

LINKS

Strengthening links between technologies and society
for European disaster resilience

D3.2 FIRST DMP-METHODOLOGY FOR THE LINKS FRAMEWORK AND THE CASE ASSESSMENTS

Research Report

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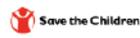
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EXECUTIVE SUMMARY

About the project

LINKS “Strengthening links between technologies and society for European disaster resilience” is a comprehensive study on disaster governance in Europe. In recent years, social media and crowdsourcing (SMCS) have been integrated into crisis management for improved information gathering and collaboration across European communities. The effectiveness of SMCS on European disaster resilience, however, remains unclear, the use of SMCS in disasters in different ways and under diverse conditions. In this context, the overall objective of LINKS is to strengthen links between technologies and society for improved European disaster resilience, by producing sustainable advanced learning on the use of SMCS in disasters. This is done across three complementary knowledge domains:

- Disaster Risk Perception and Vulnerability (DRPV)
- Disaster Management Processes (DMP)
- Disaster Community Technologies (DCT)

Bringing together 15 partners and 2 associated partners across Europe (Belgium, Denmark, Germany, Italy, Luxembourg, the Netherlands) and beyond (Bosnia & Herzegovina, Japan), the project will develop a framework to understand, measure and govern SMCS for disasters. The LINKS Framework consists of learning materials such as scientific methods, practical tools, and guidelines addressing researchers, practitioners, and policy makers. It will be developed and evaluated through five practitioner-driven European cases, representing different disaster scenarios (earthquake, flooding, industrial disaster, terrorism, drought), cutting across disaster management phases and diverse socioeconomic and cultural settings in four countries (Denmark, Germany, Italy, the Netherlands). Furthermore, LINKS sets out to create the LINKS Community, which brings together a wide variety of stakeholders, including first-responders, public authorities, civil society organisations, business communities, citizens, and researchers across Europe, dedicated to improving European disaster resilience through the use of SMCS.

About this deliverable

This deliverable aims to provide a DMP methodology that guides and supports the development of the LINKS Framework and the case-based assessments in the LINKS project. This first methodology of the LINKS project is primarily aimed at addressing the knowledge gaps that have been identified in the DMP knowledge base (D3.1). These knowledge gaps are addressed through three overall research questions developed in this methodology:

- How are European disaster management organisations applying social media and crowdsourcing in disaster management processes across the phases of the disaster management cycle (RQ1)?
- What are the limits and potentials of this application associated with institutional resilience (RQ2)?
- Following the two first questions, how can the application of social media and crowdsourcing in disaster management processes be further strengthened (RQ3)?

The first question aims at creating a comprehensive overview of the actors that apply SMCS in DMP as well as the institutions that guide these complex governance processes. It thus speaks directly to one of the major knowledge gaps identified in D3.1 where we argue that most studies have an almost exclusive focus on response. Moreover, it promotes a continuous mapping of formal governance processes for a greater understanding and overview of the application of SMCS in European DMP.

The second question aims to explore the meaning and experiences associated with the use of SMCS in DMP across multiple settings. By asking this explorative question, we get one step closer to understanding the potential impact of SMCS in DMP in both theory and practice. This second research question thus aims at addressing a second major knowledge gap identified in D3.1: focusing on people and organisations and their uptake of SMCS technologies.

The third question then aims to provide recommendations for how disaster governance can be strengthened through the use of SMCS in DMP. The answer to this question is provided by combining the descriptive and explorative ambitions of the two first research questions.

To answer these important questions for assessing the impacts of SMCS in DMP, the methodology provides a comprehensive research design as well as a list of research instruments for the empirical data collection process inherent to the case-based assessment.

The research design is based on two main pillars: A comparative multi-sited design component (cross-case assessments) and an explorative and grounded component (deep dive assessments).

The cross-case assessments are developed in close collaboration with WP2 and WP4 who have the responsibility for the two other LINKS methodology: The DPRV methodology and the DCT methodology. The cross-case assessment is a multi-sited design that allows us to both quantitatively and qualitatively analyse the similarities and differences in policy and practice of the various dimensions reflected in the DMP Resilience Wheel.

The second assessment is an in-depth design (a deep dive) that allows the local case assessment teams to explore certain aspects that they find to be of particular value for understanding contextual features of SMCS use in DMP through the DMP Resilience Wheel, a tool developed in D3.1.

Finally, the methodology provides a description of the concrete research instruments which are applied to the cross-case assessments, and which are mandatory for all case assessments teams (CATs) to implement in the upcoming activities under WP6. These research instruments are surveys and qualitative research interviews.

This deliverable must be read in combination with D2.3 and D4.2. D2.3 focuses on how vulnerability and disaster risk perceptions are further assessed within the LINKS project, and D4.2 presents the methodology on DCT providing us with a research design and research instruments for exploring existing tools and technologies for disaster risk management.

This deliverable is for both the LINKS partners and a broader audience. The research instruments defined are for the partners involved in the LINKS Framework design (Work Package 5, WP5) and for those involved in the five case-based assessment (Work Package 6, WP6). The deliverable may also be useful for the scientific community interested in reusing the proposed methodology in different contexts.

