



RESILOC

Resilient Europe and Societies by Innovating Local Communities

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Tavistock Institute of Human Relations, UK

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Checked and approved by	NKUA, Vassilis Papataxiarhis	15/12/2022
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Author(s)	Joe Cullen Francis Clay Anna Sophie Hahne Thomas Spielhofer
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Abstract

This deliverable presents the work carried out through RESILOC Task 3.2: Definitions on new strategies for improving resilience. Its main objectives are to contribute to validating the relevance, comprehensiveness and usability of the RESILOC Resilience Indicators and matrix and to explore how these indicators and the matrix could be used to define and develop new strategies to improve community resilience. The deliverable presents the methodology used for Task 3.2, describes how the approach and methodology were implemented, presents the main results of the work and sets out the key conclusions and implications for RESILOC going forward

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VI. List of Acronyms

Acronym	Meaning
EU	European Union
GA	General Assembly
KOM	Kick Off Meeting
LRT	Local Resilience Team
MRT	Mid-Range Theory
RQ	Research Question
SD	Standard Deviation
UK	United Kingdom
WP	Work Package

The terminology used within this report is defined within the Base and Project Glossaries¹. The terms and phrases used within this document have the meanings described by the glossary unless explicitly described otherwise in the relevant text.

¹ <https://www.resilocproject.eu/publication/>



1 Executive Summary

This deliverable presents the work carried out through RESILOC Task 3.2: Definitions on new strategies for improving resilience. The first objective of Task 3.2 was to validate the relevance, comprehensiveness and usability of the RESILOC Resilience Indicators and its capacity to identify gaps and weaknesses in community resilience. Its second objective was to explore ways in which citizens could be supported to actively contribute to address these gaps and weaknesses, and to make strategic choices and decisions and put them into practice in order to improve community resilience in the future.

To achieve these objectives, Task 3.2 developed and applied a research approach combining three elements. First, a scoping and validation exercise was carried out. This aimed at setting the scene for the research, which included an initial focused literature review, together with feedback interviews with RESILOC end users to validate the RESILOC Resilience Indicators and Matrix, and also included ongoing monitoring and review of the results of RESILOC activities in WP4 and WP5 (community feedback and field trials). Second, case studies in three of the the four RESILOC field trial sites were implemented, combining documentation analysis; structured interviews and co-creation workshops, to understand in more depth the main factors that shape how new ways of improving community resilience could be designed, developed and implemented. Third, an online survey was carried out with 2,000 citizens in the UK and 405 in Italy to further explore and deepen understandings of the key factors that shape individual decision-making and adaptation in threat situations.

The results of the research on the one hand provided general support for the RESILOC Resilience Indicators and Matrix and their relevance, usability and effectiveness – with the proviso that the validation exercise covered only one of the dimensions in the Matrix – the ‘social’ dimension. It also highlighted some challenges that needed to be taken into account with regard to the practical application of the Matrix in community resilience self-assessment – in particular the potential lack of availability of data needed to assess resilience over the majority of the indicators provided, as well as potential problems in applying the indicators and proxies in different contexts – for example in a large urban community vis a vis a small rural community. The results also confirmed the need for additional systems, processes and tools to supplement the core RESILOC ‘self-assessment offer’ – in particular the need for a ‘social support system’ in which the core RESILOC platform and tools could operate in order to be most effective.

The case studies carried out in Task 3.2 provide a clearer picture of this social support system and the ‘add on’ functions required to support continuous development and monitoring of the resilience and adaptive capacity of the community. However, the case study results, supported by the results of the Citizen Survey, suggest that RESILOC has some way to go towards delivering new strategies for improving resilience and supporting communities to develop and implement strategies and action plans for improvement in the future. Although the evidence shows that the RESILOC self-assessment tool is on the whole rated positively by end-users, and hence provides a good baseline for the identification of resilience strengths and weaknesses, there are currently not enough functionalities in the RESILOC ‘system’ to enable analysts and decision-makers to evaluate the relative merits of strategic planning and operational choices and their associated pay-offs. Similarly, additional work needs to be done on gaps and weaknesses identification, representation and review. Information and knowledge sharing is poorly developed within the RESILOC system, with few mechanisms in place to support reaching a collective understanding of the opportunities for improving resilience that should be explored. Although, as noted below, the research highlighted some good examples of stakeholder engagement in the process of designing local resilience action plans,



knowledge and information sharing infrastructure needs to be further developed to enable a broad spread of stakeholders to be routinely involved in co-design and co-creation. Some significant progress has been made towards involving citizens in disaster governance – for example three of the four RESILOC Trials have developed a written Local Resilience Strategy, and two have currently been approved by the local citizens – but, overall, the evidence from Task 3.2 suggests that further attention paid to developing systems and spaces to engage citizens as active co-designers and implementers of strategies and action plans. Moreover, the results of the Citizens Survey reinforce the picture of a majority of citizens who feel disengaged from decision-making systems and structures.

Nevertheless, the research has identified foundations that can be built upon in the future beyond the official end of the project. These foundations include, for example, building on existing functionality within the RESILOC platform and toolbox that is already being used to represent visually a community's strengths and weaknesses, and to begin to review these strengths and weaknesses in light of future resilience improvement strategies, and capitalising on the important role LRTs are already playing as 'co-creators' of these strategies. The areas that need to be built on to improve these foundations are:

- Improved technical functionality in the platform and toolbox, for example providing 'plain English' explanations of the toolkit, its methodology and its functions and tools to compare different scenarios
- A more extensive programme of training for different target groups – including data analysts, planners, policy makers, LRTs and citizen representatives – to improve understandings of how RESILOC works and to develop their decision-making and strategic planning skills
- Systems, processes and tools to increase stakeholder involvement across the spectrum in all stages of the 'resilience improvement process' – from reviewing strengths, weaknesses and gaps to monitoring progress on strategy and action plan targets
- Innovative data collection tools to gather and analyse information to feed into strategy development and action planning – in particular 'lifeworld analysis' tools and the training to use them effectively
- Awareness-raising and 'engagement' campaigns to increase citizens' sense of self-efficacy, their sense of empowerment and decision-influencing capability and their willingness to buy into, and support, future actions aimed at improving community resilience, as well as 'cohesion-building' initiatives to increase the level and impact of community engagement in measures adopted to increase community resilience
- These campaigns and initiatives need to be targeted to reflect any community 'fragmentation' and to meet the profiles and needs of clusters and groups within the community – for example younger people, people with no previous experience of a disaster, people from lower income groups.

2 Introduction

2.1 About this Deliverable

This deliverable presents the work carried out through RESILOC Task 3.2: Definitions on new strategies for improving resilience. Task 3.2 forms part of a trilogy of tasks that make up work package 3 (WP3) of the project. As Figure 1 shows, WP3 marks RESILOC’s transition from its ‘studies phase’ – which aimed to increase understandings of how resilience works in societies and communities, through a comparative analysis of concepts, theories and practices around resilience – to its ‘methods’ phase, the main objective of which is to develop new strategies for improving community resilience, using the insights gained from the ‘studies’ phase. These new strategies then feed into the development of tools and solutions to improve community resilience through RESILOC’s ‘software’ phase, which are subsequently validated through field trials in the final phase of the project.

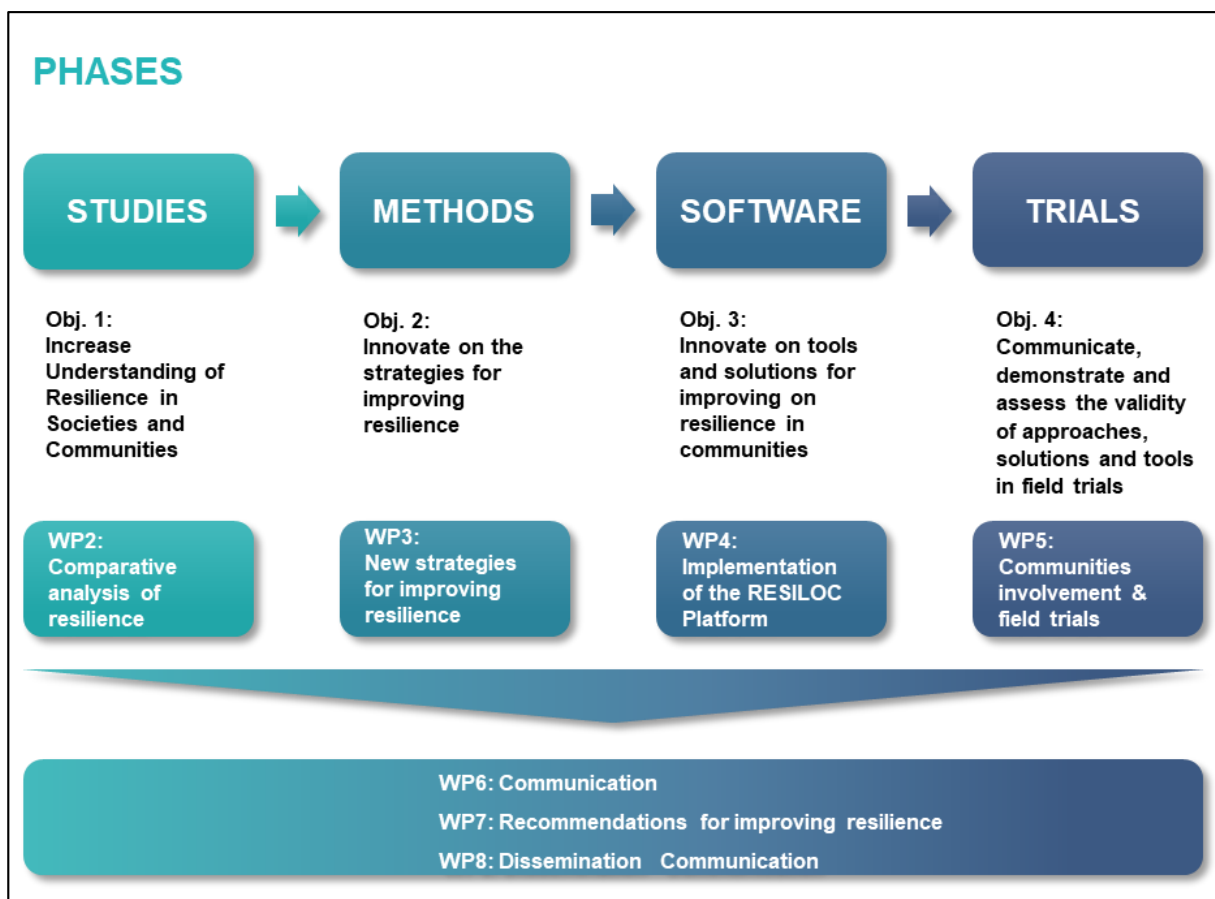


Figure 1: WP3 contribution to RESILOC objectives

Figure 2 shows the three tasks that combine to deliver work package 3 and the ‘methods’ phase of the project. As Figure 2 shows, WP3 aims to convert the results of the comparative analysis of approaches on community resilience into innovative strategies and tools aimed at improving resilience in communities.

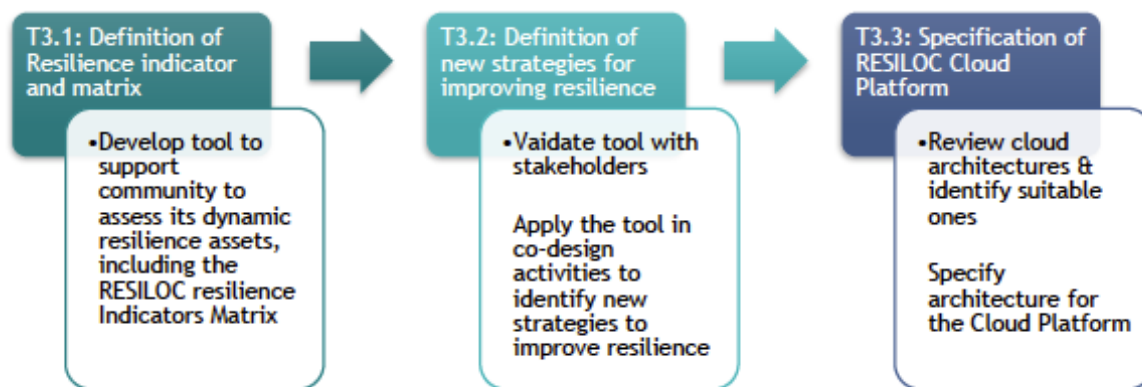


Figure 2: Task 3.2 positioning within WP3

Task 3.2 is situated as the middle pillar of the three tasks that comprise WP3. Through Task 3.1, RESILOC applied the results of the comparative research carried out in WP2 to develop a set of Resilience Indicators and a matrix to help communities self-assess the level and characteristics of resilience in their community. This self-assessment is intended to subsequently be used to identify gaps and weaknesses that could in turn feed into developing strategies and action plans to improve community resilience, thereby contributing to better disaster management in the future.

Task 3.2 has two main objectives. First, to contribute to validating the relevance, comprehensiveness and usability of the Resilience Indicators and matrix developed in Task 3.1. Second, to explore how these indicators and the matrix could be used to define and develop new strategies to improve community resilience, including helping communities prioritise future actions that could mitigate the gaps and weaknesses highlighted as a result of a community's self-assessment of its resilience level and characteristics. The outputs and outcomes of Task 3.2 then feed into Task 3.3, which provides a specification for the RESILOC Cloud Platform, which incorporates the validated indicators and matrix developed in Task 3.1.

This Deliverable – D3.2 – tells the story of Task 3.2, how it was designed and implemented, the key results it delivered and the conclusions and implications of the work carried out for the RESILOC project going forward. In the sub-sections below, we set out the background and context of the work and the challenges it addressed. Following this introductory section, the deliverable is structured as follows:

- Section 3 presents the approach and methodology used to deliver Task 3.2
- Section 4 describes how the approach and methodology were implemented
- Section 5 presents the main results of the work
- The concluding section – Section 6 – sets out the key conclusions and implications for RESILOC going forward.

2.2 Background and context

As noted above, Task 3.2 follows on from Task 3.1 – Definition of the Resilience Indicators and Matrix. In this context one of its objectives is to validate the relevance, comprehensiveness and usability of the tool developed in Task 3.1 – i.e., the RESILOC Resilience Indicators and Matrix. However, the core purpose of Task 3.2 is shaped by the overall objectives of RESILOC work package 3, which aim to ensure that the results of the research carried out in Task 3.1 – i.e., the production of the resilience indicators and matrix “will be validated by practitioners and local communities in (a) non-automated way and used for identifying how the resilience indicators can be used for defining new strategies for improving resilience, i.e., deriving a



priority on the possible actions to overcome shortcomings or weaknesses.”

In this context, Task 3.2 is positioned as a bridge between the two ‘high level’ RESILOC Objectives Objective 2 – Innovate on the strategies for improving resilience – and Objective 3 - Innovate on tools and solutions for improving on resilience in communities. Through Objective 2 the RESILOC Inventory – which is built on the resilience indicators and matrix – enables communities to not only map and assess the existing level of resilience of their community across a range of dimensions but also to “identify weaknesses, gaps and opportunities for improvement” so as to help communities “assess their resilience and the best approaches to improve it by means of a combination of social and technological solutions”. Objective 3 then works to address the gaps and weaknesses identified in Objective 2 by i) designing a process for “improving the human and societal factors of resilience”, focusing on supporting citizen communication and involvement, and ii) developing the RESILOC cloud-based platform to enrich the Inventory through knowledge and experience exchange.

Task 3.2 therefore marks a shift from an *analytical* exercise – mapping and assessing the existing level of resilience of a community across a range of dimensions – to a *prescriptive* and *prospective* exercise – identifying opportunities and strategies to reduce weaknesses and gaps in a community’s resilience so as to reduce the potential damage to that community as a result of disasters that may occur in the future.

Against this background the core purpose and objectives of Task 3.2 are:

- To add value to the RESILOC tools and system by identifying ways in which it could support communities in making strategic choices and decisions to address their resilience gaps and weaknesses
- To explore ways in which citizens could be supported to contribute not only to the process of identifying opportunities and strategies to reduce weaknesses and gaps in community resilience, but to actively shape the systems and processes put into place to improve community resilience in the future.

2.3 Challenges

Delivering the core purposes and objectives of Task 3.2 poses a number of challenges. These challenges have been highlighted in a range of research and academic papers, as briefly referred to below. A common theme referenced in these papers is the methodological and technical issues associated with assessing resilience – for example developing and applying standardised indicators of resilience that are comparable across different areas and contexts. For example, Bakkensen et. al. (2016) show that resilience and risk assessment metrics ‘are not all created equal’ and need to show their underlying objectives and structure in order to be useful to policy and decision-makers. Similarly, Anderson et. al. (2020) point out the diversity of resilience assessment approaches and methods available in the field – arguing that this reflects different underlying disciplines and domains, such as sociology, natural sciences and engineering. This in turn reflects the difficulty of developing a single, transferable assessment method and set of indicators applicable everywhere, because of the context-dependency of resilience itself. Another key challenge, they suggest, is the difficulty of reconciling ‘top down’ assessment approaches with the need to take a more participatory ‘bottom up’ approach that aims to both represent the diverse range of voices in the community as well as capture rich and system local knowledge.

