institutions, academics and local communities are particularly affected by this lack of available and accessible resources. However, with economic actors, they also play key roles in providing the necessary knowledge, funding, and expertise.

Increasing required resources for stakeholder engagement can be supported with:

- Secure stable, long-term funding and resources to support adaptation initiatives, including engagement activities (Enabler: *Developing financial support*);
- Strengthen partnerships between academics, government bodies, and communities to improve knowledge transfer and ensure that the solution is based on the most accurate and context-specific information (***Key enablers 1 and 3***, enabler: *Involving intermediaries*);
- Develop training and capacity-building tools for public administration, adaptation practitioners and community representatives to enhance their ability to facilitate and participate in co-production processes (***Key enablers 6***).

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6.2. Key enablers to support stakeholder engagement in adaptation

Key enabler 1: Developing strong collaboration and communication

Fostering collaboration and communication both within the adaptation process and with external stakeholders appears to be key to sustainability and effectiveness of an adaptation co-production process. Indeed, effective collaboration and communication strategies among participants will help to improve trust and respect among people and the process, create long-term relationships and networks, better understand roles and responsibilities, but also to create a shared understanding and language. Thus, these strategies will have positive impacts on all steps in the adaptation process, but also promote important outcomes such as knowledge production and sharing, learning, adaptation issue reframing and participants' empowerment during the process. Potential challenges include overcoming hierarchical structures that inhibit open communication (Barrier: *Power imbalance and distrust*), managing diverse perspectives and interests (Barrier: *Different interests and expectations*), and ensuring that all participants feel valued and heard (**Key barrier 2**).

To develop these collaboration and communication strategies, it is essential to:

- Establish clear engagement rules that foster trust and transparency among participants;
- Create a safe space for dialogue where all participants feel comfortable sharing their perspectives and ideas without fear of judgment;
- Create structured feedback loops to ensure that participants' contributions are considered and acted upon, acting as a form of accountability;
- Ensure iterative, non-hierarchical and transparent interactions among all participants;
- Utilize various communication channels and tools to reach all audiences and ensure information accessibility and learning;
- Work with participants to develop a common language and understanding of adaptation objectives and processes, thereby aligning efforts and expectations;
- Develop an external communication strategy adapted to inform different audiences.

These actions must be implemented by the organisers and facilitators of the co-production process, ensuring that all stakeholders are fully involved.

Key enabler 2: Building a flexible process design

Incorporate flexibility and adaptability in adaptation co-production processes is key to facilitate stakeholder engagement and develop a context-based approach. Such enabling working environment will help to build a relevant process, enabling the co-produced adaptation solution to be adapted to the local context, needs and challenges but also to external influences. It will shape all the process steps, and lead to knowledge production and transfer, participants' learning and empowerment. Significant challenges remain, linked to the lack of training and resources allocated to stakeholder engagement (***Key barriers 4***), the diversity of participants' work habits and the complexity of the issues and adaptation solutions (***Key barrier 1 and 2***).

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To develop such flexible working framework, adaptation practitioners should:

- Design a process that can accommodate a wide range of perspectives and knowledge forms;
- Co-define appropriate scope and scale of reflection and action;
- promote systems thinking and consider short-, medium and long-term benefits of climate adaptation initiative;
- Leave room to deal with uncertainty, mistakes and learning by doing approach;
- Promote reflective approach and allocate enough time to each process step;
- Build on good examples and best practices;
- Encourage iterative feedback and continuous learning to refine the process based on participant inputs.

Co-production process organisers and facilitators are responsible of implementing such actions.

Key enabler 3: Building an inclusive and integrative approach

To increase adaptation solution co-produced legitimacy and saliency it is necessary to build an inclusive and integrative process. These two enablers were separated during the analysis; however, they are strongly interlinked due to their associated actions and impacts, which is why we chose to present them as a single priority. Recognizing and involving the different actors' groups concerned or impacted by the adaptation process, and integrating their perspectives allows to incorporate different source of knowledge but also to confront different perception, worldviews, values and expectations both about the process and adaptation issue. It also helps to incorporate contextual information and parameters and to deal with power relation while building trust, respect and reciprocity. Building an inclusive and integrative approach help to ensures that diverse knowledge and perspectives are considered during problem framing and solution selection and design, leading to more robust and contextually relevant outcomes. Thus, it supports knowledge production and sharing but also participants learning, empowerment and social justice, fostering a sense of community and shared responsibility. Achieving this inclusive and integrative approach has proven to be challenging for the adaptation practitioners. These challenges relate to overcoming entrenched power imbalances (Barrier: *Power imbalance and distrust*), ensuring genuine representation of all groups (***Key barriers 2 and 3***), and effectively integrating diverse knowledge systems (***Key barrier 2***).

Actions recommendation to build an inclusive and integrative approach are:

- Involve a representative sample of stakeholders, e.g. communities, citizen, private sectors, vulnerable and marginalized groups, governments, researchers, youth, civil society, NGOs…;
- Tailor engagement approach and the process considering the needs and local context of diverse stakeholders including vulnerable and underrepresented groups;
- Facilitate knowledge exchange between participants to broaden the scope of solution using diverse participatory tools;
- Promote vertical and horizontal integration and cross-sectoral collaboration;

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- Build on existing skills and knowledge within the participants;
- Empower participants by recognizing and incorporating their insights into adaptation process decision-making.

Again, this enabler must be implemented by the organisers and facilitators of the co-production process with the help of different groups representatives among public authorities, civil society, experts, private sectors and local communities. Engagement methodologies have been synthetized and evaluated within the WP2 of Agora project in two deliverables.

These first three key enablers are extensively studied and described in the work carried out as part of Work-package 1 of the AGORA project, so for those who are interested in the methods and good practices for engaging citizens and stakeholders in climate change adaptation processes, we invite you to consult the deliverables D1.1 “Mapping of existing citizen engagement initiatives” and D1.2 “Report on the methodologies used for citizen engagement”.