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LIST OF ACRONYMS

Acronym / Abbreviation	Description
CATs	Case Assessment Teams
CCA	EU Emergency and Crisis Coordination Arrangements
DCT	Disaster Community Technologies
DHPOL	German Police University
DMP landscape	Disaster Community Technologies in Disaster Management Processes
DMC	Disaster Management Cycle
DMP	Disaster Management Processes
DPPI SEE	Disaster Preparedness and Prevention Initiative of South-Eastern Europe
DMO	Disaster Risk Management Organisations
DRPV	Disaster Risk Perception and Vulnerability
EU	European Union
FEU	European Union Fire Officer Associations
FRB	Frederiksberg Kommune
GDPR	General Data Protection Regulation
HBR	Hovedstadens Beredskab
HNS	EU Host Nation Support Guidelines
KB	Knowledge base
LCC	Links Community Center
PTF	Practitioner task force
RQs	Research questions
SCIT	Save the Children Italy
SIC	Safety Innovation Centre
SMCS	Social media and crowdsourcing
UCC	University College Copenhagen
UCPH	University of Copenhagen



UNIFI	University of Florence
VOST	Virtual Operations Support Teams
VU	Free University Amsterdam
WP	Work package

DEFINITION OF KEY TERMS¹

Term	Definition
Case-based assessment	5 case studies are evaluated to assess the operationalisation of the key concepts retrieved from the DMP knowledge base
Cross-case assessments	The cross-case assessments are joint efforts between WP2-4 and investigate the specific knowledge domains across different contexts while exploring interacting themes. The cross-case assessments are thus both an attempt to explore domain-specific questions through a comparative lens and an attempt to explore the interdependent questions cutting across knowledge domains.
Citizens	Citizens can be considered via the same levels as the other stakeholders, and for LINKS, particular relevance should be given to local citizens who are likely to be impacted by the case studies. LINKS identifies two key sub-categories of citizen stakeholders: Civil Society and Vulnerable Populations (LINKS Glossary and D8.1).
Crowdsourcing	Describes a distributed problem-solving model where the task of solving a challenge or developing an idea is “outsourced” to a crowd. It implies tapping into ‘the wisdom of the crowd’ (definition builds on Howe, 2006; see also LINKS Glossary).
Governance	The process of making decisions. Refers to more than the formal institutions and organisations through which the management of disasters is or is not sustained. It comprises the mechanisms, processes and institutions, through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations and mediate their differences. It should be noted that governance is not government, even though government is often part of governance (definition builds on Rosenau, 1995; see also LINKS Glossary).
Deep dive case assessments	A particular approach to the case-based assessments that take the local specificities of each LINKS case-countries as their departure point. The deep dive case assessments can be associated exclusively

¹ Definitions are retrieved from the LINKS Glossary (forthcoming).

	with the DMP knowledge domain or investigate a theme that cuts across more than one of the LINKS knowledge domains
Disaster Community Technology (DCT)	A DCT is a software(-function) for interaction with, within or among groups of people who have similar interests or have common attributes (communities) in case of a disaster as well as performing analysis of these interactions (LINKS Glossary and D4.1).
Disaster Management Processes landscape	Joint effort with WP4 to map SMCS in DMP and create a comprehensive “DMP landscape” that provides a base for accessing information on the use of DCTs in DMP. The DMP-landscape will visualise DMOs, practices, experiences and scenarios in which DCTs are successfully applied in DMP.
Disaster risk management	Disaster risk management is the application of disaster risk reduction policies and strategies to prevent new disaster risk, reduce existing disaster risk and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses (UNDRR, 2016).
Disaster risk management organisations (DMOs)	Organisations that operate to support disaster risk management activities at different levels.
Disaster Management Processes (DMP)	A collective term encompassing a systematic series of actions or steps taken to reduce and manage disaster risk. Disaster management processes are often associated directly with the phases of the DMC. In the context of LINKS, we specifically refer to DMP as the policy frameworks, tools and guidelines developed to govern disasters across all phases of the DMC (LINKS Glossary).
DMP Resilience Wheel	DMP Wheel is a conceptual framework that captures the key concepts of the DMP knowledge domain (i.e.: decision-making, vulnerability, credibility, learning) and is used as operational tool for the DMP methodology.
Institutions	Institutions are social structures that are composed of regulative, normative and cultural-cognitive elements that provide stability and meaning to social life. Institutions provide the ‘rules of the game’

	and define the available ways to operate by discouraging, constraining or encouraging given behavioural patterns (Scott, 2001).
LINKS Framework	<p>A set of best-practices consisting of methods, tools and guidelines for enhancing the governance of diversity among the understandings and applications of SMCS in disasters for relevant stakeholders.</p> <ul style="list-style-type: none"> • Methods in LINKS refer to approaches that will enable researchers and practitioners to assess the effects of SMCS for disaster resilience under diverse conditions; • Tools are practical instruments supporting first-responders, public authorities and citizens with the implementation of SMCS in disaster and security contexts; • Guidelines are recommendations for improving national and regional governance strategies on SMCS as well as introductions and explanations of how to apply the methods and tools under diverse conditions (LINKS Glossary)
LINKS Knowledge Bases	The outputs and knowledge obtained from the assessments of the knowledge domains (LINKS Glossary)
LINKS Knowledge Domains	The three crucial domains of analysis for studying European disaster resilience and SMCS. These include: Disaster Risk Perception and Vulnerability (DRPV), for assessing changes in the citizens' perception of disaster risks induced by SMCS, as well as assessing the changes in the vulnerability of practitioners and citizens. Disaster Management Processes (DMP) for analysis of how SMCS changes the procedures and processes within the crisis and disaster management. Disaster Community Technologies (DCT), for assessing SMCS related technologies used by practitioners (and citizens) in disasters (LINKS Glossary).
Resilience	The ability of individuals, institutions, and systems to recover from disturbance and to develop and adopt alternative strategies in response to changing conditions (definition builds on Tyler & Moench, 2012; see also LINKS Glossary)
Scenarios	The LINKS scenarios refer to the hazards in each case (case 1, earthquake, Italy; case 2, industrial, the Netherlands; case 3, drought,