In addition to this technical and methodological focus, a number of broader societal, political and policy challenges around disaster risk governance can be identified, including supporting collaboration and knowledge exchange between different stakeholders, including disaster policy and decision-makers, civil society and representatives of the community. A major challenge in this regard is how to engage the civilian population as a whole in resilience



assessment and resilience planning – in particular reflecting the diversity of different population sub-groups, including the most vulnerable of these sub-groups. These challenges also figure in the work of the Horizon 2020 ‘DRS01 Cluster’ – a group of H2020-funded projects working to build disaster-resilient societies in the EU. A particular focus in the collaboration between the four projects in the cluster is on this key challenge of empowering stakeholders². A recent paper on measuring social resilience (Copeland et. al., 2020) merits a specific mention in this regard because it makes an explicit connection between the technical challenges associated with community resilience assessment and these broader societal, political and policy issues. Four key challenges are highlighted in the paper as follows:

- Resolving the tension between ‘**persistence and transformation**’. This speaks to a need to make a bridge between the level and state of resilience in a community in the ‘here and now’ – as depicted by the results of a community resilience self-assessment using the RESILOC tool – and the transformations that will happen within and to that community, as a result of that self-assessment, or following a severe disruption in the future. This implies developing additional functionalities to the RESILOC tools that enable community decision-makers to not only identify what needs to be done for disaster prevention, mitigation and a return to a status quo post recovery – but also to identify the *transformative capacity* of the community going forward.
- Revealing and understanding the **normative nature of indicators used to assess community resilience**. The selection of particular indicators and proxies from the RESILOC matrix to assess the resilience of a community reflects the particular values of those who are doing the selecting. These values in turn will influence the choices made to improve the community’s resilience. For example, assessing the resilience of a community on the basis of the representation of vulnerable people in that community implies a judgement about the relative value of those people to that community.
- The **normalisation** issue. This refers to the inherent problem encountered in resilience assessment of ‘normalising’ indicators that are measured at different scales or may mean different things depending on the context in which they are applied. The same potential problem applies ‘post-assessment’ since decision-makers will need to assess the relative merits of strategies to improve resilience in their communities when these strategies can potentially be assessed at different scales and in different contexts.
- The **commensurability and aggregation** issue. This relates to the ‘normalisation’ issue in that decision-makers will need to make choices about the relative potential pay-offs associated with choosing a particular direction of action vis a vis another one.

Evidence from the RESILOC ‘Studies’ phase reinforces the position on challenges taken by the Copeland paper. This evidence also highlights four challenges that need to be taken into account in relation to delivering the core purpose and objectives of Task 3.2. These on the one hand resonate with the four challenges in the Copeland paper, but also add additional definition to those challenges. The challenges highlighted are:

- Understanding and working with behavioural adaptation
- Reflecting geography and culture
- Making sense of power and agency
- Embedding ‘mid range theories’ into strategic planning and decision-making.

² see for example <https://www.resilocproject.eu/resiloc-and-the-drs01-cluster-push-the-need-to-connect-citizens-communities-to-the-sendai-fa-during-the-efdr21/>

2.3.1 Behavioural adaptation

Taking decisions on which gaps and weaknesses identified through a community resilience self-assessment should be prioritised and, subsequently, developing strategies to mitigate these gaps and weaknesses, requires an informed understanding of how citizens are likely to respond to those decisions. As noted in the RESILOC ‘Studies’ phase there is a considerable body of research work on how ‘behavioural adaptation works’, some of which is contradictory and contested. However, a common strand in the research emphasises ‘proximal factors’ as key determinants of adaptive behaviour – factors shaped by context and local ‘lifeworld’ – rather than ‘distal factors’ – such as age and gender.

As a number of approaches, ranging from prospect theory (e.g., Lechowska, 2018), through protection motivation theory (e.g., De Boer et al, 2014), protective action decision model (e.g., Lindell and Perry, 2012), vested interest theory (e.g., Adame and Miller, 2016), to prevention theory (e.g., De Boer et al, 2014) and attachment theory (e.g., Shreve et al, 2014) argue, the key factors that shape individual decision-making and adaptation in threat situations focus on things like norms, values, self-efficacy and place attachment. This speaks to Copeland’s call for new types of methodologies for resilience assessment and strategy development that can handle issues around data aggregation and can take ‘distributive issues’ into account, i.e., how to reflect not only possible variations in resilience within sub-groups in a sub-territory of a community, but also individual variations within these sub-groups. In the RESILOC ‘Studies’ phase we developed a model to reflect understandings and evidence of what works in adaptive behaviour. This model is reprised in Figure 3.

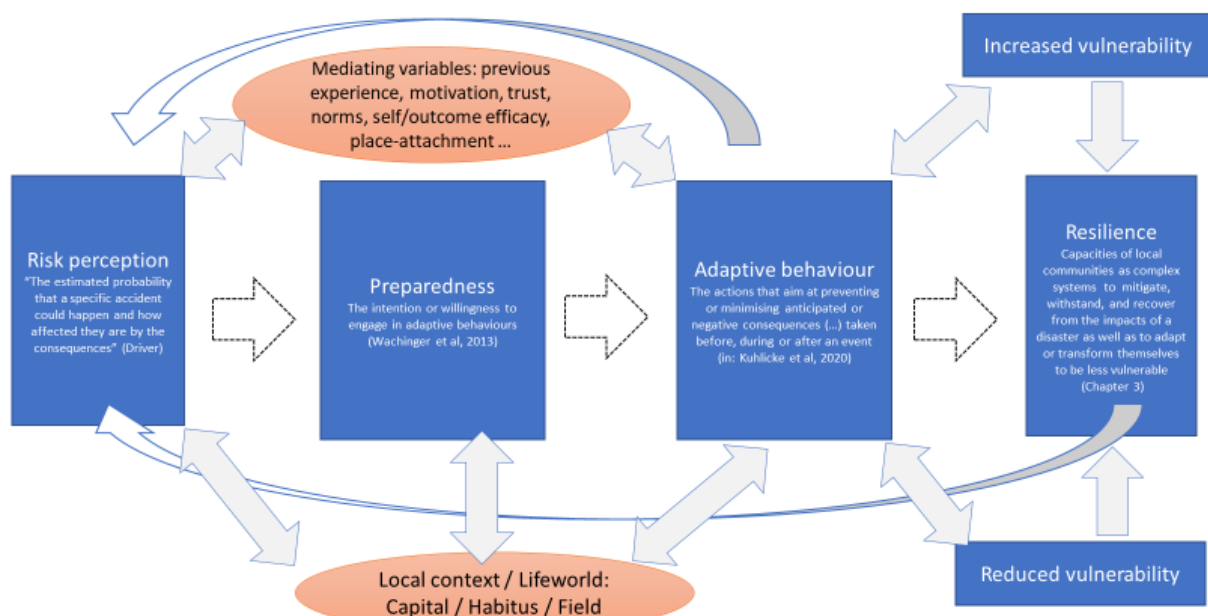


Figure 3: The RESILOC adaptive behaviour model

The model depicts the pathway at the individual level between risk perception and resilience. This pathway shows a link between risk perception and preparedness that is primarily informed by temporal recency and spatial proximity to disasters; trust in authorities and attachment to community and local knowledge. The strength of the connection between preparedness and adaptive behaviour is shaped by factors like self-efficacy, outcome efficacy and descriptive and injunctive norms, including for example whether adaptation will be approved or disapproved by others. The connection between preparedness/adaptive behaviour and



vulnerability is bi-directional, depending on context and circumstance, as adaptive behaviour can lead to either increased or reduced vulnerability.

These pathways are also strongly influenced by context – by the spatial, cultural and temporal ‘envelope’ that constitutes ‘community’. Within this envelope, an individual’s adaptive behaviour strategies will be determined by their habitus, their access to capital and the fields in which they operate. These strategies will also be shaped by the particular attributes of their lifeworld, which determines their social interactions, networks and importantly their relationship with ‘the system’. This relationship is shaped by the power structures that pertain in a given community. They influence the ‘adaptive capacities’ the community enjoys and, more importantly, dictate the extent to which these adaptive capacities make a difference in terms of whether they mitigate the effects of a hazard situation in reality. The experience of such mitigation in response to a hazard will then feed back into a new cycle of risk perception, preparedness, adaptive behaviour and resilience.

2.3.2 Geography and culture

As Copeland et. al. (2020) point out, communities are dynamic entities that are constantly evolving, as a result of factors like changes in geographical boundaries or through demographic and cultural changes driven through migration. This position re-iterates the stance taken by Cutter, which developed a ‘place-based’ model for understanding community resilience and emphasised the need to consider resilience assessment as a process rather than an ‘outcome’, one that needs to consider a community’s adaptability and evolution (Cutter et. al., 2008). On the one hand, this implies new kinds of resilience assessment methodologies and tools that capture a community’s adaptive capacity – particularly in response to a disruptive shock like a disaster – rather than focusing on static measures like a community’s demographic attributes. In turn, applying the results of a community resilience assessment to identifying resilience gaps and weaknesses that can subsequently be addressed through strategic planning implies the need for a deeper understanding of how communities work as complex ecological systems (comprising a complex set of nested, inter-subjective, and inter-level interactions that enact, enable, and enhance or lessen resilience at all levels – individual, group and community) and what the implications of these understandings are for developing new strategies for improving resilience.

Complexity, complex systems and socio-ecological systems theory (Hollings, 1973; Ostrom, 2008; Gunderson, 2010) highlight the role of diversity in contributing to strengthening resilience, the role of different forms of capital and the importance of cross-scale interactions. But there’s no consensus on how this could work in practice. On the one hand, diversity is seen in the resilience literature as beneficial for resilience, since it implies increased adaptability to disruptive forces. However, diversity can also be associated with fragmentation and the weakening of social bonds, which can be seen as having a negative impact on resilience (Newman and Dale, 2005).

Social capital theory (Giddens, 1999; Bourdieu, 1986) highlights the importance of context in particular social spaces and the complexity of the social environment within these spaces as the bedrock that needs to underpin community resilience. In this environment, adaptive behaviour in the context of a threat can be understood as the combination of habitus - an individual’s perceptions of risk and vulnerability and their disposition to take adaptive actions; capital - the combination and distribution of the assets available to the individual to take adaptive action and field - the social space in which the individual operates, and which will reflect the ‘rules’ that determine which adaptive strategies to take (Ober and Sakdapolrak, 2017; Kuhlicke et. al., 2020b). It follows that developing new strategies for improving resilience



need to reflect these three aspects of the relationship between geography and culture in a community.

Moreover, research highlights a lack of understanding about how geography and culture shape the social construction and utilisation of community resources. As social constructivist theory shows, resources – like health care – provide benefits for communities not simply in relation to their innate ‘properties’ but because they embody different cultural beliefs and purposes (Woolgar, 1991; Cullen and Cohen, 2006). Actor-network theory (Latour, 2005; Stone-Jovicich, 2015) argues that documenting, understanding and measuring the inter-relationships between all of the entities in a complex socio-ecological system – not just human interactions but human-natural-object interactions – is key to developing strategies to improve resilience. This speaks to Copeland et. al.’s challenge of ‘commensurability and aggregation’ since community resilience improvement strategies would need to capture and make sense of how different sub-elements of the community perceive strategic choices and the values that underpin them. For example, this could require understanding how community sub-groups perceive the relative pay-off between increasing the number of fire engines available in a community vis a vis directing resources to improving community risk awareness.

2.3.3 Power and agency

As reflected in the adaptive behaviour model described above, and highlighted in the ‘Studies’ phase of RESILOC, assessing community resilience and capacity requires an assessment of the governance and power structures that affect the community’s ‘agency’. This equally applies if we switch the focus from the analytical to the prescriptive – i.e., move from mapping resilience to the *consequences* of mapping. This entails documenting and evaluating the relationships between the ‘system’ – e.g., disaster management decision-making – and the ‘lifeworld’ – e.g., the extent to which different community groups have a say in decision-making. It entails critically reviewing the actual and potential role of community groups in co-designing and developing prescriptive and prospective strategies to address the resilience weaknesses and gaps identified by resilience assessment. It entails helping decision-makers to evaluate the trade-offs associated with taking a particular normative strategic position in response to the identification of resilience weaknesses and gaps. It means understanding and reflecting the ‘lived experience’ of users on the ground (Principe, 2015) in prescriptive and prospective activities and recognising the possibility that there can be many potential configurations of resilience ‘solutions’ to resilience gaps and weaknesses in any given community (Clayton and Davies, 2006).

As Copeland et. al. (2020) argue, the objective of measuring community resilience ‘*in order to improve*’ requires ‘greater transparency and responsibility toward those communities’. This implies an improved understanding of:

- How communities work as complex ‘knowledge ecosystems’ and how these ecosystems can best be tapped as a source for developing resilience improvement strategies, for example by using tools like lifeworld analysis; rapid appraisal and disaggregated statistical analysis
- How the process of developing resilience improvement strategies could maximise transparency, for example by using ‘design thinking tools’ – like structured co-creation workshops – to ensure the range of stakeholder constituencies in the community are represented in the development of resilience action plans based on assessment results
- The normative implications of prescriptive and prospective decision-making, for example how different gaps and weaknesses affect different sections of the



community and in what ways, and what are the trade offs involved in making particular prescriptive choices

- The transformative nature of prescriptive and prospective resilience strategies – how to capture, monitor and reflect on the evolution of community resilience as it develops through the implementation of prescriptive and prospective strategies aimed at reducing weaknesses and gaps, for example through using theory of change tools and longitudinal surveys as well as dynamic data collection tools (e.g., social media analysis, citizen consultation apps and sensor data) to monitor community developmental trajectories.

2.3.4 Mid-range theories (MRTs)

Copeland et. al.'s point of departure is the recognition that many of the factors that make a community more or less resilient are social factors, primarily because of the relationships formed between members of the community and their interaction with the resources that are socially available to them (a position which echoes to a large extent that of actor-network theory). If this proposition holds true, then one of the primary purposes of developing new strategies to improve resilience is to provide a bridging mechanism that connects adaptive behaviour modelling at the individual level to the use of community resources to support adaptive behaviour and to resultant resilience outcomes at the community level. 'Intentional' or purposive behaviours that are assumed to increase an individual's resilience need to be reflected in strategic decision-making in a post-assessment phase. So a strategy that aims to improve, say, civic engagement should reflect the behavioural attributes that are assumed to increase civic engagement – for example the level of participation in community activities and events – and why this is likely to contribute to improved resilience. It should also reflect the resources needed to bring about this desired behaviour and how they are used.

This complex undertaking implies that strategies developed to increase community resilience represent the 'mechanisms' through which behaviour leads to increased resilience, via access to and utilization of the resources that are socially available to community members. In the evaluation field, mechanisms are defined as 'underlying entities, processes, or structures which operate in particular contexts to generate outcomes of interest' (Astbury and Leeuw, 2010). They specify the 'resources' available to actors to change their behaviour, and the 'reasoning' – the processes through which resources are applied to change awareness, attitudes and behaviours – which in combination lead to behavioural changes. The way the mechanism works depends on the 'context' in which it operates. There is always an interaction between context and mechanism, and that interaction is what creates outcomes: Context + Mechanism = Outcome.

In resilience strategic planning, these mechanisms could equate to 'middle range theories' (MRTs). MRTs are theories that lie between day-to-day analyses of life on the ground and grand all-inclusive theories that try to explain all observed uniformities of behaviour, social organisation, and social change (Merton, 1967). They allow planners and decision-makers to generate evidence-based scenarios for community resilience improvement that account for a degree of regularity across time and place – for example, so as to reasonably calculate the likely level of resilience improvement within sub-groups of a community or between different communities (Pawson, 2000). Unveiling the middle range theories that shape the assumptions behind strategic decisions is therefore important in determining the extent to which these strategies are likely to have their desired effect.

This introduction has set out the context and background of the work carried out in Task 3.2, as well as the key challenges that work needs to address. To deliver the purposes and objectives of Task 3.2, within the context of the RESILOC project overall, and to meet those



challenges, requires a methodological approach that reflects the conceptual landscape and evidence base, represents the different voices and perspectives of stakeholders involved in the project and collects and triangulates information from these different perspectives in order to produce conclusions and recommendations that are supported by the evidence. This approach is set out in detail in the next section.

3 Methodology

3.1 Research questions

The methodological approach to Task 3.2 starts with defining the research questions the task addresses. To achieve its purposes and objectives, Task 3.2 needs to answer the following research questions (RQ):

- RQ1: How relevant, comprehensive and usable is the Resilience Indicators and matrix from the perspective of potential users?
- RQ2: What resilience weaknesses and gaps are currently being identified through testing the RESILOC resilience assessment tool and what are the implications of these for developing opportunities for resilience improvement?
- RQ3: How should these resilience gaps and weaknesses be represented to enable subsequent review and reflection on them?
- RQ4: What kinds of approaches, methodologies and tools – if any – are community decision-makers currently thinking of using to identify and develop opportunities for resilience improvement; what kinds of ‘values’ and perspectives do these reflect and to what extent do they involve stakeholders and the community?
- RQ5: How is information and knowledge about disasters and disaster management shared in the communities piloting the RESILOC tool and how could this contribute to developing opportunities and strategies for resilience improvement?
- RQ6: What systems, structures and processes need to be in place to optimise opportunities for resilience improvement?
- RQ7: What kinds of tools would most effectively facilitate developing opportunities for community resilience improvement?