Key enabler 4: Fostering citizen and stakeholder motivation

Stakeholder motivation is critical to their engagement and their action in favour of climate adaptation therefor it must be cultivated throughout the co-production process. Motivated and informed stakeholders are more likely to engage in adaptation processes, enhancing the effectiveness of co-production efforts. Their participation is crucial for knowledge co-production and transfer, as well as for building capacity and resilience at the community level. Motivation is driven by individuals' perceptions and willingness to reduce their vulnerability, their awareness and experience of climate impacts, and the benefits obtained from participation. Intrinsic factors such as values, beliefs, and a sense of responsibility also play a critical role. Associated challenges include addressing diverse motivations across different groups (***Key barrier 3***), overcoming scepticism and distrust about the effectiveness of adaptation measures or the process (Barrier*: Scepticism about people and process*), and ensuring sustained engagement over time (e.g. avoiding participation fatigue) (***Key barrier 3***).

While some actions can be developed by adaptation practitioners, others rely on factors acting prior to engagement:

- Develop awareness-raising campaigns that highlight the individual and community benefits of climate adaptation efforts;
- Communicate on issues that directly impact people daily lives and concerns;
- Communicate about the value and impact of their contributions and the benefits obtained (e.g. learning, sense of responsibility);
- Develop a rewarding system such as monetary or non-monetary incentives;
- Leverage past experiences with co-production processes and encourage participants to share the benefits they’ve experienced;
- Mobilize existing networks and relationships to foster engagement and sense of community;

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- Provide tailored support to individuals based on their specific needs, concerns, and levels of engagement.

Fostering motivation to engage appears to be of a shared responsibility among the different types of actors, however, this type of action specifically targets citizens and local communities.

Key enabler 5: Increasing knowledge availability and capacity to engage

Ensuring knowledge availability and enhancing participants capacity appeared crucial for practitioners and policymakers for effective stakeholder participation and the saliency of adaptation initiatives. Access and training on context-specific, clear, up-to-date and reliable data and information are needed to support stakeholders in the co-development of the adaptation solution. Available knowledge and capacity building resources play a significant role in the initial steps of engagement and throughout the adaptation solution co-design and co-implementation. However, it remains challenging to overcome the lack of access to reliable information, to bridge the gap between available knowledge and its practical application, and to ensure equitable access to capacity-building resources within different stakeholder groups (***Key barrier 3 and 4***).

Increasing knowledge availability and capacity to engage require actions such as:

- Develop platforms providing easy access to relevant data and information and facilitate the exchange of information and best practices among stakeholders;
- Mobilize available skills, abilities and knowledge among participants;
- Involve academics and experts as intermediaries and knowledge brokers, facilitating the flow of knowledge between participants;
- Promote collaboration and communication among participants to enhance learning, share resources and expertise;
- Develop training campaigns that empower citizens with the skills and knowledge necessary to participate effectively in adaptation initiatives;
- Advocate for policies providing funding and resources to enhance knowledge availability and capacity building.

Experts and academics have a great role to play as well as public authorities in collaboration with adaptation practitioners to implement these actions.

Key Enabler 6: Strengthening institutional support

To be implemented at scale adaptation solutions co-production processes require a supportive institutional framework. Indeed, it can incentivize engagement by providing clear policies, regulations, guidelines, planning tools and resources, but also by pushing public authorities and obtain political support at different scale based on their leadership, capacities and influence. Such intuitional framework is critical for the implementation of all process steps and particularly for initial engagement and adaptation solution implementation. It contributes to obtain specific outcomes such as strengthened stakeholder networks, policy uptake of the adaptation solution and improved management practices. Significant barriers and challenges can hinder progress linked to the current

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functioning of institution with poor coordination across sectors and scale, lack of trained workers, heavy bureaucracy and the existing gap between well-developed legal frameworks and the low political commitment locally (***Key barrier 1***).

Priority actions that should be undertaken to build this supportive framework are:

- Establish clear and coherent policies, regulations, funding scheme and guidelines that mandate or incentivize citizen and stakeholder engagement in climate adaptation initiatives;
- Build flexibility into the system, using flexible action plans and road maps, that can be adjusted as new data and input comes available;
- Promote these policies and instruments, and apply them consistently at different levels of government;
- Ensure that these frameworks are supported by transparent administrative processes and accessible to all stakeholders;
- Provide dedicated funding and resources for adaptation initiatives, including for the co-production process;
- Allocate sufficient human resources and expertise to coordinate efforts across various government departments and levels;
- Promote coherence and coordination across different administrative levels and departments;
- Cultivate political will and leadership commitment to facilitate long-term uninterrupted engagement of public authorities.

The responsibility for implementing these actions primarily belongs to the local public authorities but also national policymakers. In contrast to the key enablers presented above, this type of action will have an influence in the medium to long term and on a local, regional or national scale, but will not affect the process or individuals directly.

It is important to emphasise that all the enablers identified in this work are highly interconnected and any action implemented in one of these categories could have an influence on the achievement of others. There are clear influences between the recommendations for action under the enablers described above, such as the development of strong collaboration and communication, which can facilitate the integration of the knowledge and views of all the participants. Similar links also exist with the types of enablers that were less prevalent among practitioners, such as the influence that the development of a supportive funding scheme could have on the allocation of human resources within institutions to support co-production efforts.

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6.3. Knowledge gaps: key barriers remain not addressed

Our results suggest that there are already many enablers available to adaptation practitioners identified to improve the design of the process, which helps to overcome the major barriers often identified in connection with the implementation of this type of process. These are good practices to follow, enabling the development of an approach adapted to the local context, including all the relevant stakeholders, their visions and knowledge, and co-defining the decision-making process and individual responsibilities. Such an approach addresses important barriers, particularly external ones, such as managing different interests and expectations, and power inequalities, compensating for the lack of capacity of some of the participants or reinforcing motivation. These actions are mainly in the hands of the organisers and facilitators of the co-production processes, which makes them accessible and easier to implement.