	<p>Germany; case 4, flooding, Denmark; case 5, terrorism, Germany). They are instrumental to case-based assessment of the Framework as they are the “storylines” through which both the gaps, needs and challenges emerge and the research design (first iteration of the cases), learning materials and other components (second iteration of the cases) are assessed. They are not used to assess the performance of the teams involved in the cases, as in crisis management exercises.</p>
<p>Social media</p>	<p>A group of Internet-based applications that build on the ideological and technological foundations of the Web 2.0 and that allow the creation and exchange of user-generated content. Forms of media that allow people to communicate and share information using the internet or mobile phones. Web 2.0 is the Internet we are familiar with today in which people are not just consumers of information but producers of knowledge through social networking sites and services like Facebook, Twitter and Instagram (definition builds on Kaplan & Haenlein, 2010).</p>
<p>Sustainable Advanced Learning</p>	<p>A maintainable and evolving collection of knowledge and best practices produced for and by relevant stakeholders. Sustainable Advanced Learning entails a cognitive dimension (the capability to gain in-depth knowledge of e.g. crises and crisis management), a social dimension (the collaborative efforts to implement that knowledge into new practices), and a transformative dimension whereby reflections are made on how knowledge was learned, what has changed in the process, and how and in what ways new knowledge might continue to evolve.</p>

1. INTRODUCTION

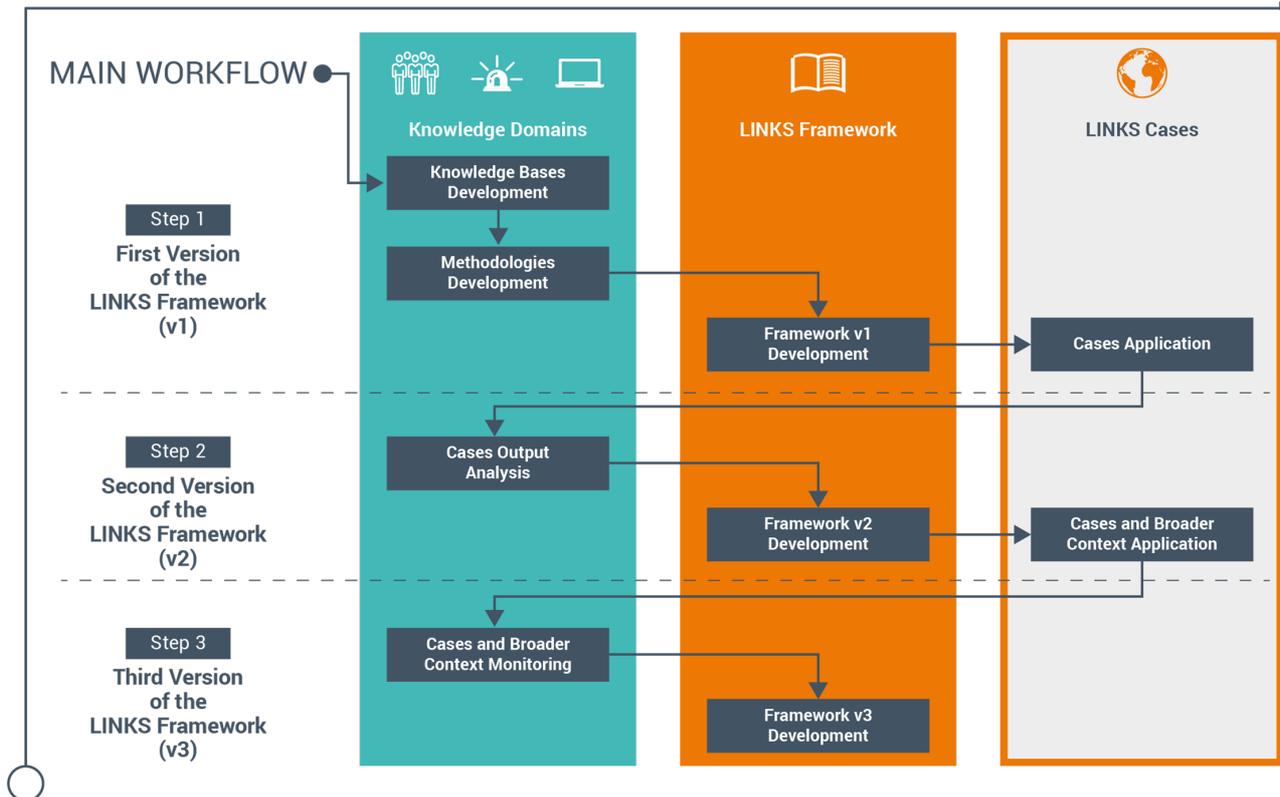
The increasing availability of the internet worldwide has led to the availability of large amounts of data. A significant part of this is generated by user interactions on social networks. Social media and crowdsourcing (SMCS) technologies have become an important part of people's daily lives, enabling them to communicate and collaborate in ways never before possible. The availability of information on and through social media networks is becoming increasingly important for a wide range of applications - including disaster situations. This makes SMCS platforms and processes increasingly relevant for disaster risk management organisations (DMOs) and the processes designed to manage disaster risk (see D3.1, Nielsen & Raju, 2020).