3.2 Overall approach

To answer these research questions the overall methodological approach for Task 3.2 combines three methods and sets of activities, as shown in Figure 4.

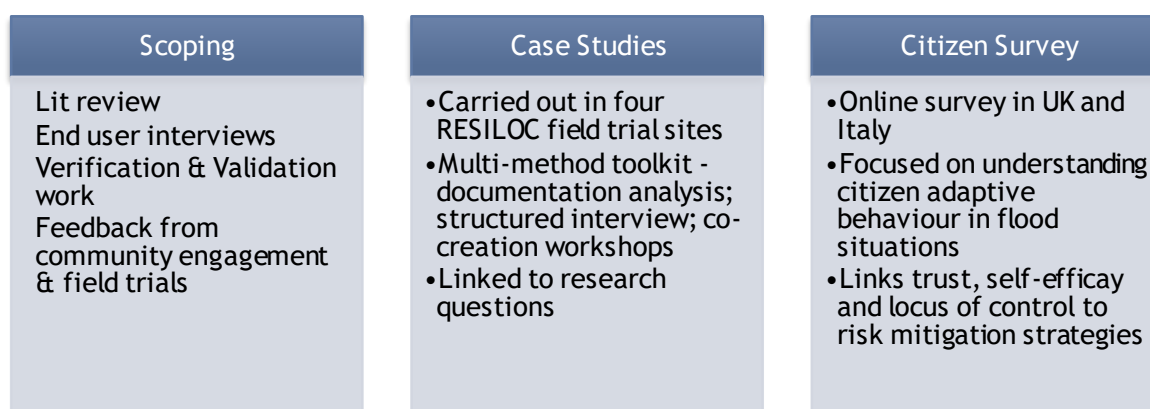


Figure 4: Task 3.2 Methodological approach

As Figure 4 shows the overall approach entails:

- Scoping – this aimed to deepen understandings of how the challenges presented in Section 2.3 above could be addressed through the work of Task 3.2 and how the case study and citizen survey elements of the Task 3.2 methodological approach should be designed and delivered to achieve the Task objectives. On the one hand, it represents



a discrete research task, involving a review of the literature together with field work involving interviews with RESILOC end-users from four of the five pilot communities. On the other it entails continuous monitoring of RESILOC activities in related project tasks – particularly verification and validation work carried out in WP4 – implementation of the RESILOC platform and - similar work carried out in WP5, including continuous feedback with communities and the execution of the RESILOC field trials.

This enables us to expand and deepen our understandings of the relevance, comprehensiveness and usability of the Resilience Indicators and matrix, 'sense check' the conceptual and implementation framework on which Task 3.2 is based, gain more insights into possible gaps and weaknesses in community resilience and feed into the design of the case studies and citizen survey.

- Case studies – this entailed gathering data from key stakeholders in the RESILOC pilot sites using a multi-method case study approach (Yin, 2014) to understand in more depth the main factors that shape how new ways of improving community resilience could be designed, developed and implemented.
- Citizen survey – this aimed to further explore and deepen understandings of the key factors that shape individual decision-making and adaptation in threat situations, with a focus on how factors like norms, values, self-efficacy and place attachment are linked to adaptive behaviour in threat situations, including propensity to take mitigation and prevention actions.

These three elements of the overall methodological approach are described in detail in the following sub-sections.

3.3 Scoping work

As noted above the main objectives of the scoping work were:

- To contribute to validating the relevance, comprehensiveness and usability of the Resilience Indicators and matrix developed in Task 3.1.
- To validate and improve the Task 3.2 conceptual framework and methodology.
- To feed into the design of the case studies and citizen survey elements of the Task 3.2 approach.
- To gain more insights into possible gaps and weaknesses that need to be addressed in developing new strategies for improving community resilience.

The scoping work is not entirely a preliminary research activity that precedes the case study and citizen survey elements of the Task 3.2 approach. Although an initial scoping exercise was implemented to help validate this overall approach and highlight any revisions necessary, the scoping work also entails continuous monitoring of related RESILOC activities that take place in other project work packages and which focus primarily on platform and tools verification and validation and user and community engagement. This monitoring supports learning and feedback into the ongoing research carried out in Task 3.2.

This scoping work entails the following research activities.



- Validation of the RESILOC Resilience Indicators and Matrix. This involved initial exploratory research combining, first, a review of the relevant literature on citizen engagement in resilience assessment and, secondly, collecting user feedback on one of the RESILOC indicator dimensions – the ‘social’ dimension – from key informants in four of the RESILOC field pilot sites.

Eleven key informants participated in structured co-creation workshops. The key informants reflected a range of RESILOC user groups, covering representatives of local authorities, representatives of civil protection services, and volunteers. Workshop participants were asked to rate the ‘social’ dimension and indicators from the perspective of relevance, usefulness and importance; contribution to assessing resilience; missing information; measures used to collect data on the indicators; the ‘mid range theories’ underpinning the indicators and recommendations for improvement. This methodology was subsequently used as part of the activities carried out in Task 3.1 to validate the full set of dimensions used in the RESILOC Resilience Indicators Matrix.

- Monitoring and learning from the verification work carried out as part of RESILOC Task 4.3. This involved a suite of verification activities carried out in three of the RESILOC trial communities: Community 1 (Italy), Community 2 (Italy), and Community 3 (Bulgaria). The purpose of the verification task T4.3 was to assess whether / how far the platform meets user needs from a technological perspective. Through a co-creation process with the communities leading the trials of the RESILOC platform, a multi-methodological verification process was developed, consisting of non-participant observations of platform use, focus groups, translation and distribution of an adapted Brooke’s 10-item system usability questionnaire (SUS) (Brooke, 1996) and RESILOC partner interviews.
- With the help of these methods, we sought to explore the user satisfaction, usability, efficiency, effectiveness and flexibility of the RESILOC platform. Although this work has a technical focus – capturing user interactions with the platform itself and focusing on platform and tool functionalities – it also provided relevant information for Task 3.2 by identifying which indicators and proxies in the RESILOC Resilience Indicators Matrix were working well and which ones were working less well. In addition, the verification activities allowed exploration of some of the broader issues of interest to Task 3.2 – in particular highlighting the extent to which the platform and tools require a ‘social support system’ in which to operate, and what this social support system might look like. Data from this work fed into the ‘case study’ element of the Task 3.2 methodological approach.
- Monitoring and learning from activities carried out in RESILOC work package 5. This incorporates work in Task 5.1 – communities’ involvement and continuous feedback – and Tasks 5.3 and 5.4 – Field trial execution and Validation. Relevant data from local community engagement and from the field trials is fed into case studies carried out in Task 3.2.

3.4 Case studies

The case studies entail gathering data from key stakeholders in the RESILOC pilot sites using a multi-method case study approach (Yin, 2014) to understand in more depth the main factors that shape how new ways of improving community resilience could be designed, developed and implemented. Each of the three pilot sites participating as case study’s for D3.2 is treated



as an indicative case environment in which the D3.2 research questions are explored by triangulating different sets of data drawn from different sources and perspectives to derive balanced and evidence-based conclusions. Three main types of research activities – and data – are used in the case studies:

- Documentation analysis
- Structured interviews
- Structured co-creation workshops.

Documentation analysis is the primary source of data for the case studies. Co-ordinating partners in each RESILOC field trial site manage the task of collecting and collating existing and available data from a wide range of sources to answer the key Task 3.2 research questions. Table 1 shows how the document types used in the documentation analysis link to the research questions. It should be noted that the case studies do not cover the first Task 3.2 research question - validation of the RESILOC Resilience Indicators and Matrix – was not covered in the case studies, since this was covered by the Task 3.2 ‘scoping’ activities.

Table 1: Research questions covered by Case study documentation analysis

RQ2: What resilience weaknesses and gaps are currently being identified through testing the RESILOC resilience assessment tool and what are the implications of these for developing opportunities for resilience improvement?	
Data collected	Sources
The resilience indicators and proxies for which data have been impossible or difficult to find when assessing community resilience using the RESILOC tool	Analysis of the data collected from field trials using the RESILOC resilience indicator matrix
The resilience indicators and proxies that score low in a community resilience assessment using the RESILOC tool	Analysis of the data collected from field trials using the RESILOC resilience indicator matrix
Aspects of community resilience that can be identified as weak and which need to be strengthened to improve the community's resilience for the future	Review of the above data analysis to rank the indicators and proxies from ‘weakest’ to ‘strongest’.
Gaps in a community resilience self-assessment, on which data collection needs to be improved in the future	Review of the above data analysis to make a list of the indicators and proxies for which there are data gaps and which represent ‘high priority’ areas for future data collection
RQ3: How should these resilience gaps and weaknesses be represented to enable subsequent review and reflection on them?	
Data collected	Sources
Specification for additional functionality in RESILOC tools to represent weaknesses and gaps, e.g., scores or graphics	1. Review of the data collected from field trials using the RESILOC resilience indicator matrix 2. Content analysis of available documentation – e.g., reports of community consultation workshops; validation exercises; field trials 3. Stakeholder interviews 4. Co-creation workshop
Specification for additional methods and tools to support review and reflection on weaknesses and gaps	As above
RQ4: What kinds of approaches, methodologies and tools – if any – are community decision-makers currently thinking of using to identify and develop opportunities for resilience improvement; what kinds of ‘values’ and perspectives do these reflect and to what extent do they involve stakeholders and the community?	
Data collected	Sources



A list of the key actors in the community who will be responsible for using the data from a community self-assessment to develop strategic plans for improving community resilience in the future	1.Re-visit any documents you may be able to get hold of – e.g., community profiles; consultation workshops – that provide information on who the key stakeholders in the community are
A list of the methods and tools these actors are likely to be using to develop these strategic plans. Examples could be statistical tools to analyse resilience self-assessment data; community consultation exercises	1.Documentation analysis – reports of consultation meetings; relevant good practices from literature reviews; previous surveys carried out for RESILOC 2.Stakeholder interviews 3.Co-creation workshop
An assessment and interpretation of the extent to which these methods and tools reflect community involvement and participation. Are they ‘top-down’? Do they involve ‘bottom-up’ and ‘grass roots’ participation? In what ways?	1.Documentation analysis – carry out a ‘content analysis’ on relevant documents to identify the key positions adopted 2.Stakeholder interviews 3.Co-creation workshop
RQ5: How is information and knowledge about disasters and disaster management shared in the communities piloting the RESILOC tool and how could this contribute to developing opportunities and strategies for	
Data collected	Sources
A map of the disaster information and communication flows within the community. This should specify the main sources of information in disaster situations – which messages, from whom and to whom	1. Analysis of the results derived from piloting the resilience assessment tool, particularly on the ‘governance’ (e.g., ‘accountability’ and ‘citizen participation’) and ‘social’ (e.g., community engagement’ and ‘social connectedness’) dimensions of the indicator matrix 2. Content analysis of relevant available documentation – e.g., previous work on community profile done in WP2 3. Stakeholder interview 4. Co-creation workshop
Identification of information and communication points and channels that could potentially act as ‘hubs’ and mechanisms for carrying out future consultation and participation activities with community stakeholders to develop strategies for resilience improvement	Review of the data derived from the information and communication mapping exercise.
RQ6: What systems, structures and processes need to be in place to optimise opportunities for resilience improvement?	
Data collected	Sources
A specification of the systems, structures and processes that would facilitate reviewing and reflecting on the resilience weaknesses and gaps identified through a community resilience assessment	1.Results of state-of-the-art review previously carried out in RESILOC – e.g., D2.1 2. Review of data from stakeholder and community consultation exercises 3.Feedback from pilot trials 4.Stakeholder interviews 5.Co-creation workshop
A specification of the systems, structures and processes that would facilitate developing an action plan to address weaknesses and gaps	As above
A specification of the systems, structures and processes that would facilitate monitoring the evolution and effectiveness of the action plan	As above
RQ7: What kinds of tools would most effectively facilitate developing opportunities for community resilience improvement?	



Data collected	Sources
List of stakeholders currently involved in disaster planning in the community and their roles	1. Review of data from stakeholder and community consultation exercises
Analysis of levels and nature of stakeholder involvement in disaster management and planning and areas for improvement	1.Gaps analysis of the stakeholder list – which stakeholders are missing 2.Analysis of the results derived from piloting the resilience assessment tool, particularly on the ‘governance’ (e.g., ‘accountability’ and ‘citizen participation’) and ‘social’ (e.g., community engagement’ and ‘social connectedness’) dimensions of the indicator matrix 3.Review of data from stakeholder and community consultation exercises 4.Stakeholder interviews 5.Co-creation workshop
Specification of systems and processes to enable different community groups to make an active contribution to developing strategies and action plans to improve community resilience for the future (e.g., political and policy-making systems; awareness-raising actions; citizen participation processes)	Review of results of stakeholder analysis
List of technical tools to facilitate developing strategies and action plans for community resilience improvement (e.g., adding functionalities to the RESILOC tools to enrich the ‘Inventory’)	1.Feedback from pilot trials 2.Stakeholder interviews 3.Co-creation workshop
List of definitional and operational tools to facilitate developing strategies and action plans for community resilience improvement (e.g., ways of capturing the everyday life of the community)	As above
List of data capture and analysis tools to facilitate developing strategies and action plans for community resilience improvement (e.g., indicators and data needed to monitor progress in a resilience action plan)	As above
List of data sensemaking tools to facilitate developing strategies and action plans for community resilience improvement (e.g., supporting community decision makers to interpret assessment results and sensitivity analysis)	As above

As Table 1 shows, the case study methodology allows for collection of supplementary primary data to provide information for research questions that cannot be fully answered with the available ‘secondary’ documentation sources. These supplementary data collection tools cover:

- Structured interview guideline - aimed at collecting data from a ‘key informant’ with a good knowledge of the community. The Guidelines is structured to follow the Task 3.2 research questions.
- Structured co-creation workshop guideline’ - intended for use working with a group and aims to encourage group participants to ‘co-create’ ideas for the research. The group should be representative of a spectrum of community stakeholders – including local resilience teams (LRTs), those responsible for collecting and analysing data through



RESILOC's community resilience assessment tool, strategists, planners and decision-makers responsible for developing resilience improvement actions and community representatives. The workshops focused on identifying the systems, structures and processes that need to be in place to optimise opportunities for resilience improvement, and identifying and co-designing the tools needed to facilitate new opportunities for improvement.

Analysis of the data collected uses content analysis (Stemler, 2001) and applies "a systematic, replicable technique for compressing many words of text into fewer content categories based on explicit rules of coding". This is done using a coding frame (Nuendorf, 2002) that specifies the main themes (i.e., research questions); breaks down the main theme into relevant 'constructs' that explain this theme and provides examples of each construct – e.g., quotations from interviews.

The case study data collection was summarised in a 'Summary Report Template' that essentially provides an evidence-based answer to each research question supported by evidence from the analysis.

3.5 Citizen Survey

The Citizen Survey supplemented the core work of Task 3.2 that was carried out through the Case Studies. Its main aim was to further explore and deepen understandings of the key factors that shape individual decision-making and adaptation in threat situations. In particular, it aimed to validate and refine the 'behavioural adaptation' model described above in Section 2.3 by exploring how factors like self-efficacy, locus of control and sense of belonging shape the strategies citizens may or may not take to mitigate and manage threat situations in their community. By linking these factors to variables like 'trust in authority' and 'ability to influence decisions' it also situated behavioural adaptation within the broader context of social capital, so making a link to the 'power and agency' dimension also discussed above in Section 2.3.

These questions the Survey sought to tease out have a direct bearing on the core purpose of Task 3.2 – which is to explore new strategies for improving community resilience. As argued above this purpose needs to be informed by more evidence on what needs to be in place to support citizens to contribute not only to the process of identifying opportunities and strategies to reduce weaknesses and gaps in community resilience, but to actively shape the systems and processes put into place to improve community resilience in the future. The survey was delivered online to a sample of citizens in the UK and Italy.



4 Presentation of Results

4.1 Scoping Work

Initial scoping work in Task 3.2 was carried out in the context of validating the relevance, comprehensiveness and usability of the Resilience Indicators and matrix developed in Task 3.1. It combined a focused review of the relevant literature on citizen engagement in resilience assessment with collecting user feedback on one of the RESILOC indicator dimensions – the ‘social’ dimension - and its associated indicators and suggested proxy measures. A structured interview was carried out with eleven key informants from the RESILOC communities in Gorizia, West Achaia, Tetovo and Kamnik. The key informants reflected a range of RESILOC user groups, covering representatives of local authorities, representatives of civil protection services, and volunteers. Workshop participants were asked to rate the ‘social’ dimension and indicators from the perspective of relevance, usefulness and importance; contribution to assessing resilience; missing information; measures used to collect data on the indicators; the MRTs underpinning the indicators and recommendations for improvement. Interviewees were also asked to give their views on the kinds of methods that would be effective in engaging the community in developing strategies to improve community resilience in the future.