However, when it comes to supporting the agency of participants or developing a supportive institutional and financial framework, the situation appears to be quite different. This is also the case for the barriers linked to the current organisation and functioning of local institutions, which seem unsuited to support climate change adaptation initiatives and engagement of citizens and stakeholders. Importantly, supporting citizen agency is a democratic aim that goes beyond climate adaptation and can thus be achieved by implementing policy instruments that cut across different sectors and thematic areas.

Yet, adaptation practitioners have little influence on decisions relating to national public policies, their local application, the organisation of institutions or the design of funding schemes. While through the process of engaging stakeholders they can influence participants' motivation and awareness, increase cross-sectoral collaboration and propose capacity-building solutions, these barriers can be addressed only by implementing systemic changes involving other stakeholders at different scales. As local institutions play a vital role in adapting to climate change and getting stakeholders involved, further research is required to better understand how institutions should progress in this direction.

Future research could also focus on measuring impacts of different co-design and stakeholder engagement processes by employing a systematic and robust methodology.

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7. Conclusion

This study has highlighted three main priorities for developing a favourable context to support adaptation practitioners in engaging stakeholders in the co-production of innovative solutions. Different stakeholders can be involved in developing these priorities. The first axis is based on the design and implementation of the co-production process. These enablers account for a large proportion of the enablers identified and several studies contribute to identifying good practices to maximise the inclusiveness, saliency and flexibility of the co-production processes implemented (Norström et al. 2020; Chambers et al. 2021). Thus, the actions to be taken tend to be in the hands of the stakeholders in charge of the co-production and adaptation processes.

The second priority axis concerns the institutional and governance framework for implementing adaptation and co-production processes. This strand would address one of the barriers most cited in the literature, but also by practitioners and decision-makers. They report that, on the one hand, although a legal framework currently exists, it remains difficult to implement, notably because of a lack of operational resources and commitment from leaders. On the other hand, the current functioning of local institutions appears to be a major barrier. This priority relies on legislators, local decision-makers and funders, as well as those involved in the organisation of local institutions.

Finally, the third priority is to increase the capacity of stakeholders and citizens to get engaged in this type of processes, by creating trust and improving their knowledge, awareness and motivation regarding climate change issues. The aim is also to acknowledge and value their participation in various ways (e.g. reward systems). Different types of stakeholders can work together to make progress in this direction, in particular those involved in education, academia and the media, but also institutions and adaptation practitioners, in order to raise awareness of the challenges of adaptation and to share responsibilities to address the climate crisis.

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9. Annexes

Annexe 1: Papers included in the systematic literature review

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This project has received funding from the European Union's Horizon Europe Research and Innovation Actions under grant agreement No 101093921

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Annexe 2: Systematic literature review coding framework.

Main topic	Criteria	Parameters and code	Definition (if needed)	Source
Paper details	**Publication type**	1=Scientific paper		
		2=Grey literature		
		3=Other		
	Study type	1=Case studies		
		2=Review of case studies		
		3=Literature review		
		4=Comparative study		
		5=Other		
	Data collection methods	1= Literature		
		2=Stakeholder elicitation	workshops, survey, interview...	
		3=Document analysis		
		4=Experience based		
		5=Mixed methods		
		6=No data collection		
		7=Other		
Information on adaptation solution co-produced	**Adaptation solution types**	1=Nature-based	Actions to protect, sustainably manage, or restore natural ecosystems, that address societal challenges such as climate change, human health, food and water security, and disaster risk reduction effectively and adaptively,	Berrang-Ford, Lea, et al. "A systematic global stocktake of evidence on human adaptation to climate change." Nature Climate

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			simultaneously providing human well-being and biodiversity benefits (UICN)	Change 11.11 (2021): 989-1000
		2=Research/innovation	Knowledge co-production	
		3=Technical/Infrastructural	Use of technical/technological/infrastructural/engineering/mechanical items to cope with risks	
		4=Social/behavioural	People making changes in their behaviour (practices, migration), shift in economic and livelihood activities, change in consumption habits, (e.g. community-based adaptation, education, capacity building)	
		5=Institutional	Creating policies, programmes, regulations and procedures and establishing formal and informal organizations	
		6=Financial	Financial mechanisms	
	Adaptation solutions sectors	1=Health		Transformar Horizon project categories (basic sectors related to adaptation) and AGORA project WP1
		2=Agriculture		
		3=Fisheries and aquaculture		
		4=Water management		
		5=Environment (Biodiversity/)		
		6=Infrastructure (Buildings/transport)		
		7=Land use planning		
		8=Tourism		
		9= Disaster risk reduction		
		10=Energy		

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		11=Financial		
		12=Business and Industry		
		13=Cultural/Heritage		
	Adaptation solutions benefits	1=Disaster Risk Reduction		
		2=Climate Change Mitigation		
		3=Sustainable urbanisation		
		4=Social justice (including equity)		
		5=Ecosystem restoration (biodiversity benefits)		
		6=Water management		
		7=Human health (including wellbeing)		
		8=Economic development (including green jobs)		
		9=Waste management		
		10=Cultural heritage and diversity		
		11=Sustainable consumption and production		
		12=Maintaining livelihood		
		1=Local	Unique initiative	

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	Adaptation solution scale	2=Regional	Several (or replicated) initiatives across one region (intermunicipal, departmental or regional level)	
		3=National	Several (or replicated) initiatives across one country	
		4=Supranational	Several (or replicated) initiatives in in nearby countries	
		5=Global	Several (or replicated) initiatives in countries across the world	
	Adaptation solution location	1=Europe (Russia)		UN Standard country for statistical use
		2=Asia		
		3=Americas		
		4=Africa		
		5=Oceania		
		6=Antarctica/Arctic		
		7=Global		
Information on co-production process	**Co-production definition**	Copy paste the of definition of "co-production" provided in the paper if available		
	Co-production type	1=Co-planning of policy	Deliberative participation, citizens assemblies,	
		2=Co-prioritisation of services	Participatory budgeting (macroscale), personal budgets (micro-scale), stakeholder groups on budget committees.	
		3=Co-financing of services	Crowdfunding, local fundraising.	
		4=Co-design of services	User forums, service design labs.	Bovaird at Loeffer 2012
		5=Co-management of services	Community management of public assets (such as libraries, community centres, youth clubs,	Bovaird and Loeffler 2013