The first version of the DMP knowledge base (D3.1) addressed this technology-policy nexus and provided a comprehensive overview of the knowledge we currently have on the impact of SMCS in DMP. Following the results of D3.1, the DMP methodology presented in this document has two overarching objectives:

- First, to enable a continuous mapping of the formal governance processes in relation to SMCS and disasters within and across the local institutional context of the LINKS case assessment countries;
- Second, to create an approach that allows to critically engage with the knowledge gaps and theoretical assumptions provided in the DMP knowledge base through case-based assessments;

By combining the two aims, we hope to achieve an extended and improved version of the DMP knowledge base where the European and case-specific contexts are at the heart of this improvement. The short-term target of this document is to support the development of the first version of the LINKS Framework (WP5) and the case-based assessments (WP6) as illustrated in Figure 1. The target audiences of this deliverable are thus WP5 and WP6, however, the methodology also provides overall transparency around how the first round of case-based assessments is designed for all of those interested in the DMP domain and how it was built.

Figure 1: Workflow of LINKS



Source: LINKS

Together with deliverables D2.3 (Bonati et al., 2021) and 4.2 (Gehlhar et al., 2021), this methodology provides an approach to investigate the gaps highlighted in the DRPV, DMP, and DCT knowledge bases (see Bonati, 2020; Habig et al., 2020; Nielsen & Raju, 2020; Pazzi et al, 2020). The first version of the LINKS Framework will mainly consist of a consolidated version of the research design developed in WP2-4 and entails the provision of a consistent research design to be applied in each of the five case settings. When applied to the cases, these combined elements will feed into the creation and development of the learning materials in the second version of the Framework.

Accordingly, this deliverable provides:

- A set of research questions essential to the further development of the DMP knowledge domain;
- A research design that provides the overall design principles and structure. This design aims at answering the proposed research questions through the empirical investigation embedded in the case-based assessments;

- A set of research instruments that guide these case-based assessments.

1.1 Reading Guide

The methodology presented in this document consists of four different sections which each represents an important building block of the DMP methodology. Section 3 revisits D3.1 and the main implications of this deliverable for the further development of the DMP methodology. This section aims to connect the DMP knowledge base (D3.1) directly with the DMP methodology and to further analyse and assess the research designs that characterise existing literature on SMCS use in DMP.

Section 4 builds directly on Section 3 and presents the research questions that guide the development of the first round of the case-based assessments. The section provides the overall research questions for the DMP knowledge base, their interactions with the DRPV and DCT methodologies as well as the operationalisation of those questions through the DMP Resilience Wheel.

Section 5 describes the research design. Here we point to a two-pronged design consisting of a comparative (cross-case assessments) as well as an explorative and grounded component (deep dive assessment). The cross-case assessment is a multi-sited design that allows us to both quantitatively and qualitatively analyse the similarities and differences in policy and practice related to the various dimensions of institutional resilience as conceptualised in the DMP Resilience Wheel. The second assessment is an in-depth design (a deep dive) that allows the CATs to explore certain aspects of the DMP knowledge base in-depth within their local context.

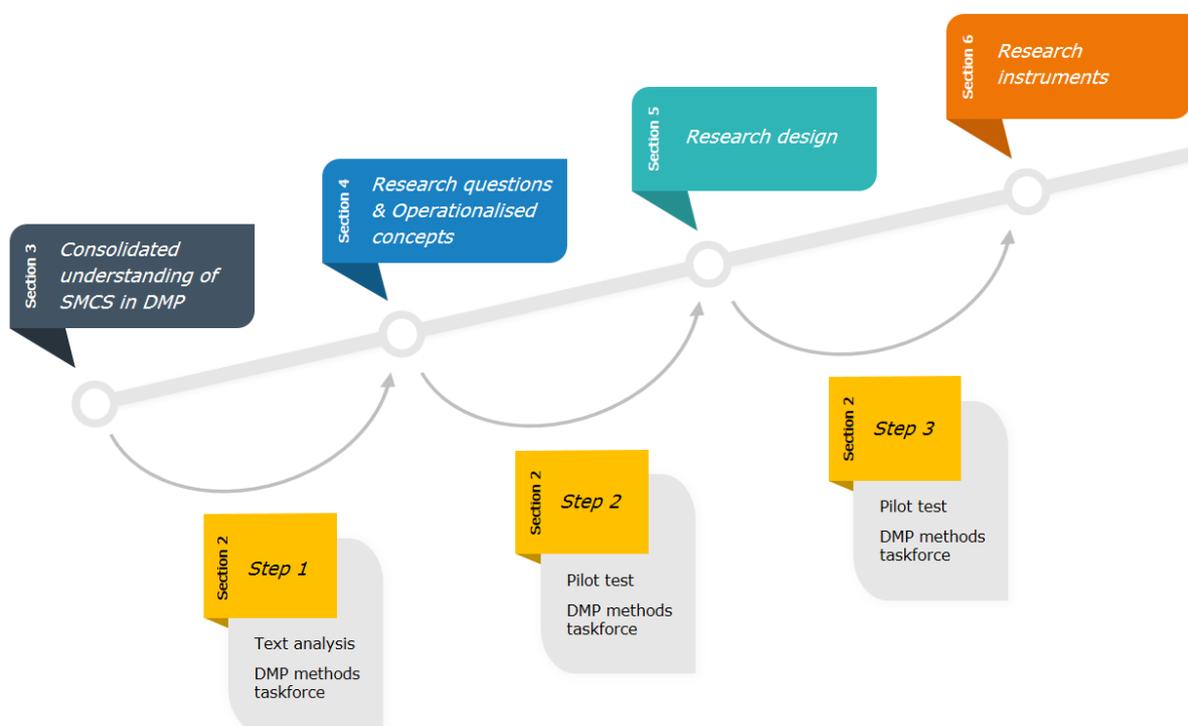
Finally, in Section 6, we provide an overview of the research instruments designed for the cross-case assessments. These research instruments (surveys and interviews) will be applied to all the five LINKS cases and support the comparative ambition embedded in the cross-case assessments.