Overall, most end-users found the indicators on the ‘social’ dimension relevant to assessing resilience in their community, although some were judged to be more relevant than others by different respondents. ‘Civic engagement’, ‘disaster preparedness’ and ‘risk awareness’ were rated as very important by most of the areas. ‘Social support’ was generally also seen as an important indicator of resilience. None of the areas rated ‘community profile’ as very important. This indicator was felt to be dissimilar to other indicators and is difficult to rate. The extent to which particular indicators were deemed to be more or less relevant could depend on the role of end-users – for example, whether they have more strategic or operational responsibility in the municipality.

The biggest issue highlighted was the lack of availability of data to assess most of the indicators. Respondents in all four areas stressed that they currently did not have access to data relevant to most of the suggested proxy measures for these indicators. Another concern was that some of the indicators may be more relevant for urban areas and less so for very rural communities such as West Achaia; this would suggest a need to adapt the indicators and measures to such areas.

The results of the literature review and user feedback on the social dimension of the RESILOC Resilience Indicators and Matrix suggest a need for the development of a set of integrated longitudinal and dynamic data collection tools that support continuous development and monitoring of the resilience and adaptive capacity of the community across four stages.

- Definitional and operationalisation tools (Stage 1) to support the adaptation of the generic RESILOC indicators framework to the local community context, as well as testing the adapted framework to ensure measurement quality.
- Data collection tools (Stage 2) to fill any gaps in data of relevance to the relevant indicators at the local level. This data could be collected via targeted community surveys, focus groups and expert workshops. It could be supported and supplemented with ‘dynamic’ data collected through the RESILOC App, social media data and remote sensor data. While the focus of such tools should, as far as possible, be on collecting statistically representative data, in some cases gaps in data may need to be filled by



more qualitative assessments by experts or groups of community representatives, e.g., through the involvement of LRTs.

- Sensemaking and decision support tools (Stage 3) to support community decision makers to interpret the initial results of the resilience assessment and develop a resilience Action Plan which sets relevant goals and targets to increase the community's resilience.
- Monitoring and adaptation tools (Stage 4) to support monitoring of progress against the resilience Action Plan. This could be done by setting appropriate targets and key performance indicators (KPIs), together with continuing updating of dynamic data collection – from the RESILOC App, social media data and remote sensor data – to create snapshots at regular intervals of the evolving status of resilience in the community. Continuous monitoring would enable an evidence-based assessment of progress on the resilience Action Plan, and the identification of additional gaps and weaknesses in community resilience. Continuous monitoring would need to be accompanied by measures to enable analysis, review and reflection of the results of the monitoring process, for example through regular stakeholder workshops and community consultation Forums.

4.2 Case Study Analysis

This section presents the analysis of the three case studies that were undertaken with the content analysis methodology outlined in Section 3.4 of this report. Analysis of the case studies seeks to provide insight into the factors shaping how community resilience could be designed, developed, and implemented.

The analysis is presented in two sections. The first section presents the findings produced by the coding process along six themes (and subsequent sub-themes where appropriate), drawn from the research questions outlined in Section 3.1 above. These are:

1. Resilience weaknesses and gaps identified through testing RESILOC assessment tool.
2. Means of representing resilience gaps and weaknesses to enable review and reflection.
3. Types of approaches, methodologies, and tools under consideration for use by community decision-makers to identify and develop opportunities for resilience improvement
4. Existing means of sharing information and knowledge sharing for disasters and disaster management for resilience improvement.
5. Types of tools would most effectively facilitate developing opportunities for community resilience improvement.

4.2.1 Thematic Trends from the Case Studies.

4.2.1.1 Resilience weaknesses and gaps identified through testing RESILOC assessment tool.

Across the case studies there are some weaknesses and gaps that were consistently identified as being significant regardless of scenario tested with the RESILOC tools. The most common resilience weaknesses and gaps identified in the case studies related to the relationships and channels of communication between citizens and local authorities. Proxies relating to citizen trust in local authorities were consistently flagged as gaps in need of addressing.

“The level of trust in communications and institutional information... is discreet, with a high percentage of people who believe in it only in part”

Further gaps were identified in terms of citizen engagement with the disaster risk management and planning processes. This included a lack of participation in training courses; not being aware of which authorities are responsible for managing disaster response; and a lack of awareness of the responsibilities of individuals in the case of an emergency. This lack of knowledge also manifested as a low percentage of people expecting to be affected by a given disaster scenario, regardless of the level of risk that a given scenario might occur in the community.

Other consistent weaknesses and gaps were consistent by their nature but were divergent owing to their specificity to a given disaster scenario. Citizen access to resources in different scenarios was frequently found to be lacking. In the case of wildfire, for example, one example given referred to the percentage of people with access to insurance being a weakness. In the case of an earthquake, however, citizens lacked access to stockpiles stores of clean drinking water. Both represent a lack of access to the resources, whether financial or material, required in an emergency, but manifest in different shortfalls. The case study data does not state the causes of these shortfalls.

Significantly, testing the RESILOC tool also revealed gaps in data collection pertinent to disaster risk management and planning in communities. The nature of these absences varied but were consistently found to be widespread. In some cases, basic critical topographical and meteorological data was found to not be collected by local authorities, ranging from the distance from the coast to the city centre, to the annual precipitation in the locality. In others, while critical data was being collected, it was not being collected at the level of the local municipality or was only accessible at considerable expense (financial/time expended). This was seen to undermine the effectiveness of existing disaster risk management efforts.

“There is a civil protection plan that is updated periodically, but many data related to the city's resources are not recorded and cannot be found”

The gaps in resilience data were caused by the absence of its regular collection by authorities or other bodies; the decentralised nature of its collection (and hence inaccessibility without considerable time and afforded to liaise with multiple entities to find and access it); or the financial cost incurred by accessing it. This had negative implications for the resilience planning efforts undertaken in the RESILOC trials. In the case studies, challenges in data collection have been present to the extent that it has required an additional burden to the community of data collection at best and has prevented the inclusion of proxies and indicators in some scenarios at worst.

“Examples for data that was not collected in the environmental dimension are number of days with severe wind (above 20 m/s); Mean of daily mean summer temperature (June, July, August); Summer precipitation (June, July, August).”



It is not possible to infer from the data drawn for this case study to assess a generalisable pattern as to what proxies are likely to present difficulty in data collection. At a minimum, it can be said that this issue transcended three communities with very different profiles, ranging from a small landlocked village to a large coastal metropolitan area.

4.2.1.2 Representing resilience gaps and weaknesses to enable review and reflection

The suggestions for representing resilience gaps and weaknesses to enable review and reflection presented in the case studies align with the usability challenges that were identified in Deliverable 4.2. The most consistent suggestions reflect the high level of expertise required to use the tool effectively, proposing additional explanation of key concepts in the methodology and the tool itself so that it can be understood by non-specialist community members. Gaps and weaknesses can not be represented nor reflected on if not understood.

“there is a need for matrix transparency – where do the values of the indicators come from, how they are formed? This needs to be explained in layman terms in order to be understandable for the stakeholders that would eventually become product owners in the community.”

“With regard to proxies... the purpose is not always clear and the lack of adequate bibliographic support has made it difficult to identify the focus of the question”

Other suggestions are more technical in nature, proposing that the tools could be improved by making it easier to compare changes to inputs and the subsequent outcomes, both within a given scenario and in comparison to others.

“It would be good to have a place, where those working with the RESILOC platform can see what the difference / Delta (in numeric terms) for indicators in alternative scenarios is. For example, if one proxy value or indicator attribute (for example relevance) is changed, would the indicator change significantly (including in terms of colour)?“

It was also suggested that the graphical representation presented by the tool is helpful as a starting point for reflection, but the interactions between different stakeholders is more effective at strengthening understanding of the context for decision makers:

“The graphic representation provided by the RESILOC Platform certainly represents a good starting point. But the interaction among different stakeholders (e.g., CSOs, citizens, municipality staff and civil protection representatives) proves more efficient as it offers the opportunity to strengthen the context/community knowledge available to the planner.”

4.2.1.3 Types of approaches, methodologies, and tools under consideration for use by community decision-makers to identify and develop opportunities for resilience improvement

The data suggests a mixed picture as to what methodologies and tools are under consideration to identify and develop opportunities for resilience. As a baseline, the approach adopted by RESILOC was seen to be fundamentally different and improved upon from existing approaches.

“I think that [the RESILOC tool and methodology] can - first of all – stimulate a reflection on the current state of things”

In one case study, the methodology and tools under consideration for use are for the most part based on RESILOC, with some adjustments made based on the experience of the trials.



“The methods and tools likely to be [used] to develop strategic plans include the RESILOC platform aided by the process established during Stage 4 of the (pilot) trial, i.e., producing a preliminary local resilience strategy that is presented to the wider community, amended or confirmed by to have in the end a local resilience strategy.

The methodology for creation of the preliminary strategy is “top-down”; the drafting of the strategy moves in a co-creator mode; the community presentation and validation (cross check D-day 1 and voting D-day 2) are bottom-up.”

Where this approach was being considered for adoption, two motivating factors are present. First, the trial was considered to have been successful, and the approach of bringing together a holistic range of key actors from the community to lead the process, and the subsequent co-creation and bottom-up validation of the strategic plans having facilitated a broader and more comprehensive understanding of the community and its needs, resulting in a widely accepted and supported strategy. That said, it cannot be conclusively inferred from the data whether adoption of the approach is being considered based on outcomes or in support of given values.

Second, as noted in the preceding findings on the absence of a holistic and continuous efforts to develop opportunities for improving resilience, the community had become familiar with the methodology and hence adopting it requires minimal further training or learning. As such, adopting the methodology itself fills a significant weakness in resilience planning.

In other communities, from the case study data, it is not clear what approaches and methodologies are being considered for adoption, or whether existing approaches to developing opportunities for resilience planning will continue unchanged. Existing approaches see specialist experts or local governmental bodies regularly reviewing and producing disaster plans, though the precise methodologies for the creation of said plans are not specified within the data, in marked contrast to the RESILOC tools.

It can be noted from the data that the approach to resilience planning is sometimes codified in legislative or defined in administrative statutes, and as such consideration of alternative approaches must adhere to requirements laid out therein. For example, in one community, the level of citizen involvement with disaster management and planning processes is codified in law. It is unclear from the case study data whether this explains the variance in new approaches for resilience planning under consideration.

4.2.2 Existing means of sharing information and knowledge for disasters and disaster management for resilience improvement.

Insufficient data was collected to conclusively determine the existing means of sharing information and knowledge for disasters and disaster management. The data that was collected referred to communication plans drawn up as part of national and regional disaster response procedures. The approach in the case study communities is centralised, with communications being coordinated and disseminated from a central governmental body specifically tasked with this role. Means of communications are emergency radio frequencies, text messages, and emergency hotlines that can be reached by citizens.

It was suggested that the difficulty in accessing data on these communication channels is a reflection of the ‘static’ nature of the RESILOC tools. Mapping communication flows would involve intensive, ‘live’ data collection to understand how information is shared beyond the documentation detailing the formal mechanisms stemming from official disaster management bodies. This is a notable gap, as some indicators and proxies within the RESILOC tool refer to the capacity of communities to effectively communicate information and knowledge in disaster scenarios. It is a further reflection of the difficulty in collecting certain key pieces of data that



was reported as a challenge when by communities when trialling the RESILOC tool. This represents a significant gap in understanding how best to identify and operationalise opportunities to develop resilience strategies.

4.2.2.1 What systems, structures and processes need to be in place to optimise opportunities for resilience improvement?

The case study data largely endorsed the LRT, or a system similar to this, as an appropriate structure to optimise opportunities for resilience improvement. This was because it brought together a wide variety of stakeholders with an intimate first-hand knowledge of the community, who are well positioned to use the RESILOC tool to effectively analyse data and from that co-produce a resilience plan with the wider community.

“This whole research question (with its sub-questions) is answered through the involvement of the LRT. The LRT is tasked with making the assessments. It collects the data, then proceeds to make the assessment with the help of the RESILOC platform. The assessment provides a visualization of gaps and weaknesses that are in turn analysed by the LRT to come up with the draft local resilience strategy (i.e., and action plan to address weaknesses and gaps).”

It was noted, however, that for the LRT to meet this need, it would need to be supported by adequate resources, whether financial or political, in order to maintain the database and RESILOC tools. Likewise, adequate training is necessary for communities to use the RESILOC methodology. In some circumstances it was suggested that this may not be feasible:

“the application of RESILOC “architecture and solutions” might represent a burden to communities with non-optimal economies of scale on these matters.”

The above point is supported by a criticism of the LRT flagged in another case study, namely that it is dependent on being able to identify and have on board appropriate individuals who can undertake the task effectively.

“It is difficult to track down useful people to carry out the research and we often find ourselves “bounced” from one office to another without getting results. Discussion with competent figures revealed a general resignation with respect to the current state of the art.”

Further, one recommendation noted that the effective structure would require widespread participation from the community, alongside more robust data collection from authorities as a prerequisite to the inputs required of the tool. There are some signs of this happening. The Trial and related Validation activities allowed for the identification of Strategic Objectives for local resilience across the trials. In this context, at least three out of four Trials have developed a written Local Resilience Strategy, including two having been presented and approved by the local citizens, by means of Citizens Jury exercises.

4.2.2.2 Types of tools would most effectively facilitate developing opportunities for community resilience improvement.

Suggestions for tools were provided in the following sub-categories:

Stakeholder engagement

It was suggested that municipality and emergency service stakeholders – the police, fire safety, medical services and so forth – would need to be introduced alongside the wider community as a whole. However, it was noted that stakeholder engagement in disaster management



planning in one case is codified in law, which requires competencies from people that are not found in that particular community.

Systems and processes

It was suggested that, based on the experience of the trials, it is essential that adequate training is provided for any tool that is put in place. These need to be both specialised for the LRT and for the wider public. Further, a broad mix of community groups need to be involved ranging from political and policy-making representatives, awareness raising actors (practitioners and academics), and governmental services alongside citizens.

Technical tools and Data Collection Tools

The survey functionality of the RESILOC tool was highly praised across the case studies. A further reference was made to the sensor functionality, which was seen as having the potential to monitor how well followed emergency plans are.

“I find extremely useful some of the tools provided by the project namely: the questionnaire tool, which is being used at the moment to trace information, as far as possible and the use of sensors that can surely shape up as a valuable tool in the long run to understand how much and if the practices suggested by the civil protection plans are known and internalized adequately.”

In support of the suggestion that training was essential, it was also suggested that a tool that would allow “learning-by-doing” (such as a training platform or training program) would be beneficial.

Definitional and Operationalizable Tools

The suggestions for operationalizable tools were in support of training and usability of the tool – a manual for using the tool, and educational workshops for the community to offer education on resilience situations in everyday life.

Sensemaking and Action Support Tools

Several approaches were suggested for sensemaking tools to support community decision makers on interpreting results. These included an in-app panel, panel discussions, and the Delphi method. The data did not elaborate as to the nature of these suggestions, though indicated that they emerged from observations during the trial process.

4.2.3 Synthesis and Analytical Conclusions

Having synthesised the data and presented it along thematic lines, this section draws across the themes to make analytical inferences and conclusions as to what factors shape how community resilience could be designed, developed, and implemented. The synthesis here follows from the content analysis, interpreting the thematic trends drawn from the coding process and inferring links across the themes.

There are several inhibiting factors emergent from the data that shape how community resilience is presently approached. At the governmental level (whether municipal or regional), the case studies illustrate that there is an absence of data available to support resilience planning across geographical and emergency scenario contexts. It can be inferred that this has significant implications for developing opportunities for resilience improvements. Lacking data (whether owing to it not being collected, decentralised, or difficult to access) meant that, when trialling the RESILOC tool, some proxies and indicators could not be included in analysis. This does not necessarily mean that the ‘right’ data is not collected, rather it indicates a divergence in understandings between the relevant authorities and communities as to what information is important for resilience planning.



The case studies further indicate that there is a lack of trust between communities and local authorities and a general disengagement with resilience issues. In the RESILOC trials, these were consistently flagged as issues that undermined community resilience. Further, the experience of the trials has broadly led to the conclusion amongst those that participated that community involvement, engagement, and indeed ownership of the process is fundamental to effective resilience planning. Yet, community members cannot simply be ‘dropped’ in to the community planning process without guidance, oversight, and training; there is a need for internal knowledge of the process, and for continuous engagement in efforts to educate the wider community on resilience matters.

In line with findings from Deliverable 4.2, usability issues were raised regarding representing these resilience gaps – technical suggestions were made specifically referencing the RESILOC tool, but likewise it was suggested that the most efficient elements of the process were the interactions between stakeholders participating in the LRT. This aligns with the support in the case studies for the LRT as the basis for the structures required for community resilience planning, and the further suggestion that a broad section of the community must be involved to ensure that opportunities for community resilience development can be pursued.

While it is unclear as to whether some communities intend to continue with the status-quo of resilience planning, where the RESILOC trials have had an impact it is telling that the modifications to the process are intended to facilitate a mixture of top-down, co-creation, and ‘bottom-up’ community engagement with the process. It can be inferred from this that the relevant authorities value the community engagement that was trialled via RESILOC – it is, however, unclear to what extent the shape of this potential approach is shaped in part by legislative boundaries as opposed to methodological or value-driven assessment of the approach.