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			sports facilities), school governors.	
		6=Co-implementation/ delivery of services	Peer support groups, Neighbourhood Watch, Speed Watch).	
		7=Co-assessment	Including co-monitoring and co-evaluation of services and outcomes—e.g. tenant inspectors, user online ratings.	
	Co-production process outputs	1=Knowledge	All forms and supports of knowledge/climate information/tools (web application, research report...)	Defined from accumulated knowledge and experience of authors
		2=Adaptation plan/strategies	Adaptation strategies/plan at different level (could be for one municipality, a company, a region)	
		3=Policies/instruments	Public policies, sectoral policies, legal document, policy instruments, land planning document (at different scale from local to international)	
		4=On ground actions	Initiatives implemented on ground, physically (such as planting trees) or socially (behaviour change, change in practices)	
		5=Capacity building	Participant empowerment, capacity building, network or partnership creation	
		6=Other		
	Stakeholder engagement in the co-production process	1=Surveys		AGORA project WP1 stakeholder and citizen engagement mapping classification
		2=Focus groups		
		3=Interviews		
		4=Workshops		
		5=Training sessions		
		6=Gamification		

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		7=Online forums		
		8=Webinars and live streams		
		9=Interactive content		
		10=Personalized communication		
		11=Meetings		
		12=Public hearings		
		13=Participatory research		
		14=Civic hackathons		
		15=Online platforms		
		16=Mobile apps		
		17=Field data collection		
information on drivers	**Total of driver described in the paper**	Provide the exact number of drivers described in the paper added to the review		
	Driver to what	Copy paste of the intend of the analysis of the drivers		
	Driver denomination	Copy paste or provide a denomination for each driver denomination		
	Driver's main category (only one parametercould be selected)	1=Institutional	Formal rules such as policies, regulation tools, legislation, administration	Defined from extensive reading and knowledge of the authors
		2=Socio-cultural	Informal rules such as cultural norms, habits and attitudes	
		3=Technical/technologies	Material resource (e.g. facilities, infrastructures) and technical resource (e.g. technologies for engagement)	
		4=Knowledge/Education	Multiple form of knowledge (scientific, practical, traditional...), access to, inclusion of and K sharing	

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			(education, training of initiators and participating actors	
		5=Financial	Funds supporting co-production steps, resources and activities, money (e.g. incentives, accountability)	
		6=Communication	Communication media supporting awareness, engagement, networks	
		7=Values and motivations	Participants interests (individual vs collective), priorities, perception; values, responsibility	
		8=Human resource	Human resources (e.g. process support) and time	
		9=Relational/interpersonal	Networks, partnerships, power, influence, trust building, participatory work, relationships, inclusiveness	
	Drivers effect	1=Enabler	Drivers facilitating, favouring the co-production process	
		2=Barrier	Drivers hampering, threatening or blocking the CPP	
	Driver's origins	1= Endogenous	Internal to the co-production process	
		2= Exogeneous	External to the co-production process	
	Spatial scale at which driver has an effect	1=Individual	Affecting people (such as mind, behaviour)	
		2=Local	Affecting initiative scale or municipal level	
		3=Regional	Affecting intermunicipal, departmental or regional level	
		4=National	Affecting national level	
		5=Supranational	Affecting transnational level (from several countries like Europe or worldwide)	
		6=Global	Affecting global level	
		1=Immediate	Direct effect when drivers is activated (days/months)	

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	Temporal scale at which driver has an effect	2=Short term	Effect on the following years after driver activation (1 to 5 years)	
		3=Medium term	Effect up to a decade after driver activation (5 to 10 years)	
		4=Long term	Effect after a decade after driver activation (10 to n years)	
	Stakeholder groups responsible for the driver	1=Local communities	Group of interacting people living in a common location that is organized around common values and is attributed with social cohesion within a shared geographical location, generally in social units larger than a household (Wikipedia...)	AGORA project's target groups
		2=Academia and Research	Registered Training Authorities, universities, schools, networks, experts	
		3=Governments and decision makers	local and regional authorities for climate adaptation; policymakers at local, regional and EU levels; policy advisors, i.e. institutes and public agencies at local, regional and EU levels	
		4=Civil society	Civil society organisations, NGOs, young associations (World bank def: Civil society ... refers to a wide array of organizations: community groups, non-governmental organizations [NGOs], labour unions, indigenous groups, charitable organizations, faith-based organizations, professional associations, and foundations) --> influence	
		5=Citizens/ Public opinion	Citizens as individuals (organized groups of citizens falls in civil society)	
		6=Investors/ economic actors	Local businesses, small, medium and large firms, financial	

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			institutions, publicly owned enterprises, institutional investors	
		7=Media	journalists, communications officers, publishers and digital media publishers, editors	
	Stakeholder groups affected/targeted by the driver	1=Local communities	Group of interacting people living in a common location that is organized around common values and is attributed with social cohesion within a shared geographical location, generally in social units larger than a household (Wikipedia...)	AGORA project's target groups
		2=Academia and Research	Registered Training Authorities, universities, schools, networks, experts	
		3=Governments and decision makers	local and regional authorities for climate adaptation; policymakers at local, regional and EU levels; policy advisors, i.e. institutes and public agencies at local, regional and EU levels	
		4=Civil society	Civil society organisations, NGOs, young associations (World bank def: Civil society ... refers to a wide array of organizations: community groups, non-governmental organizations [NGOs], labour unions, indigenous groups, charitable organizations, faith-based organizations, professional associations, and foundations) --> influence	
		5=Citizens/ Public opinion	Citizens as individuals (organized groups of citizens falls in civil society)	
		6=Investors/ economic actors	Local businesses, small, medium and large firms, financial institutions, publicly owned	