In the following section (Section 2), we present how this methodology was developed through various phases of consultation in the LINKS consortium.

2. TOWARDS A DMP METHODOLOGY

In the following sections, we present how this methodology was created. The entire process is illustrated in Figure 2 below and consists of three overall steps that connect the four building blocks of the DMP methodology. These design steps consisted of a systematic process established to achieve a trustworthy and transparent translation of D3.1 conclusions and outcomes to concrete research instruments for the CATs to implement locally. The first step is linking D3.1 with concrete research questions and concepts. This was done through an updated literature review of the texts included in D3.1 as well as through consultations processes with LINKS consortium partners. The next step was to link the research questions with concrete research principles. This was done through consultation processes with LINKS consortium partners and a pilot study that tested part of the planned approach (the cross-case assessments). Finally, we linked the research design with concrete research instruments. This was also done through consultation processes and pilot testing that assessed the feasibility of the design and suggested methods.

Figure 2: Developing D3.2



Source: Authors' contribution

2.1 Text Analysis

We analysed all research papers included in 3.1 a second time focusing on their applied methodology. For the additional analysis carried out for this methodology, Nvivo12 was used as a support tool to scrutinise abstracts and identify study design, context, and type of disaster for each research paper. The literature was subsequently classified based on these parameters. This systematic allocation was an iterative process, during which the research design and method categories were changed multiple times in an attempt to match papers in the most accurate fashion.

2.2 The DMP Methodology Taskforce

For the DMP methodology, a designated DMP methodology taskforce was established to ensure a broad consultation process across LINKS consortium partners and, in particular, with the case assessment teams (CATs) responsible for implementing the methodology presented in this document. This taskforce assisted in all design steps and a broad selection of members of the LINKS consortium took part in selecting and developing the methodology.

As specified in D5.1, a practitioner taskforce (PTF) was established in September 2020 to explore the needs, gaps and challenges of the practitioners included in the LINKS consortium and preliminary results are included in D5.1. The PTF meeting notes and the main findings of all these activities provided a preliminary understanding of the research contexts for the LINKS cases. Concretely, they were used as background information for the first meetings held in the methodological task force.

The DMP methodology taskforce operates through three layers of consultation:

- The first layer comprises a core group consisting of representatives from WP3 (DMP knowledge domain) and WP6 (case-based assessments). This core group was responsible for coordinating, designing and writing this deliverable and was thus involved in all steps of creating the methodology;
- The second layer consist of regular consultations across the WP2-4 teams to ensure coherence and coordination between the three LINKS methodologies. All methodological buildings blocks were discussed and decided upon for the development of this methodology;
- The third layer consists of consultations with CATs from all the LINKS cases. The original purpose was to match local concerns and needs with knowledge established in D3.1. Furthermore, the aim was to understand the overall needs for the methodology, to test research questions and to listen to wishes for the DMP research design.

While the DMP methodological taskforce was designed to support DMP methodology presented in this document, the taskforce will continue to operate through the case-based assessments. It ensures a bridge between the DMP knowledge base team (WP3) and the CATs (WP6).

2.3 Pilot Test

To test some of the main methodological ideas presented in D3.2, a small pilot test was carried out with assistance from the Danish CAT working on the Copenhagen flood scenario. The pilot test had two overall aims:

- First, to test the applicability of the DMP Resilience Wheel as an operationalising tool for selecting themes and focus-areas for interviews in the contexts of the LINKS cases;
- Second, to test the interview format as a core approach for collecting data across all LINKS cases.

The themes provided in the conceptual tool for assessing institutional resilience developed in D3.1 (the drivers of the DMP Resilience Wheel) were used to select interview topics and to structure the pilot interviews with practitioners.