The LRT is seen by some participating communities as a highly effective structure for community resilience planning, even where it is not clear whether the approach will be adopted in the community moving forwards. In all cases, the community involvement and co-creation elements of the process were flagged as being the most impactful element. The technical tools facilitated analysis, but the LRT brought together a wide array of community members and as such was able to capture a nuanced picture of the community informed by local people and their needs.

From this discussion, key factors can be identified that shape community resilience planning:

- The resources and practices of local authorities to engage with community resilience planning, which informs the nature of data that is accessible to resilience planners to make informed decisions.
- The level of engagement from community members with resilience planning matters; their trust of local authorities to engage in processes where available; and the dispersion of local knowledge and expertise amongst the community. Where people are disengaged, relevant authorities cannot ensure proper communication of plans, nor are they likely to be able to effectively assess community needs.
- The presence of systems that can bring together a breadth of local knowledge, perspectives, and expertise into the resilience planning process. The LRT is an example of such a system.
- Appropriate tools being available to facilitate analysis. In the context of RESILOC, for example, tools are both technical (the inventory/platform), but also social and structural. The efforts to train LRT members in the process, the workshops undertaken during the trials, and the co-creation processes included throughout are examples of such tools. The tools available must also be supported by appropriate training for those using them.



4.3 Adaptive Behaviour Survey

This section summarises the findings and implications of the survey on adaptive behaviour and resilience conducted in the area of Catania (Sicily, Italy) and the UK during October 2022.

The survey was carried out to further explore and elaborate the findings in Deliverable 2.1 (Analysis on Risk Perception), with a greater focus on adaptive behaviour. The Citizen Survey supplements the case study analysis presented in this Deliverable by exploring and deepening understandings of the key factors that shape individual decision-making and adaptation in threat situations.

Of relevance to D3.2, its objectives were to:³

- 1) Test some of the assumptions made in the Community-based adaptive behaviour and resilience model which was developed as part of Deliverable D2.1 Adjustments to the model may be made should the findings support this.
- 2) Provide local data on the level of risk perception and preparedness in the trial area of Catania.

In doing so, it aimed to validate and refine the 'behavioural adaptation' model described in Section 2.3 of this Deliverable by exploring how factors like self-efficacy, locus of control and sense of belonging shape the strategies citizens may or may not take to mitigate and manage threat situations in their community. By linking these factors to variables like 'trust in authority' and 'ability to influence decisions' it also situated behavioural adaptation within the broader context of social capital, so making a link to the 'power and agency' dimension also discussed in Section 2.3 of this Deliverable.

Figure 5 presents the original adaptive behaviour model that was produced for Deliverable 2.1, from which the survey has sought to test underlying assumptions:

³ A third core objective of the survey was to improve the measurement of key constructs from the previous survey conducted in RESILOC, prioritising finding brief and basic questions that are measurable in different contexts (e.g., across countries) – and could be used to determine values of indicators or proxies for the RESILOC social dimension. The main findings relating to this aim are reported separately in Deliverable 8.9.

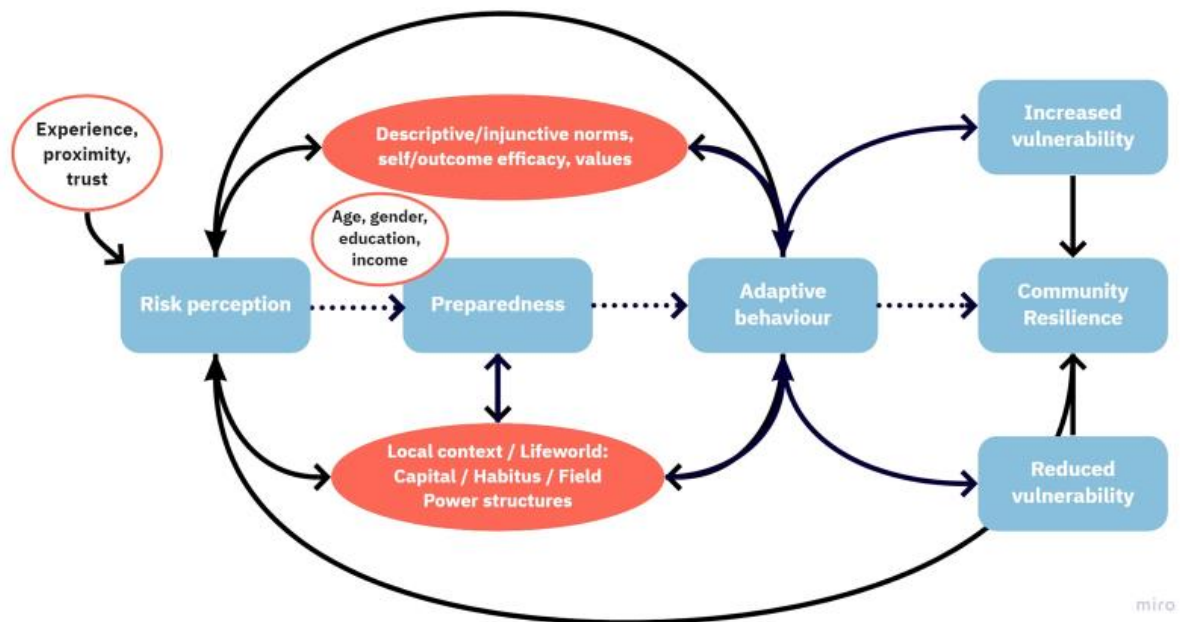


Figure 5: The Community-based adaptive behaviour and resilience model

Specifically, the survey sought to test the following hypotheses describing relationships between the different constructs in the adaptive behaviour model, including:

Hypothesis 1: Self-efficacy is a stronger predictor of adaptive behaviour than demographics.

Hypothesis 2: Higher preparedness leads to higher levels of adaptive behaviour.

Hypothesis 3: Intervening variables such as self-efficacy influence the connection between preparedness and adaptive behaviour.

Hypothesis 4: Risk perception is influenced by disaster experience, temporal and spatial proximity, and trust in authorities.

Hypothesis 5: Individual risk perception and adaptive behaviour influence community resilience.

Hypothesis 6: Local context/Lifeworld influences risk perception, preparedness and adaptive behaviour and vice-versa

Hypotheses that were tested are represented in



Figure 6 below with each colour linked to one hypothesis listed above.

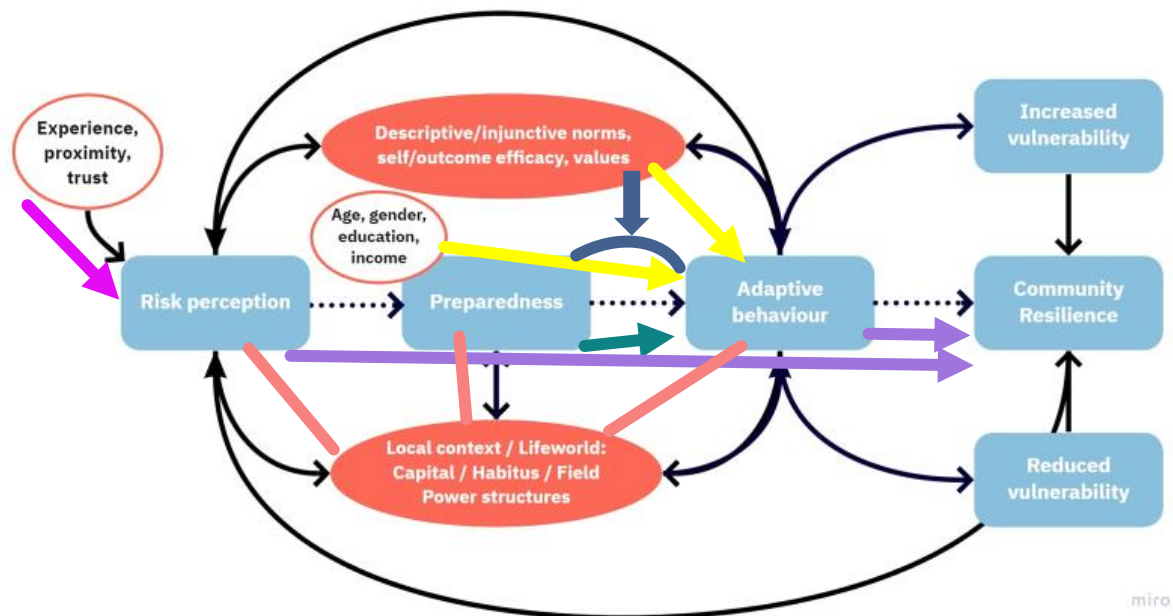


Figure 6: Community-based adaptive behaviour and resilience model: Hypotheses to be tested

4.3.1 Survey Design and Implementation

For the design of the survey, previous surveys that measured at least one of the constructs we intended to use were examined. Likewise, the survey design was informed in part by questions that were designed for the RESILOC questionnaire on risk perception conducted in 2019/2020.

An initial questionnaire drawing on these inputs was compiled and presented as part of the European Conference on Risk Perception and Behaviour (ENCORE 2022) in Berlin in June 2022. As part of Conference, a workshop was carried out in which researchers external to the RESILOC project were invited to comment on the survey and provide suggestions. Input from this workshop informed revisions to the survey. Following these revisions, a pilot of the survey was carried out with approximately 30 individuals participating. The pilot provided feedback for further refinement from which the final version of the survey was created.

The survey was distributed via two commercial online survey providers in September 2022. In the end, the following constructs and questions were included in the survey:

- Demographics (gender, age, employment, social class and region)
- Experience of floods
- Proximity to floods
- Risk perception
- Trust in government protection and local authority
- Community cohesion
- Agency
- Community competence
- Adaptive behaviour
- Preparedness
- Resilience

Most of these constructs included link specifically to floods, while others, such as 'resilience', are more general in nature. The full survey, together with more technical evidence of the



statistical properties of the main constructs used as part of the analysis – are reported in more detail in Deliverable 8.9.

4.3.2 Results

The following section presents findings for both the UK and Catania. Both surveys were conducted via national research agencies with online survey panels. The UK survey sample intended to be a nationally representative survey sample by gender and age, while the Catania survey sample was designed to be representative of the citizens of the Catania region. As outlined in Section 4.3, the main purpose of the UK sample was to test some of the assumptions of the Community-based adaptive behaviour and resilience model while the Catania sample further aimed to provide some context detail as Catania was a field test area of the project. Overall, 2000 UK citizens completed the survey between the 4th and 8th October 2022 and 405 respondents in Catania completed the survey between the 28th September and 4th October 2022.

4.3.2.1 Sample description

In the UK, the gender distribution was approximately even with 1024 women (51.2%) and 969 men (48.4%). As in the UK, the gender distribution in Catania was approximately even with 208 women (51.4%) and 197 men (48.6%). About 10% of the UK survey sample was under 25 and 20% over 64. The majority of the sample was between 25 and 44 years (31.7%) and between 45 and 64 (34.1%). In Catania, about 14% of the survey sample was under 25, 42.2% were between 25 and 44 years and 44% between 45 and 64.

Regarding employment status, in the UK nearly half of the sample was working full-time (47.6%) and 17.5% were working part-time. This proportion was considerably lower in Catania, about 2 in 5 were working full-time (39.5%) and 20.2% were working part-time. One-fifth were unemployed, 2% retired, 9.9% full-time student and also 8.4% were not working otherwise. In the UK sample, 4.9% unemployed, one-fifth (19.8%) was retired, 2.5% full-time student and also 7.9% were not working otherwise. Of the UK citizens working the most popular sectors were: Healthcare (12.3%), Education (11.6%), IT / Computing (9%), and Wholesale, retail and franchising (8.5%). Two-thirds of the UK respondents (66.4%) were classified as social grade ABC1 and one-third as social grade C2DE.⁴ In Catania, there was a smaller proportion of respondents being classified as social grade ABC1 than in the UK (i.e., 54.6%) and therefore, a larger proportion as social grade C2DE (i.e., 45.4%).

In the UK, respondents were located across the twelve regions: East Midlands (7.9%), East of England (10.9%), London (14.1%), North East (4.2%), North West (10.3%), Northern Ireland (2.7%), Scotland (6.8%), South East (12.9%), South West (9.6%), Wales (4.9%), West Midlands (8.2%), and Yorkshire and Humberside (7.8%). The Italian survey was only carried out in Catania, Sicily. Of the 405 respondents living in the metropolitan city of Catania, 147 (36.3%) lived in the *commune* of Catania, and the other 258 respondents (63.7%) in one of the other 44 communities.

Nearly two-thirds of the UK sample (62.2%) lived in the property they own – including 515 (25.8%) with mortgage and 729 (36.4%) owning the property outright. In Catania this was over two-thirds of the sample (71.6%) who lived in the property they own. Also, just over one-fifth (20.7%) were renting their main home and 21 (5.2%) were living rent-free.⁵ In the UK, just under one-third (30.5%) were renting their main home – 323 (16.1%) from a private landlord,

⁴ <https://www.ukgeographics.co.uk/blog/social-grade-a-b-c1-c2-d-e>

⁵ 10 (2.5%) responded 'Other'.



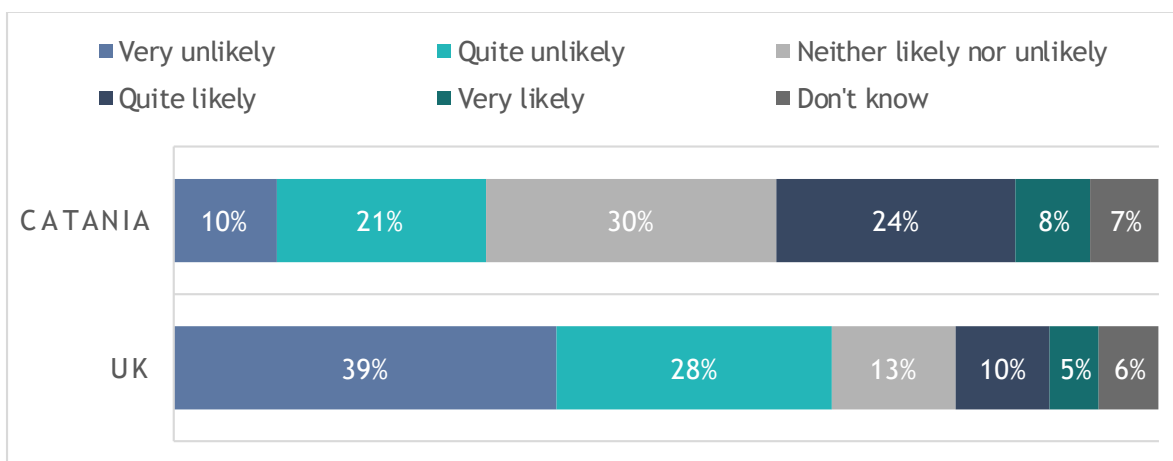
161 (8%) from a housing association and 128 (6.4%) from the local authority. Furthermore, 129 (6.4%) live rent-free.⁶

The UK survey sample was weighted in line with national statistics and therefore represents a representative sample according to age and gender. Further results below use the weighted sample. The Catania survey sample was not weighted as age and gender were in line with the Catania general population statistics. Therefore, both survey sample can be seen as representative samples according to age and gender.

4.3.2.2 Proximity to risk and risk perception

We measured both spatial and temporal proximity to floods as referenced as ‘proximity’ and ‘experience’ in the community-based adaptive behaviour and resilience model. Spatial proximity was measured by asking respondents whether the area they live in is likely to experience flooding in the next five years.

Only 14.6% thought that the area they live in is at least quite likely to experience flooding, the vast majority (66.8%) thought this event is unlikely in the next five years. Generally, younger respondents thought a flooding is more likely than older respondents ($r=-.288, p<.001$). Nearly one-third (31.9%) of residents of Catania thought that the area they live in is at least quite likely to experience flooding, which is more than double compared to the UK average. Also, about one-third (31.6%) thought this event is unlikely in the next five years (see Figure 7).



Note. N=405 and N=2000.

Figure 7: Relative frequencies of ‘How likely do you feel the area you live in is to experience flooding in the next five years?’