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			enterprises, institutional investors	
		7=Media	Journalists, communications officers, publishers and digital media publishers, editors	
	Co-production process steps affected by the driver	1=all co-production steps affected		Defined based on Tandem framework, Climate adaptation mission guidelines, policy process steps, extensive reading on co-production.
		2=Stakeholders identification and engagement		
		3=Problem framing and understanding (climate risk and vulnerability)		
		4=Solutions options identification and assessment		
		5=Solutions selection and design (decision making)		
		6=Solutions implementation		
		7=Solutions monitoring and evaluation		
	Co-production outcomes	1=Knowledge production	The process generates new knowledge with the potential to further adaptation outcomes	Chambers et al. 2021 Six modes of co-producing sustainability (suppmat: https://doi.org/10.1038/s41893-021-00755-x)
		2=Knowledge transfer	The process clearly communicates and persuasively frames existing or generated knowledge to relevant actors with the potential to further adaptation outcomes	
		3=Networks	The process changes the social network of connections among	

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			actors to aid the ability to address adaptation challenges	
		4=Process learning	The process generates and shares knowledge about the collaborative process to helps inform their own and other efforts to successfully undertake them	
		5=Reframing	The process changes pre-existing beliefs/values/ priorities of people whose actions are linked to the adaptation challenge	
		6=Empowerment (including capacity development)	The process changes people's sense of motivation, capacities to use and apply Knowledge, agency and commitment to pursue their goals	
		7=Social justice	The process creates outcomes that shift power and resources away from more powerful actors and towards more marginalized actors	
		8=Policy and Institution uptake	The process strengthens or creates existing or new institutions and policies that help govern adaptation challenges and explicitly prevent misuse of the initiative for political purposes against adaptation	
		9=Management practices	The process produces concrete shifts in management actions that help address the adaptation challenge	
		10=Ecological outcome	The process produces actual ecological improvements	
		11=Economic outcomes	Economic benefits, funds for adaptation or stakeholder engagement	
Notes and	**Need for double check**	Yes or No		

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comments	**Important notes**	Important information or quotes that where not fitting into the framework	
	Coder comments	Provides specific comments that could be helpful for the understanding of the paper or for the analysis	

Common coding was used for recurrent parameters:

20= more than one: please specify in brackets the numbers corresponding to the different answers)

21=None of them: if none of the parameters correspond

22=Information not available: if the information is missing

23=Not appropriate: If the criterion is not appropriate to the case of the paper

***: If the coder has a doubt on the chosen parameters**

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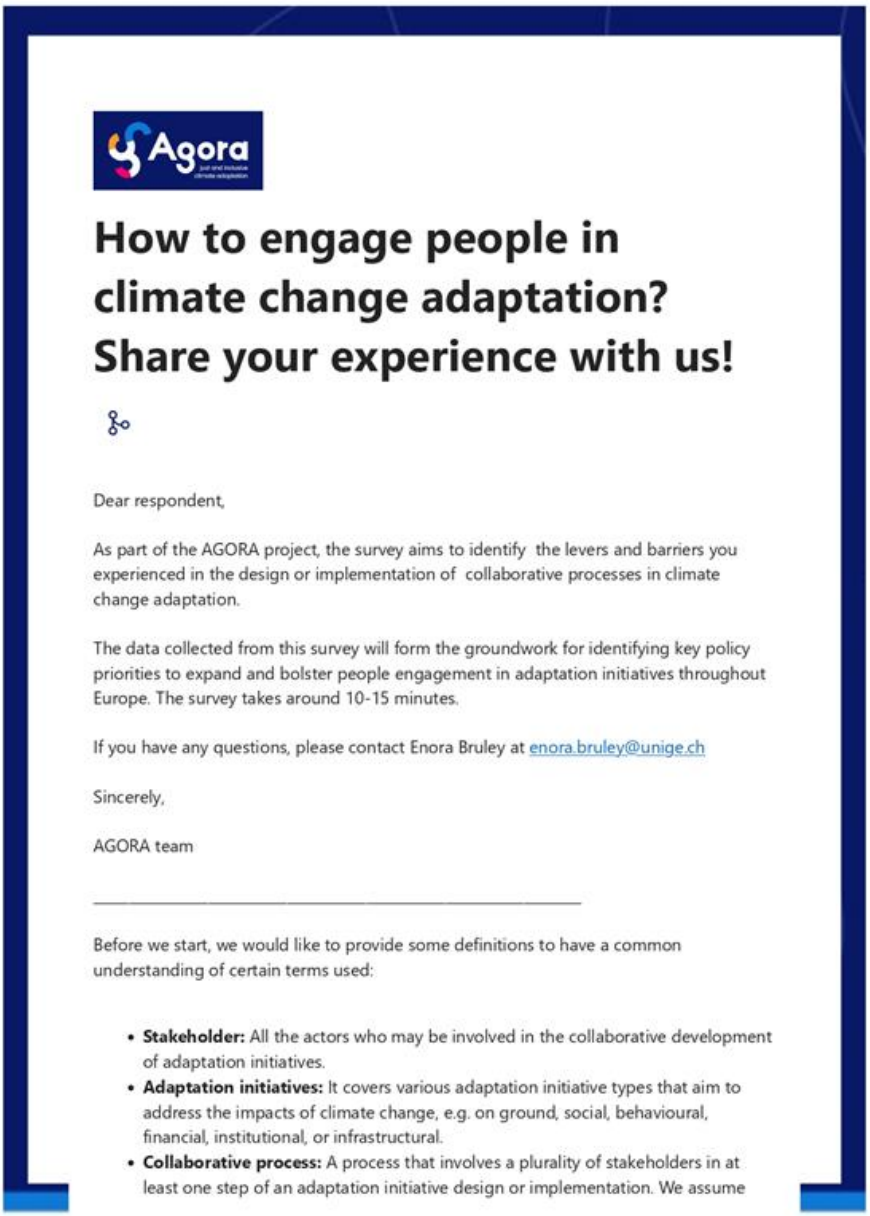
Annexe 3: Survey addressed to adaptation practitioners



How to engage people in climate change adaptation? Share your experience with us!