The pilot test was carried out in March and April 2021 and included seven professionals from Frederiksberg Municipality (3) and Greater Copenhagen Fire Brigade (5). All pilot study participants hold different positions in the two organisations, though they all have responsibilities of communicating to citizens concerning emergency/disaster prevention and response and they are appointed with significant responsibilities on the management and communication of flash floods. Their tasks range from a high degree of technical and infrastructural expertise, insights into media and communication in general, social media and crisis and emergency management. They cover both perspectives of preparedness and response in different variation and thus match the characteristics of the research planned in this methodology (see Section 4 and 5).

3. INTEGRATION OF D3.1 AND EXISTING LITERATURE ON SMCS IN DMP

This section has two main contributions to the development of the DMP methodology:

- First, the DMP methodology aims at addressing the gaps in the existing knowledge that have been identified in D3.1. Consequently, a first step is to link the findings from D3.1 (the DMP knowledge base) with the further research that we plan to conduct within the DMP knowledge domain;
- Second, to present the findings of a deeper engagement with the research designs and methods used in academic studies of SMCS in DMP building on the review of research conducted in D3.1.

Together these two elements provide a basis for a systematic positioning of the DMP methodology in both *theoretical* and *methodological* knowledge of SMCS use in DMP. First, we start with the main conclusions drawn in D3.1 and how they guide the future work carried out within the DMP knowledge domain. Then we analyse the same academic literature used to inform D3.1, however, in a different light. For this deliverable, the focus is on the research designs and methods used in existing research to examine relationships between SMCS and DMP.

3.1 Implications of Deliverable 3.1 for the DMP Methodology

In D3.1 we provided a consolidated understanding of the use of SMCS in DMP. It serves as the initial base for the DMP knowledge domain and addresses how formal institutions and actors increasingly rely on SMCS in DMP and the potentials and barriers associated with this changing technology landscape.

In this context, D3.1 had a threefold objective:

- First, to provide a conceptualisation of resilience in the context of SMCS use in DMP
- Second, to provide a state-of-the-art of the existing academic literature linking SMCS with DMP;
- Third, to map existing formal governance processes in relation to SMCS and disasters across three levels of governments: global, European and national.

Building on this consolidated understanding, D3.1 points to two 'analytical turns' important for future research on institutional resilience. Furthermore, both of these 'turns' will help close major gaps in the existing knowledge on SMCS platforms and DMP and, to certain degrees, inform the LINKS Framework.

- First, our literature review shows a substantial gap in our knowledge about the interaction between people, power and technology. Research should focus on the power shifts that

these technologies produce, the contexts in which they are supposed to be applied, as well as on the social and cultural conditions that co-produce the outcomes of SMCS use in DMP. This turn will help us shed light on some of the major knowledge gaps on the effects of SMCS in DMP that reappear in current empirical studies and requires a strong focus on the institutional uptake of the SMCS platforms in question;

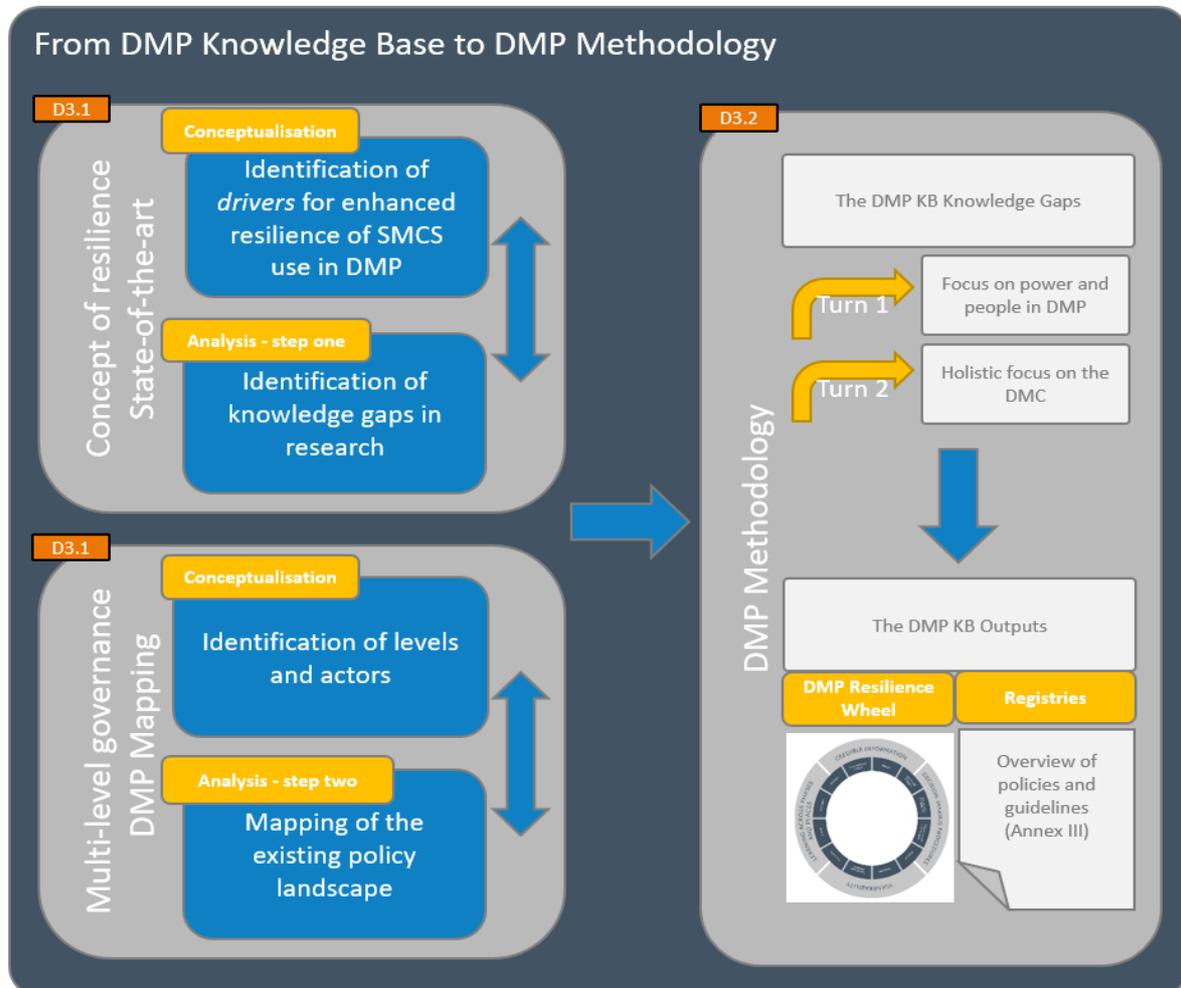
- Second, most studies have an almost exclusive focus on preparedness and response and the role of SMCS in these particular phases of the disaster management cycle (DMC). To strengthen resilience, we suggest a turn from preparedness and response to a more holistic approach including all four phases of the disaster management cycle. Understanding resilience as the capacity to respond to absorb disasters as well as the capacity to formulate alternative pathways moving forward, the varying capacities to reduce and deal with risk are conditioned by decisions taken across all four phases of the DMC. Closing this knowledge gap includes a focus on and inclusion of different actors and organisations who are involved with longer-term planning affecting overall DMP.