Respondents’ temporal proximity to risks was measured via a number of questions:

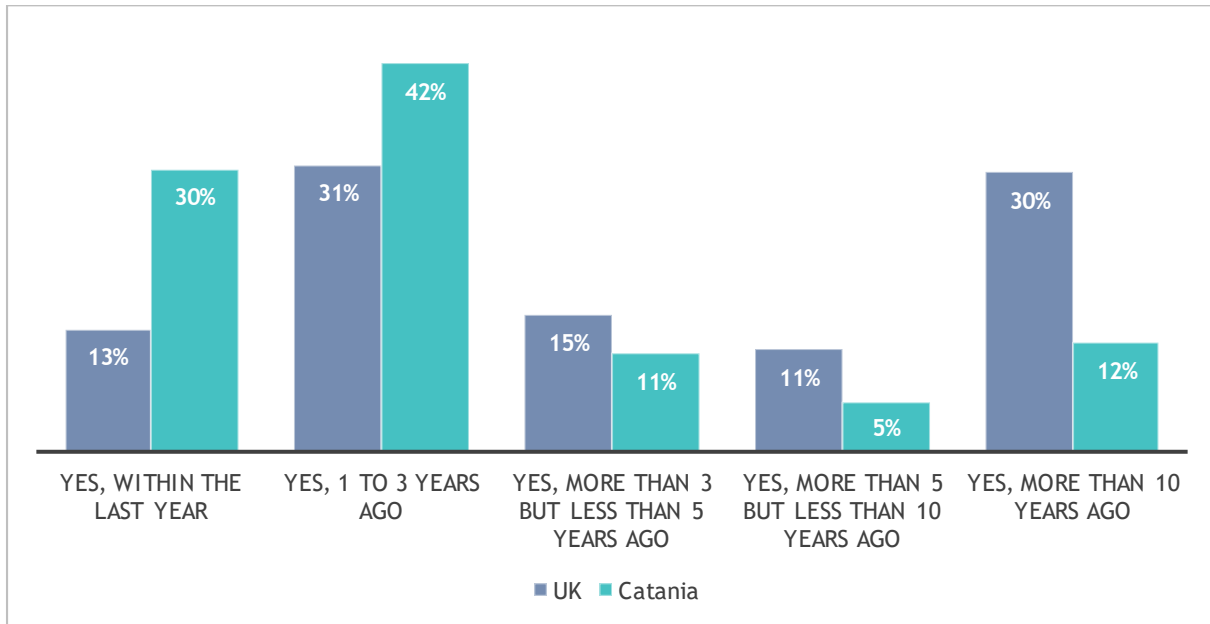
- whether they had experienced a flood, and if so:
 - How recent this was
 - How affected their property was
- whether someone close to them (such as a close friend or relative) had experienced a flood in the last 5 years.

In Catania, about 3 in 5 (60.7%) had experienced a flood at some point in their lives, which is significantly higher than the proportion in the UK. This includes 44% who have experienced a flood in the last three years. Only about one-quarter had experienced a flood at some point in

⁶ 16 (.8%) responded ‘Other’.



their lives in the UK, including 10% in the last three years and 7% more than 10 years ago (see Figure 8).

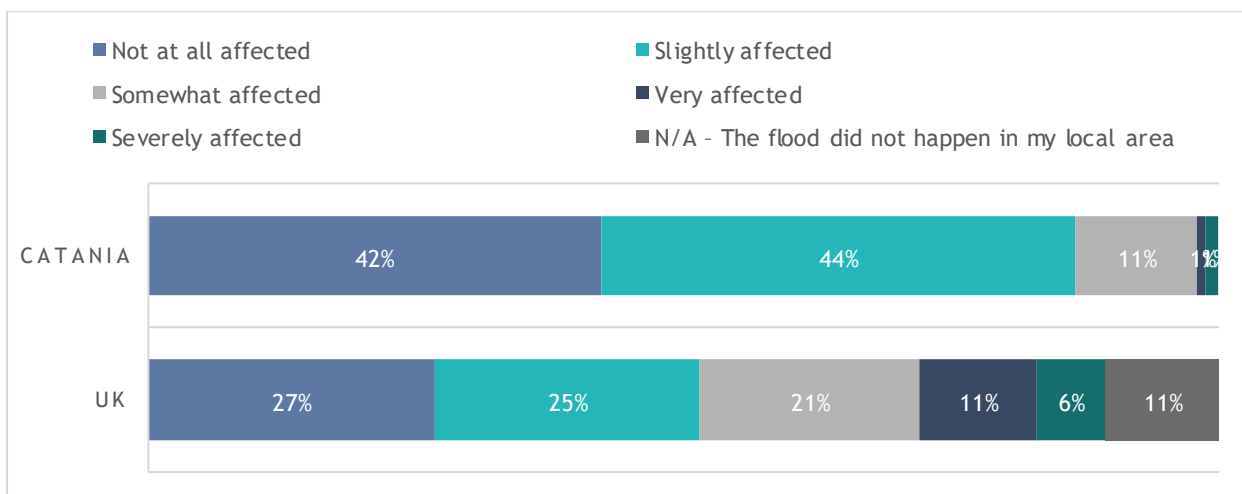


Note. N=462 and N=246.

Figure 8: Relative frequencies of most recent flood experience

Of those who have experienced a flood in the UK, more than three in five (62%) said their property was at least slightly affected by the incident. This proportion was similarly high in Catania with more than half (57.1%). In the UK, also for over a quarter (26.8%), the flood did not affect the property and for 10.6% the flood did not happen in the area. In Catania, for the remaining 42.3% the most recent flood did not affect the property (see Figure 9

).



Note. N=462 and N=246.

Figure 9: Relative frequencies of severity of most recent flood experience

Additionally, one in eight UK adults (11.7%), said that someone close to them, such as a friend or relative, had experienced a flood in the past five years. In Catania this proportion is



significantly higher with nearly half (45.7%), say that someone close to them, such as a friend or relative, have experienced a flood in the past five years.

As described above, risk perception was operationalised via a four-item scale ranging from 4 (i.e., lowest level of risk perception) to 20 (i.e., highest level of risk perception). In Catania, the average level of risk perception was 12.7(SD=3.2), which is significantly higher than the risk level in the UK sample with an average risk perception of 8.8 (SD=3.7) ($p<.001$). In the UK, the lowest possible score was the most common score, 17.5% of respondents had a risk perception of 4. Just over one quarter had a risk perception level higher than 11, which is true of over two-thirds in the Catania sample (see Table 2).

Table 2: Distribution of risk perception scores

	UK		Catania	
	N	%	N	%
Score: 4-7	774	39%	28	7%
Score: 8-11	703	35%	102	25%
Score: 12-15	411	21%	205	51%
Score: 16-20	112	6%	70	17%
Total	2000	100%	405	100%

4.3.2.2.1 Lifeworld and self-efficacy

As displayed in the model (see

), a number of other constructs are thought to mediate the relationship between risk perception and adaptive behaviour. These have been measured as part of the survey and include:

- Trust in government protection and local authority
- Community cohesion
- Agency
- Self-efficacy

As described above, trust in government protection and local authority was measured via four items. The scale ranged from four to 20 with an average score of 11.86 (SD=3.5), indicating a medium level of trust. The average level of trust in government protection and local authority in Catania was slightly lower than in the UK at 10.3 (SD=3.82). More than half (54%) in the UK sample and less than half (43.2%) in the Catania sample had a trust level ranging from 10 to 14 (see Table 3).

Table 3: Distribution of trust scores

	UK		Catania	
	N	%	N	%
Score: 4-7	226	11%	95	23%
Score: 8-11	576	29%	130	32%
Score: 12-15	888	44%	141	35%
Score: 16-20	310	16%	39	10%
Total	2000	100%	405	100%

Community cohesion was operationalised via a three-item scale ranging from three to 15. The distribution of scores was very similar in Catania and the UK. The average score of 9.77

(SD=2.39) in the UK and of 9.12 (SD=2.67) in Catania indicates medium to high level of community cohesion. Nearly two-thirds of the UK and Catania sample (65.1% and 64.0%, respectively) had scores between 7 and 11 (Table 4).

Table 4: Distribution of community cohesion scores

	UK		Catania	
	N	%	N	%
Score: 3-5	90	5%	35	9%
Score: 6-8	417	21%	103	25%
Score: 9-11	971	49%	184	45%
Score: 12-15	521	26%	83	20%
Total	2000	100%	405	100%

Agency was only measured via one single item “I feel able to influence decisions made about my local area”. In the UK, nearly half of the sample (46.9%) did not think they were able to influence decisions in their local area while only about 1 in 5 (19.3%) thought they can. Similarly in Catania, about half of the sample (50.4%) did not think they were able to influence decisions in their local area while only 16.5% thought they can.

Table 5: Frequencies of “I feel able to influence decisions made about my local area”

	UK		Catania	
	N	%	N	%
Strongly disagree	301	15.1%	102	25.2%
Disagree	637	31.9%	102	25.2%
Neither agree nor disagree	676	33.8%	134	33.1%
Agree	309	15.5%	57	14.1%
Strongly agree	77	3.9%	10	2.5%
Total	2000	100%	405	100%

The last construct included in the survey is flood-related self-efficacy. Here, the average score across the sample was 12.8 (SD=3.19) on the scale ranging from four to 20. about half of the sample (50.4%) did not think they were able to influence decisions in their local area while only 16.5% thought they can. More than half (56%) of the self-efficacy scores ranged between 10 and 14 for both Catania and the UK (see Table 6).

Table 6: Distribution of self-efficacy scores

	UK		Catania	
	N	%	N	%
Score: 4-7	100	5%	20	5%
Score: 8-11	472	24%	99	24%
Score: 12-15	1012	51%	210	52%
Score: 16-20	416	21%	76	19%
Total	2000	100%	405	100%

4.3.2.2.2 Preparedness, adaptive behaviour and resilience

Flood preparedness was measured via a series of items:

- Talk to my neighbours about their flood experience
- Look for information about what to do to keep safe during a flood
- Look for information about my flood risk
- Participate in a local organisation that aims to prepare for floods
- Create a personal plan to be used in case of an emergency such as a flood
- Prepare an emergency kit for floods or other emergencies
- Buy insurance cover to protect me from the negative effects of floods
- Receive first aid training
- Other

The count of activities that each person intended to undertake in the next 12 months indicated the level of preparedness. Overall, the Catania sample showed a higher flood preparedness than the UK sample. Around two-thirds of the sample (66.8%) were not planning on implementing any of the listed protection measures in the UK. Additionally, only 17.7% planned to do at least two of the measures to protect themselves or their property from a flood. In contrast, only 22% were not planning on implementing any of the listed protection measures in Catania. Nearly a quarter (23%) planned to do at least three of the measures to protect themselves or their property from a flood (see Table 7).

Table 7: Frequencies of Flood preparedness count

	UK		Catania	
	N	%	N	%
0	1336	66.8%	90	22%
1	310	15.5%	140	35%
2	185	9.3%	81	20%
3+	169	8.5%	94	23%
Total	2000	100%	405	100%

Regarding the activities that citizens were planning to undertake in the next 12 months, the two most common ones in the UK and Catania, were looking for information about flood risk (13% and 31%, respectively) and about what to do to keep safe during a flood (10% and 37%, respectively). Less popular was participating in a local organisation that aims to prepare for floods (see Table 8)

Table 8: Frequencies of preparedness measures

	UK		Catania	
	N	%	N	%
Look for information about my flood risk	268	13%	127	31%
Look for information about what to do to keep safe during a flood	198	10%	150	37%
Prepare an emergency kit for floods or other emergencies	169	8%	92	23%
Create a personal plan to be used in case of an emergency such as a flood	168	8%	99	24%
Receive first aid training	136	7%	55	14%



Buy insurance cover to protect me from the negative effects of floods	132	7%	32	8%
Talk to my neighbours about their flood experience	107	5%	54	13%
Participate in a local organisation that aims to prepare for floods	96	5%	44	11%
Other (please specify)	3	0%	0	0%
None of the above	1324	66%	90	22%
Total	2000	100%	405	100%

Similarly, adaptive behaviour was measured by the list of measures, that respondents had already done to protect their property or themselves. Again, in the UK, around two-thirds (65.2%) had not implemented any measures while about 8.6% had undertaken at least three of the activities. In Catania, though more respondents had implemented measures than in the UK, fewer citizens had already implemented measures compared the proportion that was planning to implement measures in the next 12 months. One-third (33%) had not implemented any measures while about 18% had undertaken at least three of the activities (see Table 9).

Table 9: Frequencies of Adaptive behaviour count

	UK		Catania	
	N	%	N	%
0	1304	65.2%	134	33%
1	326	16.3%	119	29%
2	199	10.0%	78	19%
3+	171	8.6%	74	18%
Total	2000	100%	405	100%

In terms of the actual activities, looking for information about my flood risk was the most common preparation in the UK and the second most popular one in Catania. In Catania, over one-third (36%) have looked for information about what to do to keep safe during a flood, which only 8% have done in the UK. Overall, a higher proportion of citizens in Catania have undertaken each of the preparation activities, apart from buying insurance – 10% in the UK has done that, while only 8% in Catania (see Table 10).

Table 10: Frequencies of adaptive behaviour measures

	UK		Catania	
	N	%	N	%
Looked for information about my flood risk	280	14%	112	28%
Received first aid training	276	14%	58	14%
Bought insurance cover to protect me from the negative effects of floods	192	10%	33	8%
Looked for information about what to do to keep safe during a flood	164	8%	144	36%
Prepared an emergency kit for floods or other emergencies	114	6%	40	10%
Talked to my neighbours about their flood experience	110	6%	74	18%
Created a personal plan to be used in case of an emergency such as a flood	110	6%	53	13%



Participated in a local organisation that aims to prepare for floods	67	3%	25	6%
Other (please specify)	6	0%	1	0%
None of the above	1289	64%	134	33%
Total	2000	100%	405	100%

The 10-item Connor-Davidson Resilience Scale measures the individual-level resilience and ability to bounce back after traumatic events generally. The average score of the UK sample was 25.1 (SD=6.8) with scores ranging from 0 to 40 – higher scores indicate higher levels of resilience. The average score of the Catania sample was similarly high at 25.5 (SD=6.35).

Table 11: Frequencies of the Resilience scale

	UK		Catania	
	N	%	N	%
Score: 0-9	57	3%	6	1%
Score: 10-19	298	15%	53	13%
Score: 20-29	1132	57%	249	61%
Score: 30-40	513	26%	97	24%
Total	2000	100%	405	100%

4.3.2.3 Testing model assumptions

This section will refer to the hypotheses posed at the beginning of this write-up to explore whether the data fits the assumptions of the model.

Hypothesis 1: Self-efficacy is a stronger predictor of adaptive behaviour than demographics.

Hypothesis 1 refers to the influences of adaptive behaviour. The model states that self-efficacy is a stronger predictor of adaptive behaviour. There were also other constructs such as outcome efficacy, but these were not included in the survey. The first hypothesis was tested by performing a regression analysis on adaptive behaviour. When including age, gender, social status and self-efficacy, self-efficacy is the strongest predictor of adaptive behaviour explaining 8% of the variance. Higher levels of self-efficacy relate to higher levels of adaptive behaviour. However, age, gender and social status were also found to be significant predictors. Older respondents, respondents from social grade C2DE and female tended to show lower levels of adaptive behaviour. Together, the four independent variables explain 15% of the variance of adaptive behaviour. Overall, regression model was statistically significant ($R^2=.15$, $F(4,1995)=85.87$, $p<.001$) and the fitted regression model was: Adaptive behaviour score = $.12 + .103$ (self-efficacy score) - $.016$ (age in years) - $.106$ (social grade as a dichotomous variable) + $.103$ (gender as dichotomous variable).

Table 12: Regression on adaptive behaviour

Variable	Coefficient B	Std. Error	Model	
Self-efficacy	.103***	.007	Constant	.12 (.14)
Age	-.016***	.001	R ²	.15
Social grade	-.106*	.047	F	85.87***
Gender	.103*	.047	N	2000

Note. *** $p<.001$, ** $p<.01$, and * $p<.05$.



Hypothesis 2: Higher preparedness leads to higher levels of adaptive behaviour.

The second hypothesis describes the relation between preparedness and adaptive behaviour, suggesting a positive relation. Hypothesis 2 was tested by inspecting the correlation between the two constructs. Indeed, the data revealed a statistically significant positive correlation between preparedness and adaptive behaviour ($r=.623, p<.001$). However, this does not imply causality – i.e., it could be that the two are correlated but that preparedness does not cause or directly influence adaptive behaviour. The survey was cross-sectional, longitudinal approaches would be needed to provide evidence for causality.

Hypothesis 3: Intervening variables such as self-efficacy influence the connection between preparedness and adaptive behaviour.

Hypothesis 3 builds on the second hypothesis by postulating that other variables are mediating the relationship between preparedness and adaptive behaviour. We tested this hypothesis using self-efficacy by performing a mediation analysis. This was done by comparing regression results when the potential mediator was included in the regression analysis and when it was not. This shows that strength of the predictor preparedness is decreased when the mediator self-efficacy is also a predictor. The coefficient is only decreased from .61 to .58, and therefore it is a partial and not a full mediation. The Sobel test reveals that the mediation effect is statistically significant ($T=6.32, p<.001$).

Hypothesis 4: Risk perception is influenced by disaster experience, temporal and spatial proximity, and trust in authorities

The fourth hypothesis relates to the predictors of risk perception at the beginning of the Community-based adaptive behaviour and resilience model. It suggests that previous disaster experience, likelihood of a flood, disaster experience of a significant other and trust in the local authority all influence the level of risk perception. This has been shown in previous studies, including the RESILOC survey.

Indeed, all four variables were shown to be significant, together explaining 36% of the variance of risk perception ($R^2=.36, F(4,1995)=245.45, p<.001$). The fitted regression model was: Risk perception score = $10.42 + 1.30$ (flood risk level) - 1.86 (flood experience as a dichotomous variable) - 1.50 (others experiencing flood as dichotomous variable) + $.139$ (trust score).

Table 13: Regression on risk perception

Variable	Coefficient B	Std. Error	Model	
Flood risk	1.296***	.066	Constant	10.42 (.62)
Flood experience	-1.861***	.192	R ²	.36
Others experiencing flood	-1.501***	.220	F	245.04***
Trust	.139***	.020	N	2000

Note. *** $p<.001$, ** $p<.01$, and * $p<.05$.