Dear respondent,

As part of the AGORA project, the survey aims to identify the levers and barriers you experienced in the design or implementation of collaborative processes in climate change adaptation.

The data collected from this survey will form the groundwork for identifying key policy priorities to expand and bolster people engagement in adaptation initiatives throughout Europe. The survey takes around 10-15 minutes.

If you have any questions, please contact Enora Bruley at enora.bruley@unige.ch

Sincerely,

AGORA team

Before we start, we would like to provide some definitions to have a common understanding of certain terms used:

- **Stakeholder:** All the actors who may be involved in the collaborative development of adaptation initiatives.
- **Adaptation initiatives:** It covers various adaptation initiative types that aim to address the impacts of climate change, e.g. on ground, social, behavioural, financial, institutional, or infrastructural.
- **Collaborative process:** A process that involves a plurality of stakeholders in at least one step of an adaptation initiative design or implementation. We assume

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that different types of collaborative processes exist ranging from stakeholder consultation to co-decision making.

Consent

Adhering to General Data Protection Regulation, all survey responses are confidential. We collect specific identity details only to help understand the demographic we have reached. The data from this survey will be used for scientific purposes within the AGORA project. The analysis of the survey data will be therefore anonymous and aggregated.

AGORA privacy policy link: https://adaptationagora.eu/privacy-policy/

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1

- I have read and understood the information provided above.
- I voluntarily consent to participate in this survey.
- I consent to the processing of my anonymous data for research purposes *

- ○ Yes
- ○ No

2

I confirm that I am 18 years or older: *

- ○ Yes
- ○ No

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1

- I have read and understood the information provided above.
- I voluntarily consent to participate in this survey.
- I consent to the processing of my anonymous data for research purposes *

- ◯ Yes
- ◯ No

2

I confirm that I am 18 years or older: *

- ◯ Yes
- ◯ No

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4

What type of adaptation initiative was it?
*

Sélectionnez au plus 3 options.

- [ ] On ground solution implementation (e.g. Nature-based solutions)
- [ ] Research/innovation
- [ ] Social/behavioural
- [ ] Financial
- [ ] Institutional/Policy
- [ ] Technical/infrastructural
- [ ] Autre

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5

What was the main objective(s) of this adaptation initiative (choose max 3 options)? *

Sélectionnez au plus 3 options.

- [ ] Implementation of climate adaptation measures
- [ ] Knowledge production or sharing
- [ ] Adaptation/risk reduction plan or strategies
- [ ] Policies or instruments design
- [ ] Capacity building
- [ ] Autre

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6

What sector(s) does the adaptation initiative belong in (choose max 3 options)? *

Sélectionnez au plus 3 options.

- [ ] Business and industry
- [ ] Cultural/heritage
- [ ] Disaster risk reduction
- [ ] Tourism
- [ ] No specific sector
- [ ] Land use planning
- [ ] Health
- [ ] Environment (Biodiversity)
- [ ] Energy
- [ ] Infrastructure (Buildings/transport)
- [ ] Agriculture and forestry
- [ ] Water management
- [ ] Fisheries and aquaculture
- [ ] Autre

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7

What was your role in the collaborative process? *

Sélectionnez au plus 3 options.

- [ ] Participant
- [ ] Funder
- [ ] Expert
- [ ] Facilitator
- [ ] Advisor
- [ ] Organiser
- [ ] Autre

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8

In your perspective, what type of stakeholder engagement does the process belong in? *

- ○ Inform: To provide stakeholders with balanced and objective information to assist in understanding the problem, alternatives, opportunities, and/or solutions.
- ○ Extract: To gain stakeholders' information, which might or might not be shared in subsequent forums.
- ○ Consult: To obtain public feedback on analysis, alternatives, and/or decisions.
- ○ Involve: To work directly with stakeholders throughout the process to ensure that their concerns are consistently understood and considered.
- ○ Collaborate: To partner with stakeholders in each aspect of the decision, including the identification, selection and development of the preferred solution.
- ○ Empower: To place the final decision-making in the hands of the stakeholders.

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9

Which stakeholder groups organised the collaborative process? *

- [ ] Governments and decision makers
- [ ] Media
- [ ] Local communities
- [ ] Academia and research
- [ ] Civil society representatives/NGOs
- [ ] Citizens
- [ ] Investors/economic actors
- [ ] Autre

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9

Which stakeholder groups organised the collaborative process? *

- [ ] Governments and decision makers
- [ ] Media
- [ ] Local communities
- [ ] Academia and research
- [ ] Civil society representatives/NGOs
- [ ] Citizens
- [ ] Investors/economic actors
- [ ] Autre

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In your perspective to what extent did the collaborative process achieve its objectives? *

- ○ I don't know (I'm not able to measure, too soon to tell)
- ○ None of the objectives were achieved despite efforts
- ○ Most of the objectives were not achieved
- ○ Some or a few of the objectives were achieved
- ○ Most of the objectives were achieved
- ○ All the objectives were achieved and even more

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13

To what extent did the collaborative adaptation process deliver the following outcomes? *

	Strongly disagree	Disagree
Participants mutually learned from the process and from each other	○	○
There was clear communication and continuous information-sharing	○	○
Mutual respect, trust and healthy work relationships between participants were present or developed during the process	○	○
Participants partnerships and networks strengthened as a result of the process	○	○
Participants co-defined the adaptation problem, vulnerabilities, objectives and solutions	○	○
The diversity of participants involved was appropriate for the affected demographic	○	○
Participants had an equal opportunity to participate in the decision-making process	○	○
Participant capacity building occurred during the process	○	○
The adaptation solution(s) developed align with local needs, context, expectations, and values	○	○

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Experienced levers and barriers to the implementation and progress of adaptation collaborative processes

Based on the scientific literature review, we identified internal and external levers and barriers affecting climate change adaptation collaborative processes. Here we want to understand which levers and barriers played a role in your selected process design and implementation.