Taking each of these turns seriously, this methodology aims at setting the stage for research activities for the first LINKS case-based assessments by promoting a focus on how DMP processes play out (uptake and application) and whom to focus on (inclusion of actors and organisations across DMC) in the context of SMCS. Combined with the results from the co-design activities (the methodologies taskforce), they inform the research questions and aims presented in Section 4. As explained in more details in Section 4, the further exploration of these two overall turns is done through the operationalisation of the DMP Resilience Wheel, a tool introduced in D3.1 to conceptualise institutional resilience in the context of SMCS use in DMP. The Wheel and its drivers for institutional resilience can be found in Annex I to this document.

Moreover, the registries developed within D3.1 serve as an initial mapping of the existing policies and guidelines informing SMCS use in DMP. These registries will be further developed as part of the first case-based assessment and through continuous desk research conducted by the WP3 team. The task associated with creating a comprehensive landscape of SMCS use in DMP is carried out together with WP4, which supports the registries with an overview of the existing DCTs (the DCT-schema). The output of this joint effort of mapping SMCS in DMP is named the DMP-landscape moving forward with this deliverable.

An overview of the position of the DMP knowledge base in the DMP methodology is presented in the figure below.

Figure 3: D3.1 and the DMP Methodology



Source: Authors' contribution

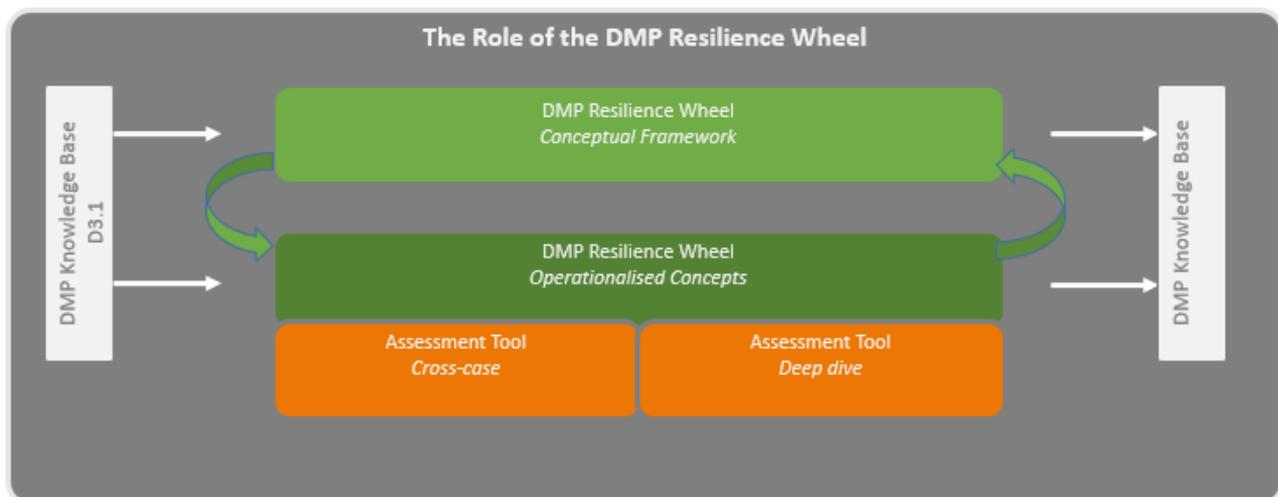
In a practical sense and taking into account diversity across the cases, the DMP Resilience Wheel supports the methodology and identification of the case-specific potentials for improving SMCS use in DMP in the context of each case. It links existing research on the topic with the experience and practice across the five case scenarios and provides a tool for further narrowing down the needs and questions to be addressed. Simultaneously, we aim at developing and adapting the DMP Resilience Wheel further into a supporting tool for assessing and addressing the potential and challenges associated with SMCS use in DMP.