When controlling for gender, age and social status the model of fit statistic R^2 increases to .38.

Hypothesis 5: Individual risk perception and adaptive behaviour influence community resilience

Hypothesis 5 relates to the last part of the model, the link to community resilience. Unfortunately, the survey only includes resilience at an individual level rather than community level. Therefore, the analysis does not test the hypothesis displayed but if risk perception and



adaptive behaviour influence individual general resilience. We tested this by performing a regression analysis which shows that both risk perception and adaptive behaviour significantly predict resilience. Higher levels of adaptive behaviour are associated with lower levels of resilience and higher levels of risk perception with higher levels of resilience. Overall, both variables only explain 2.3% of the variance of resilience, indicating that most of the variance is explained by other factors ($R^2 = .023$, $F(2,1997)=23.27$, $p<.001$). The fitted regression model is: Resilience = 25.75 + 1 (adaptive behaviour score) - .15 (risk perception score).

Table 14: Regression on resilience

Variable	Coefficient B	Std. Error	Model	
Adaptive behaviour	1.003**	.148	Constant	25.75 (.39)
Risk perception	-.151***	.045	R ²	.023
			F	23.17***
			N	2000

Note. *** $p<.001$, ** $p<.01$, and * $p<.05$.

When controlling for gender, age and social status the model of fit statistic R^2 increases to .037.

Hypothesis 6: Local context/Lifeworld influences risk perception, preparedness and adaptive behaviour and vice-versa

This hypothesis was testing by inspecting the links between community cohesion and agency with risk perception, preparedness and adaptive behaviour. Regression analysis shows that community cohesion is not a significant predictor of risk perception while agency is, also when demographics are controlled for in the analysis. In terms of the prediction of preparedness, agency is a significant predictor again, community cohesion is only a significant predictor when the demographics are controlled for. However, community cohesion and agency are significant predictors of adaptive behaviour, also when controlling for demographics.

Overall, the results suggest mixed evidence regarding the six hypotheses based on the survey data as summarised in the table below:

Table 15: Summary of results

Hypothesis tested	Results
Hypothesis 1: Self-efficacy is a stronger predictor of adaptive behaviour than demographics.	Hypothesis could not be rejected based on the data: Self-efficacy is a stronger indicator, though demographics also play a role
Hypothesis 2: Higher preparedness leads to higher levels of adaptive behaviour.	Insufficient data to support or reject the hypothesis: To be able to judge about causality longitudinal or experimental data is required
Hypothesis 3: Intervening variables such as self-efficacy influence the connection between preparedness and adaptive behaviour.	Some supporting evidence for this hypothesis: This was shown for self-efficacy, though only partial correlation, but there might be other intervening variables
Hypothesis 4: Risk perception is influenced by disaster experience, temporal and spatial proximity, and trust in authorities	Supporting evidence found for this hypothesis.



<p>Hypothesis 5: Individual risk perception and adaptive behaviour influence community resilience</p>	<p>Inconclusive evidence found: The analysis does not test the hypothesis displayed, rather it tested whether risk perception and adaptive behaviour influence individual general resilience. For resilience in general, the analysis rejected the hypothesis with variance explained mostly by other factors.</p>
<p>Hypothesis 6: Local context/Lifeworld influences risk perception, preparedness and adaptive behaviour and vice-versa</p>	<p>Mixed evidence for this hypothesis: There were some statistically significant correlations, but others did not yield a statistically significant result.</p>

Overall, the hypotheses tested are in favour of the model and most suggested that links could not be rejected based on the data in the UK and Catania. These results are dependent on the definition of the constructs and how they have been operationalised in the survey. Here, further work is needed to measure relevant lifeworld related constructs – only community cohesion and agency were measured in these surveys. Further, agency was only measured by one item and a scale needs to be developed. The survey is, crucially, missing the link to the community level, the survey only focused at the individual level.



5 Conclusion

This concluding section is split into three sub-sections:

- First, we summarise the key results of the main research activities carried out in Task 3.2
- These key results are then integrated to provide the overall conclusions of Task 3.2
- The final sub-section sets out the implications of these conclusions for RESILOC going forward.

5.1 Summary of key results

Task 3.2 has two main purposes. One is to validate the relevance, comprehensiveness and usability of the tool developed in Task 3.1 – i.e., the RESILOC Resilience Indicators and Matrix. The second - and core - purpose of Task 3.2 is to ensure that the results produced by applying the RESILOC Indicators to assess the level and nature of resilience in a community are subsequently used to define new strategies for improving resilience – by highlighting areas of shortcomings and weaknesses that need to be addressed going forward.

The main objectives of Task 3.2 were therefore, firstly, to identify ways in which the RESILOC tool could support communities in making strategic choices and decisions to address their resilience gaps and weaknesses. Secondly, to explore ways in which citizens could be supported to actively contribute to the systems and processes put into place to put those strategic choices and decisions into practice in order to improve community resilience in the future.

To achieve these objectives, Task 3.2 developed and applied a research approach combining three elements. First, a scoping and validation exercise aimed at setting the scene for the research, which included an initial focused literature review, together with feedback interviews with RESILOC end users to validate the RESILOC Resilience Indicators and Matrix, and also included ongoing monitoring and review of the results of RESILOC activities in WP4 and WP5 (community feedback and field trials). Second, case studies in three of the four RESILOC field trial sites, combining documentation analysis; structured interviews and co-creation workshops, to understand in more depth the main factors that shape how new ways of improving community resilience could be designed, developed and implemented. Third, an online survey carried out with 2,000 citizens in the UK and 405 in Italy to further explore and deepen understandings of the key factors that shape individual decision-making and adaptation in threat situations. This focused in particular on how factors like norms, values, self-efficacy and place attachment are linked to adaptive behaviour in threat situations, including propensity to take mitigation and prevention actions.

The scoping and validation work on the one hand provided general support for the RESILOC Resilience Indicators and Matrix and their relevance, usability and effectiveness – with the proviso that the validation exercise covered only one of the dimensions in the Matrix – the ‘social’ dimension. It also highlighted some challenges that needed to be taken into account with regard to the practical application of the Matrix in community resilience self-assessment – in particular the potential lack of availability of data needed to assess resilience over the majority of the indicators provided, as well as potential problems in applying the indicators and proxies in different contexts – for example in a large urban community vis a vis a small rural community.

The scoping and validation work also confirmed the need for additional systems, processes and tools to supplement the core RESILOC ‘self-assessment offer’. These add-on functions are intended to support continuous development and monitoring of the resilience and adaptive



capacity of the community and would be implemented through a four stage continuous cycle covering definition and operationalisation (adaptation to and testing of the generic RESILOC indicators framework to the local community context); data collection (filling in the data gaps identified through an initial community self-assessment); sensemaking and decision support (interpreting the initial self-assessment results and developing an Action Plan to improve community resilience); monitoring and adaptation (measuring progress against the Action Plan and continuously updating it). Review of the results of verification and validation activities in RESILOC WP4 and 5 reinforced the results from the scoping exercise. For example, the verification work in RESILOC Task 4.3 helped to identify which indicators and proxies in the RESILOC Resilience Indicators Matrix were working well and which ones were working less well. In addition, it confirmed the need for a 'social support system' in which the core RESILOC platform and tools could operate in order to be most effective and provided an initial sketch of what that social support system might look like.

The case studies carried out in Task 3.2 provide a clearer picture of this social support system and the 'add on' functions required to support continuous development and monitoring of the resilience and adaptive capacity of the community, although it should be noted that data was only available for three of the four RESILOC pilots. The first key result of the case study analysis is that it paints a picture of the resilience gaps and weaknesses in communities. The common gaps and weaknesses highlighted – across the spectrum of different community contexts represented by the case studies – focus on four main areas:

- relationships and channels of communication between citizens and local authorities, including the level of citizen trust in authorities
- a low level of citizen engagement with the disaster risk management and planning processes, including citizens' lack of awareness of risk; lack of awareness of which authorities are responsible for managing risk and disaster response and lack of training on risk and response
- citizen access to the resources needed to contribute to disaster mitigation, management, response and recovery
- data collection issues – there are widespread 'black holes' in the data needed to carry out a community resilience self-assessment and to support subsequent evidence-based strategic and operational planning to improve community resilience as a result of the self-assessment.

As noted above in the introduction to this deliverable, to make this analysis of gaps and weaknesses useful in the context of defining new strategies for improving resilience requires that they be understood. They need to be represented in such a way so the gaps and weaknesses can be reviewed and reflected on. The case studies suggest that this issue of 'representation' can be addressed largely through adding appropriate functionality to the existing RESILOC toolbox. This could cover, inter alia, providing 'plain English' explanations of the toolkit, its methodology and its functions; visual tools to show the outcomes of manipulating variables in a scenario and tools to compare different scenarios. However, the case studies also suggested that the addition of 'technical' functionalities to the RESILOC toolbox needs to be accompanied by 'human' interventions – for example creating spaces and opportunities for different stakeholders to collaborate to come to a collective view of what resilience challenges need to be addressed and how.

In an ideal world, such review and reflection lead to a collective understanding of the opportunities for improving resilience that should be explored. At present, the prevailing paradigm in the disaster management field follows a top-down approach to improving resilience, in which strategic and operational decisions across the whole 'disaster cycle', from mitigation through to recovery, are taken by 'professionals'. The case study analysis does provide some evidence that RESILOC itself is making a contribution to changing that prevailing



paradigm. In one of the case studies, informants suggested that RESILOC has been the catalyst for exploring different ways in which community decision-makers could identify and develop opportunities for resilience improvement. This involved a ‘co-creation’ model combining ‘top-down’ initial strategic thinking with ‘bottom-up’ validation and implementation. However, there is no consistent evidence from the case studies as a whole that this marks a radical departure in approach and practice. Indeed, the case studies highlighted the considerable legal, political and procedural hurdles that would need to be overcome to deliver change in an environment in which resilience planning is often codified in statutes and requirements that must be adhered to.

Moreover, the case studies provided no concrete evidence of existing mechanisms to support reaching a collective understanding of the opportunities for improving resilience that should be explored. Although some significant progress has been made towards involving citizens in disaster governance – for example three of the four RESILOC Trials have developed a written Local Resilience Strategy, and currently two have been approved by the local citizens – overall, more attention could be paid to developing the core structures, systems and processes needed to embed citizen-focused co-creation at the heart of community resilience improvement actions. Apart from the involvement of citizens in developing and approving local resilience strategies, few examples of systematic and routine knowledge and information sharing between and across different stakeholder communities to support ‘sensemaking’ were identified in the case studies. However, the evidence from the case studies does suggest that knowledge and information sharing on opportunities for improving community resilience could be facilitated through LRTs. LRTs are already working as communication channels in RESILOC and have played a significant role in collecting the data needed to carry out community resilience self-assessments in the case study locations. They are seen as bringing together a wide range of community stakeholders to deliver the self-assessment. In addition, LRTs can play a key role in reviewing and analysing the visualisation of resilience strengths and weaknesses provided by the RESILOC tool and subsequently contributing to drafting a local resilience strategy and action plan to address weaknesses and gaps. In order to do this effectively, it was suggested that LRTs would need to be supported with adequate resources and training.

In addition, the case studies provided some insights on the types of ‘add on’ functions, tools and processes that would be required to facilitate the development of new strategies for improving community resilience in line with the strengths and weaknesses revealed by self-assessment. These cover the following:

- Stakeholder involvement – apart from a general commitment to engaging as wide a spectrum of community stakeholders as possible, including representatives of the community itself, no specific methods or tools to involve stakeholders were suggested by case study participants
- Systems and processes – the key requirement suggested by case study participants was the provision of appropriate training to enable all stakeholders to play an active and effective contribution in reviewing resilience strengths and weaknesses, identifying opportunities for improvement and incorporating these within strategic and operational plans
- Technical and data collection tools - case study participants highlighted the positive attributes of RESILOC survey and sensor functionalities in data collection and suggested these would be valuable tools in subsequent monitoring of progress towards meeting resilience improvement goals and targets. It was also suggested that the RESILOC platform could benefit from incorporating training functionalities – including a ‘learning-by-doing tool’ to support the development of new strategies for resilience improvement



- Definitional and operations tools - to facilitate developing strategies and action plans for community resilience improvement, for example ways of capturing the everyday life of the community – focused on the provision of community-based education and training workshops to enable a broader section of the community to contribute to the improvement process
- Sensemaking tools – for example to support community decision makers to interpret assessment results and sensitivity analysis – suggested by case study participants included apps, panel discussion and Delphi methods, but were not elaborated on.

One of the main objectives of the Citizen Survey was to test the assumptions of the community-based adaptive behaviour and resilience model which was developed as part of RESILOC Task 2.1. The validity and applicability of this model is important for Task 3.2 because it allows us to predict the extent to which citizens could be expected to participate in actions aimed at identifying, designing, implementing and monitoring resilience improvement strategies; the extent to which they would expect to gain benefits from such participation and the likelihood of citizens changing behaviours around things like information-seeking, disaster preparedness, risk reduction and risk mitigation in the future, in light of any strategies and action plans prepared to improve community resilience. In this context, the key findings of the Citizens Survey are as follows:

- The level of citizen self-efficacy in relation to feeling able to influence strategies and decisions about disaster planning and management is low. In both UK and Italy, the majority of citizens felt they were unable to influence decisions in their local area. Although trust in government protection and local authority was not significantly low, it did not run at a high level in both locations.
- Adaptive behaviour – as measured by steps taken by citizens to protect themselves or their property – was also low in both locations.
- Higher levels of adaptive behaviour are significantly correlated with higher levels of self-efficacy. This is also related to age, gender and social status, with younger people, people from social grade C2DE and men tending to show lower levels of adaptive behaviour.
- Adaptive behaviour is also linked to preparedness. The more actions people take to prepare themselves for a disaster – for example consulting neighbours, seeking information, receiving first aid training – the more likely they are to take active steps to protect themselves.
- Risk perception is linked to previous disaster experience, perception of the likelihood of a disaster, the knowledge that a disaster has happened to a significant other and trust in the local authority.
- Community cohesion – reflected by things like sense of belonging and solidarity - and agency – the extent to which citizens feel they are able to influence strategies and decisions about disaster planning and management – are significant predictors of adaptive behaviour. In other words, people are more likely to change their behaviours around things like information-seeking, disaster preparedness, risk reduction and risk mitigation if they have a strong sense of identification with the community, feel the community is looking out for them and feel they can influence decisions.

Applying these key findings to our exploration of how new strategies for improving community resilience could be developed and implemented, the key learning ‘take-aways’ are as follows:

- Improving community resilience going forward – building on the foundations of a RESILOC resilience self-assessment – requires a shift from ‘analysis’ to ‘action’. Strategies and action plans to increase a community’s resilience will only work if the community as a whole is prepared to adopt the measures provided for in those strategies and action plans. The results of the Citizens Survey suggests that this is unlikely to be the case for a majority of citizens.



- In order to increase the likelihood of the community engaging in actions to improve resilience – i.e., increasing the numbers of citizens likely to adopt the measures provided for in future resilience improvement strategies and action plans – more citizens need to feel they can have more say in disaster management strategies and planning.
- In situations in which the community appears ‘fragmented’ – i.e., where a community scores low on levels of social cohesion and solidarity – ‘cohesion-building’ initiatives are likely to help increase the level and impact of community engagement in measures adopted to increase community resilience.
- Strategies aimed at engaging the community in these measures need to be targeted to the particular profiles and needs of clusters and groups within the community – for example younger people, people with no previous experience of a disaster, people from lower income groups.

5.2 Overall conclusions

This section draws together and triangulates the key results from the Task 3.2 research, outlined above, to provide overall conclusions on the extent to which RESILOC can currently and potentially support the transition from an analytical to a prescriptive and prospective mode of operation. In other words, to what extent does RESILOC have the capacity and capability to apply the results of a community resilience self-assessment to improve community resilience in the future?

To come to these conclusions, we firstly assess the extent to which the challenges to delivering improvements to community resilience are being or are likely to be met. Secondly, we assess the extent to which the operational conditions needed for delivering improvements to community resilience have been or are likely to be addressed.

5.2.1 Meeting the challenges

As noted in Section 2.3 above of this deliverable delivering the objectives of Task 3.2 requires five sets of challenges to be addressed. These are summarised in Table 16, which shows the extent to which each type of challenge has been met, based on an assessment of the available evidence.