pch.vector on Freepik

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14

On a scale from 1 (none) to 5 (very important), what role did these external levers play in the collaborative process implementation? *

	1	2	3
Stakeholder motivations (e.g. experience of climate impacts/risks, urgency)	○	○	○
Financial support (e.g. reward structure, long-term funding)	○	○	○
Intermediaries support (e.g. facilitators or experts' involvement)	○	○	○
Existing social capital (e.g. networks, long lasting relations)	○	○	○
Institutional support (e.g. government commitment, legal framework)	○	○	○
Knowledge availability (e.g. knowledge accessibility, usability, saliency)	○	○	○
Capacity to engage (e.g. incomes, education, awareness)	○	○	○

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15

On a scale from 1 (none) to 5 (very important), what role did these internal levers play in the collaborative process implementation? *

	1	2	3
Building an inclusive approach (e.g. representativeness, inclusiveness (gender, social groups))	○	○	○
Building an integrative approach (e.g. recognition of different values, contexts, world-views)	○	○	○
Co defining participants role (e.g. power balance, equity, shared responsibilities)	○	○	○
Relying on people (e.g. local champions, boundary organisation)	○	○	○
Building relevant process (e.g. flexibility, system thinking)	○	○	○
Building strong communication (e.g. dialogue space, transparency)	○	○	○

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16

On a scale from 1 (none) to 5 (very important), what role did these external barriers play in the collaborative process implementation? *

	1	2	3
Institutional barriers (e.g. lack or constraining legal framework, inadequate funding scheme)	○	○	○
Inadequate organisation (e.g. siloed organisation, unsuitable governance system)	○	○	○
Lack of engagement (e.g. overwhelmed actors, lack of time, cultural barriers)	○	○	○
Lack of recognition (e.g. of actors' knowledge and needs)	○	○	○
Lack of capabilities (e.g. socio-economic barriers, heavy bureaucracy)	○	○	○

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On a scale from 1 (none) to 5 (very important), what role did these internal barriers play in the collaborative process implementation? *

	1	2	3
Inadequate internal coordination (e.g. lack of experience, miscommunication, late involvement)	○	○	○
Power imbalance (e.g. gender issues, intra-group power, hidden power)	○	○	○
Lack of resource (e.g. process sustainability, human resource)	○	○	○
Conflicting interests (e.g. entrenched thinking, distinct motivations)	○	○	○
Dealing with complexities (e.g. uncertainties, sophisticated language and data)	○	○	○

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In the following questions, we would like to know if the main factors outlined above are more for specific steps of a collaborative adaptation process?

18

Among the different categories of factors, which would you consider to be the most important for stakeholder identification and/or engagement ?
*

Sélectionnez au plus 3 options.

- [ ] Expert/intermediaries support
- [ ] Stakeholder motivations
- [ ] Human/material resources
- [ ] Institutional support
- [ ] Capacity to engage
- [ ] Existing social capital
- [ ] Financial support
- [ ] Knowledge availability

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19

Among the different categories of factors, which would you consider to be the most important for vulnerability assessment and problem framing?
*

Sélectionnez au plus 3 options.

- [ ] Capacity to engage
- [ ] Existing social capital
- [ ] Human/material resources
- [ ] Stakeholder motivations
- [ ] Knowledge availability
- [ ] Financial support
- [ ] Institutional support
- [ ] Expert/intermediaries support

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20

Among the different categories of factors, which would you consider to be the most important for solutions design and selection?
*

Sélectionnez au plus 3 options.

- [ ] Capacity to engage
- [ ] Expert/intermediaries support
- [ ] Stakeholder motivations
- [ ] Financial support
- [ ] Human/material resources
- [ ] Knowledge availability
- [ ] Institutional support
- [ ] Existing social capital

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21

Among the different categories of factors, which would you consider to be the most important for solutions implementation?
*

Sélectionnez au plus 3 options.

- [ ] Expert/intermediaries support
- [ ] Knowledge availability
- [ ] Human/material resources
- [ ] Institutional support
- [ ] Stakeholder motivations
- [ ] Capacity to engage
- [ ] Financial support
- [ ] Existing social capital

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22

Among the different categories of factors, which would you consider to be the most important for solutions monitoring and evaluation? *

Sélectionnez au plus 3 options.

- [ ] Financial support
- [ ] Stakeholder motivations
- [ ] Institutional support
- [ ] Knowledge availability
- [ ] Expert/intermediaries support
- [ ] Existing social capital
- [ ] Capacity to engage
- [ ] Human/material resources

23

What are your motivations for engaging in such collaborative adaptation processes? *

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24

What are your concerns about engaging in such collaborative adaptation processes? *

- [ ] Resource constraints
- [ ] Lack of capacities
- [ ] Time constraints
- [ ] Complex decision-making
- [ ] Conflicting interests
- [ ] Autre

25

If you wish to elaborate on your answers or add an important element that you feel is missing, please use this space.

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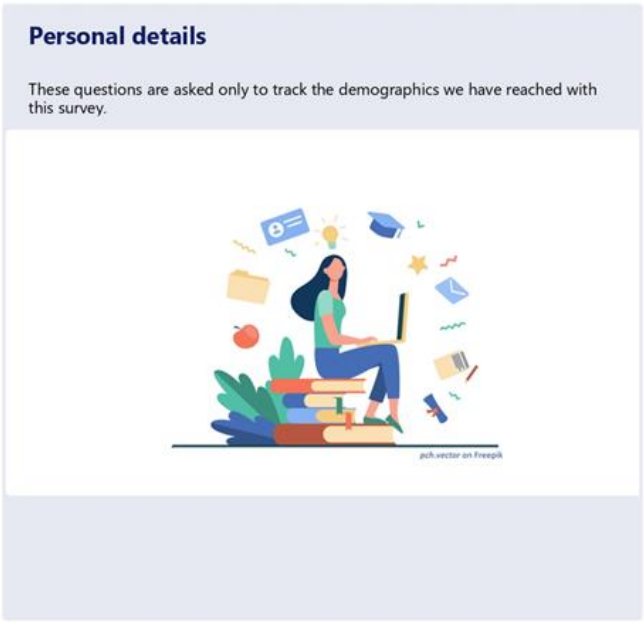

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26

What is your age group? *

- ◯ 18-25
- ◯ 26-35
- ◯ 36-45
- ◯ 46-55
- ◯ 56-65
- ◯ 66 and over
- ◯ I prefer not to answer

27

What is your gender identity? *

- ◯ Women
- ◯ Man
- ◯ Non-binary
- ◯ Prefer not to say
- ◯ Autre

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28

What's your highest academic degree (High school diploma, Bachelors Degree, Masters Degree, PhD Degree)?" *

29

What is your country of residence? *

30

Based on your professional activities, which of the following categories best describes the stakeholder group you belong to? *

- ○ Local communities
- ○ Academia and research
- ○ Governments and decision makers
- ○ Civil society representatives
- ○ Citizens
- ○ Investors/economic actors
- ○ Media
- ○ Autre

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THANK YOU & POSSIBLE WAYS FORWARD

- Thank you for your time and effort in completing this survey. Your answers are of great value to us and will contribute to a better understanding of the current context and to formulate recommendations to support this type of collaborative process for climate change adaptation in the future.

- **If you would like to be informed of the results of this survey, the outputs or events organised within the AGORA project, please enter your contact details and your preferences in a separate form:** https://forms.office.com/e/Q4KZ4WiJwb

- **The AGORA project is creating a Digital AGORA** - an online platform promoting citizen and stakeholder interaction. It will include a **map of citizen engagement initiatives on climate change adaptation. To add an initiative in our database, register it here**: https://www.surveymonkey.com/r/CEImap

You can also:
- Subscribe to AGORA's Newsletters: https://adaptationagora.eu/join-our-community/
- Consult AGORA website: https://adaptationagora.eu/
- Follow us on social media:

  - Twitter: https://twitter.com/AgoraAdaptation
  - Facebook: https://www.facebook.com/people/Adaptation-AGORA/100090701292038/
  - LinkedIn: https://www.linkedin.com/company/adaptation-agora/

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Annexe 4: Interview protocol

Background to the interview:

Despite the growing impact of climate change, the adaptation of human populations and activities is lagging. To increase the relevance, acceptability and effectiveness of adaptation initiatives (e.g. adaptation plans, behavioural changes, implementation of technical solutions, solutions based on nature, etc.), collaborative processes involving citizens and stakeholders for co-creating, -implementing and -developing these solutions are increasingly developed. It is in this context that we would like to ask you about your experience, knowledge and perspectives on policy-based support that are available or needed to support adaptation (or any other sector the interviewee is more familiar with) practitioners in implementing such processes, especially linked to citizen engagement.

The interview will be divided into three main parts:

- the first focuses on your position and experience in terms of policymaking;
- the second on current citizen engagement in adaptation processes in your municipality/or region;
- the last one on existing and future policy framework to support adaptation practitioners in citizen engagement.

A. Position and influence (5min)

1) In which institution are you working?
2) What is your role within the institution?
3) What is the scale of your action? (Local, regional, national, international)
4) Does your role involve participation in the policy-making process, encompassing any stage from visioning and designing to implementation and monitoring/evaluating? In general, what is your experience in policymaking, at any level?
5) Have you already been involved co-creation/participatory processes and citizen engagement? What role did you have in the process (organiser, participants…)?

B. Citizen engagement in adaptation processes (15/20min)

6) Can you provide us with examples of citizens actively participating in adaptation processes that you have been involved/know about in your municipality/region? (e.g. citizen juries, climate assemblies, participatory budgeting)? [See Q9 here for a fuller list]
7) How were citizens able to contribute to/influence the adaptation processes that you mentioned in the previous question? (e.g. setting the aims, sharing experiences, creating solutions, taking decisions, implementing interventions)
8) What was the purpose of engaging citizens in these adaptation processes?

8bis. Was it related to one of these broad outcomes?

- Making solutions relevant to the local area
- Promoting mutual learning
- Achieving just representation
- Fostering stronger collaboration

9) Was the process voluntary or mandatory?

C. Existing and future policy framework (30/40min)

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A prior systematic literature review reveals that with a supportive policy framework providing clear guidance, resources and incentives for collaboration, stakeholders and citizens are more likely to engage in co-production activities. Now, we would like to discuss existing policy framework and what progress should be made to incentivize decision-makers and practitioners to implement collaborative adaptation (or other sectors) processes involving citizens.

10) What type of policies or instruments did support citizen participation in adaptation processes (e.g. voluntary or binding mechanisms, nature of the participatory elements, local observatory of citizen participation)?
11) In existing policies, what resources are allocated to (or available for) adaptation practitioners for the implementation of a collaborative processes? (e.g. funding, human resources, legal framework, institutional support)
12) What policy mechanisms or instruments are still lacking or could be improved to develop a more supportive policy framework in the future? What is still needed?

12bis. Especially in terms of:

- Legal frameworks (e.g. binding processes)?
- Sustainable funding (e.g. incentives)?
- Allocation of trained human resources (e.g. boundary organisations, civil servant training)?
- Political/institutional support (e.g. political leadership)?
- Bonus: Shaping a more efficient institutions' organisation/functioning (e.g. breaking silos)?
- Bonus: Dealing with power imbalance (e.g. vulnerable people involvement)?

13) Are there lessons that can be learnt from other sectors/topics (e.g. mitigation, hazard regulation, digitalization...)?

Last questions:

14) Despite existing policy frameworks, a strong implementation gap remains. What can be done to make these policies applicable and encourage their implementation?
15) How can citizens support policymakers to improve the policy framework?

Thank you and Way forward

If you would like to be kept informed and follow the activities of the AGORA project, you can subscribe to the newsletter. If you want to be involved in future activities, such as peer-learning workshops linked to policy or governance (held in spring 2025), please specify it and we will keep your contacts to invite you to future events.

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