Table 16: Extent to which T3.2 challenges met

Challenge Type	Description	Extent to which challenge met
Indicator flexibility & adaptability	RESILOC capability to identify community adaptability and transformational capacity Capability of revealing and assessing normative choices in developing strategies Capability of comparing measurements and options at different scales and in different contexts Capability of assessing relative pay-offs between different strategies and actions	No concrete evidence of steps being taken – or planned – to collect comprehensive and systematic data on community adaptability and transformational capacity. Current RESILOC tools do not allow assessment of normative choices from self-assessment data. Research evidence from T3.2 highlights challenges experienced by end-users in comparing measurements and options at different scales and in different contexts. No functionality to assess comparative pay-offs



Behavioural adaptability	Capability of community to adopt the measures provided for in resilience improvement strategies and action plans	Citizen survey highlights low level of citizen self-efficacy and relatively low level of trust in authority. Adaptive behaviour – as measured by steps taken by citizens to protect themselves or their property –also low. Insufficient targeting of strategies and action plans to reflect community diversity
Geographical & cultural adaptability	RESILOC capability of mapping, assessing and reflecting community socio-ecological systems and 'lifeworld' in developing new strategies to improve resilience	Evidence suggests RESILOC self-assessment tool struggles to adapt to community contextual variability and diversity. This is likely to be the case moving forward from 'analytical' to 'prescriptive' mode. No evidence of use of approaches and tools for 'lifeworld analysis' or plans for doing so
Power & Agency assessment	RESILOC capability of mapping community power systems and relationships and increasing community control over strategic decision-making	Citizens survey highlights majority of citizens do not feel they have a say in disaster decision-making. Although citizens have been involved in the development and approval of local resilience strategies, case study analysis shows structures, systems and tools need to be further developed to effectively support citizens as co-creators of resilience strategies and action plans to increase resilience
MRT representation	RESILOC capability of reflecting and operationalising the 'mechanisms' that are likely to lead to increased community resilience	No evidence that RESILOC analysts, planners, decision-makers and other stakeholder groups are taking steps to identify and explore the relationships between inputs, outputs and outcomes in strategy developing and action planning

As Table 14 shows, in summary, none of the key challenges identified in Section 2.3 above that need to be addressed in order to deliver new strategies for community resilience improvement are currently being fully met. There is also little evidence that these challenges are factored into plans that are evolving to deliver new strategies for community resilience within the RESILOC system.

5.2.3 Meeting operational conditions

This section considers the extent to which the operational conditions needed for delivering improvements to community resilience have been or are likely to be met. This can be illustrated as a continuum that starts with an assessment of the data collection efficacy of the RESILOC tool, moves through gaps and weaknesses identification and representation identified through a RESILOC community resilience self-assessment and ends with designing and implementing facilitation systems, processes and tools to engage a wide spectrum of stakeholders in co-



designing and co-producing strategies and action plans for resilience improvement. The continuum broadly equates to the research questions posed in Task 3.2 and can be seen as a measure of ‘readiness’ to deliver new strategies. Each stage in this operational continuum is rated on a three point scale – low to high – on the basis of the evidence (Figure 10).

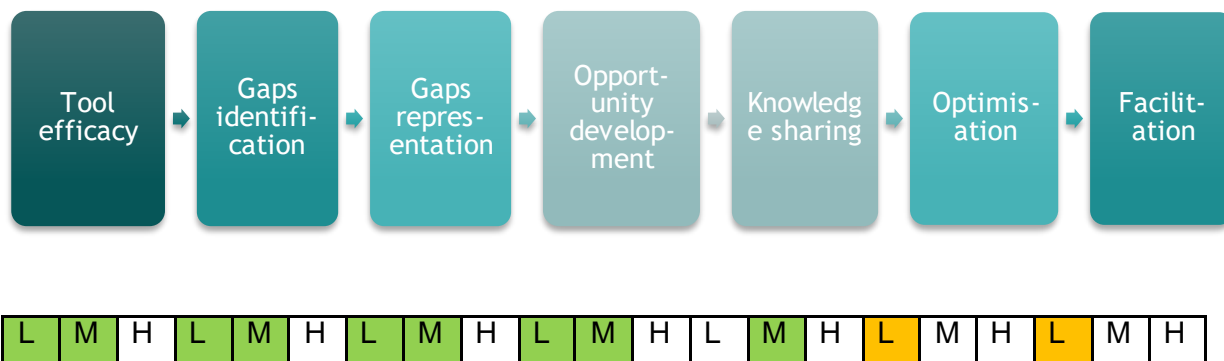


Figure 10: Delivering new strategies for resilience improvement - the operational continuum

Figure 10 shows:

- Stage 1: Tool efficacy – the capacity of the RESILOC system to deliver a baseline analysis of community resilience. The evidence shows that the RESILOC self-assessment tool is on the whole rated positively by end-users, and hence provides a good baseline for the identification of resilience strengths and weaknesses. However, challenges were identified on data availability and the capacity of the RESILOC indicators and proxies to adapt to the highly variable context of different types of community. In addition, there are currently not enough functionalities to enable analysts and decision-makers to evaluate the relative merits of strategic planning and operational choices and their associated pay-offs. Readiness level: medium.
- Stage 2: Gaps identification – the capacity of the RESILOC system to identify strengths, gaps and weakness in a community’s resilience. The evidence suggests that RESILOC has supported key actors within its pilot locations to assess the resilience positives in their community as well as highlight some key resilience gaps and weaknesses for prioritisation. The key gaps and weaknesses are consistent across the pilot locations researched and focus on communication, citizen engagement and, as for Stage 1, issues around data collection and contextualisation. However, the evidence suggests additional work needs to be done on gaps and weaknesses identification, for example providing training to enable gaps to be more accurately defined. Readiness level: medium.
- Stage 3: Gaps representation - the capacity of the RESILOC system to represent gaps and weaknesses in ways that are intelligible to analysts, decision-makers and other stakeholders in order to enable review and reflection on them. The evidence suggests that the RESILOC platform and toolbox currently provides useful functionalities – particularly graphical representation – that supports reflection and review. However, additional work is required on improving functionality – for example tools to represent scenarios comparisons more effectively. Interpreting these representations and comparisons requires a relatively high level of skill, therefore improved functionality needs to be accompanied by training and other support, for example ‘how-to’ manuals. Readiness level: (low)medium.
- Stage 4: Opportunity development - the capacity of the RESILOC system to identify and develop opportunities for resilience improvement, including assessing the different ‘value propositions’ of opportunity choices, and what kinds of ‘values’ and the extent to which they involve stakeholders and the community. On the one hand, the evidence suggests that RESILOC’s approach is seen as fundamentally different to prevailing approaches, and this is stimulating review and reflection, leading to the development



of strategies and plans for future resilience improvement that, to some extent involve ‘co-production’ between different stakeholders. However, such co-production efforts face challenges – notably the codification of disaster planning in legal statutes. There are some promising signs of citizen involvement in the development of opportunities. Three of the Trials have developed a written Local Resilience Strategy, and currently two have been approved by the local citizens, by means of Citizens Jury exercises. However, there is less evidence that citizens play an active co-creation role in opportunity development. Readiness level: Medium.

- Stage 5: Knowledge sharing – the capacity of the RESILOC system to promote information and knowledge sharing between stakeholders so as to contribute to developing new opportunities and strategies for improving resilience. The evidence suggests that information and knowledge sharing is poorly developed within the RESILOC system, with no concrete evidence provided by the case studies of mechanisms in place to support reaching a collective understanding of the opportunities for improving resilience that should be explored. However, the research suggested that LRTs are already working as communication channels in RESILOC and could play a key role in contributing to drafting a local resilience strategy and action plan to address weaknesses and gaps. This would need to be supported with adequate resources and training. In addition, the active participation of Citizens Juries in the approval of local resilience strategies, as noted above, is a promising sign of improving information and knowledge sharing across stakeholder groups. Readiness level: (Low)Medium.
- Stage 6: Optimisation – the systems and structures in place to evaluate new opportunities so as to optimise strategies and action plans for improving community resilience. The research identified few examples of systems and structures in place to support the evaluation of new opportunities for improving resilience. LRTs were highlighted as an appropriate mechanism to support this in the future, but they would need to be supported with adequate resources and training. Readiness level: Low
- Stage 7: Facilitation – design and utilisation of tools to facilitate strategies and action plans for improving resilience, including tools for collaboration and co-production, progress monitoring tools and sensemaking tools. The research suggests that the conditions necessary for developing and sustaining an environment in which ‘co-design’ and ‘co-production’ of new strategies for improving community resilience are not in place. Although some new ways of introducing ‘bottom up’ processes into developing resilience strategies and action plans have been explored in at least one of the RESILOC trial sites, these are embryonic. In particular, little attention has been paid to developing systems and spaces to engage citizens as active co-designers of strategies and action plans. Moreover, the results of the Citizens Survey reinforce the picture of a majority of citizens who feel disengaged from decision-making systems and structures. Readiness level: Low

5.3 Implications for RESILOC

On many of the measures used to develop a picture of where RESILOC stands on the key objective of Task 3.2 - identifying opportunities and strategies to reduce weaknesses and gaps in a community’s resilience so as to reduce the potential damage to that community as a result of disasters that may occur in the future – the evidence portrays a situation that can best be described as embryonic. All of the key challenges that present obstacles to delivering on the core purposes of Task 3.2 – developing flexible and adaptable indicators; ensuring citizens play a role as active contributors in developing and implementing resilience improvement strategies and plans; promoting geographical and cultural adaptability; developing spaces and opportunities for citizens to have a voice in shaping their ‘resilience future’, and understanding and working with the ‘causal pathways’ that connect resources to decisions to actions and then



resilience outcomes - remain unaddressed. Similarly, in terms of ‘capacity to operationalise the transition between ‘analysis’ and ‘prospective action’, the RESILOC ‘system’ remains at a low level of ‘readiness’ overall.

At this late stage in the project’s evolution, it is unlikely there is enough time and resources left to make significant inroads to increase this level of readiness. Nevertheless, the research carried out for Task 3.2 has identified foundations that can be built upon, both in the remaining time left, and in the future beyond the official end of the project. These foundations include, for example, building on existing functionality within the RESILOC platform and toolbox that is already being used to represent visually a community’s strengths and weaknesses, and to begin to review these strengths and weaknesses in light of future resilience improvement strategies, and capitalising on the important role LRTs are already playing as ‘co-creators’ of these strategies. The areas that need to be built on to improve these foundations are:


- Improved technical functionality in the platform and toolbox, for example providing ‘plain English’ explanations of the toolkit, its methodology and its functions and tools to compare different scenarios
- A more extensive programme of training for different target groups – including data analysts, planners, policy makers, LRTs and citizen representatives – to improve understandings of how RESILOC works and to develop their decision-making and strategic planning skills
- Systems, processes and tools to increase stakeholder involvement across the spectrum in all stages of the ‘resilience improvement process’ – from reviewing strengths, weaknesses and gaps to monitoring progress on strategy and action plan targets
- Innovative data collection tools to gather and analyse information to feed into strategy development and action planning – in particular ‘lifeworld analysis’ tools and the training to use them effectively
- Awareness-raising and ‘engagement’ campaigns to increase citizens’ sense of self-efficacy, their sense of empowerment and decision-influencing capability and their willingness to buy into, and support, future actions aimed at improving community resilience, as well as ‘cohesion-building’ initiatives to increase the level and impact of community engagement in measures adopted to increase community resilience
- These campaigns and initiatives need to be targeted to reflect any community ‘fragmentation’ and to meet the profiles and needs of clusters and groups within the community – for example younger people, people with no previous experience of a disaster, people from lower income groups.

Beyond the RESILOC project itself the evidence suggests that more needs to be done to support the broader goal of making societies more resilient. In particular, accelerating the drive towards implementation of the UN Sendai Framework for Disaster Risk Reduction 2015-30 – especially Priority 2, strengthening disaster risk governance to manage disaster risk – implies more effort in key areas such as enhancing relevant mechanisms and initiatives for disaster risk transparency, including public awareness-raising and training initiatives, reporting requirements and legal and administrative measures; putting in place coordination and organizational structures; assigning clear roles and tasks to community representatives within disaster risk management institutions and processes and decision-making through relevant legal frameworks, and undertake comprehensive public and community consultations during the development of such laws and regulations to support their implementation. As noted above, if the three indicative case studies carried out as part of the RESILOC Task 3.2 research are typical of the general situation, there is currently little solid foundation on which



to realise these goals. One clear message from the research is that the community voice in disaster risk reduction is very faint.

VII. Appendix A: RESILOC ethics self-assessment sheet

RESILOC		RESILOC ethics self-assessment sheet					
This document is a self-assessment sheet that must be filled out by owners of RESILOC deliverables. This is to ensure that research and/or development activities related to each project deliverable comply with requirements of RESILOC Guidelines on Ethics and Data Protection (GDPR).							
This RESILOC ethics self-assessment sheet must be used as part of each project deliverable that involves humans either in an active (e.g. data subjects) or passive (e.g. affected by tools) manner. Project reports (e.g. management or financial reports) are not required to undergo this ethics assessment.							
This document is an important exercise part of the RESILOC Ethics Framework as it allows the owner of each RESILOC deliverable to reflect on ethical consideration and data protection requirements in a structured and approved manner before submitting the document to the Commission for review.							
The document shall be used in line with the RESILOC Ethics Framework including the guidelines and procedures under deliverables D9.1 to D9.12 (all documents are made available on the RESILOC Own Cloud). The ethics self-assessment sheet must be included as the 1st Appendix A of the each RESILOC deliverable. In addition to filling out the sheet, authors must provide explanations of the answers given on the main table. Such explanations must be provided in the methodology section of the deliverable using the headline "Ethics Considerations and Data Protection". The ethics self-assessment sheets of private deliverables must be assessed through the responsible position within the issuing organisation. However, for public deliverables, the ethics self-assessment sheet must be approved by the RESILOC Internal Ethics Board. For that, please send this document to the Internal Ethics Board.							
For information or assistance contact:				helena.marruecos@iml.fraunhofer.de			
The self-assessment was conducted by:				The self-assessment was approved by:			
Name	Joe	Name	Nadeida				
Surname	Cullen	Surname	Miteva				
Institution	TIHR	Institution	BILSP				
Date	05/12/2022	Date	16/12/22				
					yes	no	n/a
G	GENERAL						
a	Did the research for this deliverable involve the collection of personal data?				X		
b	Does this deliverable, and the activities that have fed into it, comply with Regulation (EU) 2016/679 known as GDPR and 2002/58/EC Directive on privacy and electronic communications?				X		
c	Does this deliverable, and the activities that have fed into it, comply with the relevant national data protection and privacy laws, codes of practice and guidelines?				X		
d	Are there any ethics risk identified related to your work under this deliverable?					X	
1	Human Participation/ Informed Consent						
1.1	Procedures and criteria that will be used to identify/recruit research participants (D9.1)						
a	Did the research for this deliverable involve the recruitment of research participants? (<i>this includes surveys and interviews</i>)				X		
b	Did you identify selection, inclusion, & exclusion criteria?				X		
1.2	Recruitment of respondents via social media (D9.4)						
b	Were special measures taken to ensure that the participants are adults?				X		



c	Did the research for this deliverable involve data collection using social media?					X	
d	Were measures taken to use only public profiles for the collection of data?					X	
		yes	no		yes	no	n/a
1.3	Use of the informed consent forms and Info sheets to recruit research participants (D9.2)						
a	Consent Form was issued	X				X	
b	Information sheet was issued	X		Issued in local language		X	
c	Combined sheet was issued	X				X	
1.4	Use of the informed consent forms and information sheets on data processing (D9.9)						
a	Consent Form was issued	X				X	
b	Information sheet was issued	X		Issued in local language		X	
c	Combined sheet was issued	X				X	
2	Organizational measures						
2.1	Data Protection Officer or contact person (D9.5)						
a	Do you have a Data Protection Officer or contact person for participants?					X	
b	Was this contact mentioned on the Informed Consent Forms?					X	
3	Technical measures						
3.1	Technical safeguard mechanisms for handling of personal data (PD) and special categories of personal data (SCOPD) (D9.6 / D9.8) (SCOPD include information such as ethnic origin, political opinions, data concerning health, etc. For more details see Article 9(1) GDPR).						
a	Did the research for this deliverable involve the collection of SCOPD? (D9.6)						X
b	Which mechanisms were used to safeguard the personal data collected?						
	pseudonymisation			anonymization			
	encryption			other (specify in the line below)			
	access restriction	X					
3.2	Data minimisation (D9.7)						
a	Has as little as possible data been collected throughout the research process?					X	
b	If more data was collected than initially needed, did you ensure the data was deleted?					X	
3.3	Data profiling (D9.10)						
a	Was or will the data collected in the deliverable be used for data profiling?						
b	Were all data subjects informed of the profiling and its possible consequences? (as part of the Inform Consent Form and the Information Sheet)						
c	Were sufficient measures in place to safeguard their fundamental rights?						
3.4	Processing of previously collected personal data (D9.11)						
a	Did you obtain consent to use personal data from previously executed research?						
b	Are technical/organisational measures required to safeguard the rights and freedoms of the data subject according to EU and national legislation in place in your organisation?						
4	Other Issues of ethical concern						
a	Were there any other ethical considerations detected during the work of this deliverable that are not covered by the list above?					X	
b	If yes, please list the concerns below and elaborate on the related counter measures in the methodology section of this document						



B cont.									
5	Opinions/approvals provided by ethics committees and other experts								
5.1	Following documents received opinions/approvals provided by ethics committees and other experts for the research conducted for this deliverable.								
			yes	no			yes	no	n/a
a	Informed Consent Forms and Information sheet	IEB	X		EEA				
		DPO			LEB				
b	Questionnaires / Surveys	IEB			EEA				
		DPO			LEB				
c	Design /Methodology of research activity	IEB			EEA				
		DPO			LEB				



VIII. Appendix B: List of References

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