Consequently, the DMP Resilience Wheel serves two overlapping yet separate goals to improve the DMP knowledge base:

- In the short term, the purpose of the Wheel is to support the development of a dedicated DMP methodology where the Wheel will be used to operationalise institutional resilience across the five LINKS case settings;
- In the long term, the DMP Resilience Wheel may be turned into an actual and applicable practical tool for disaster management organisations that maps, guides and measures their approach to integrated and improving SMCS use in DMP.

These two roles are illustrated in Figure 4.

Figure 4: Role of the DMP Resilience Wheel for the DMP Knowledge Base



Source: Authors' contribution

Moreover, all the collected policies and guidelines that we identified in D3.1 are brought into further discussions enabled by the research design and research instruments presented in this methodology and the methodology presented in D4.2. This includes a discussion on whether these policies and guidelines are visible in policy and practice and the extent to which there is a need for them to be further adapted and adjusted to fit the needs of the LINKS Community. Consequently, the results and insights from both analyses presented in D3.1 are operationalised in this methodology and the following assessment phases before they are tested, adapted or adopted and translated into learning materials integrated into the LINKS Framework.

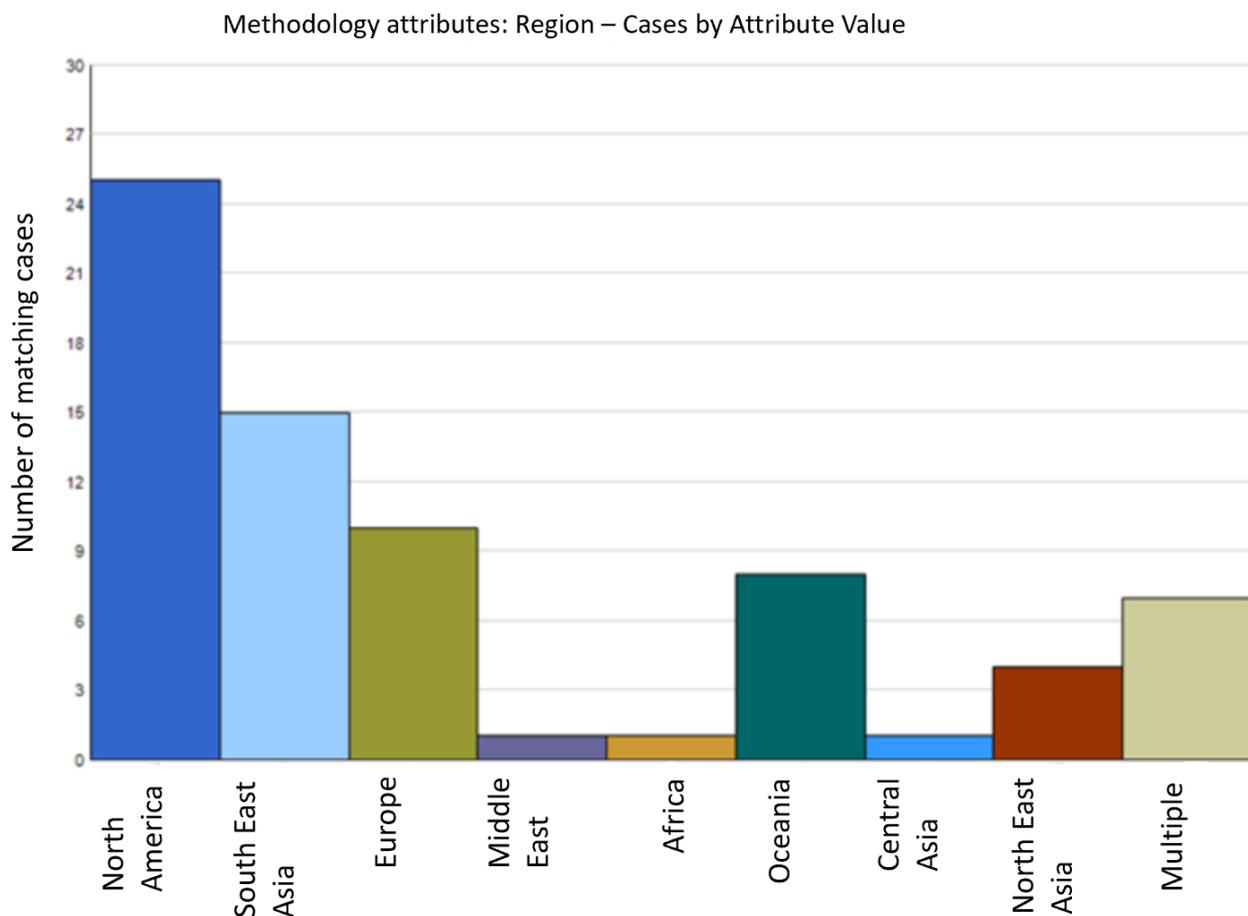
3.2 Methodologies in Existing Academic Research

While D3.1 presented the thematic insights provided by the more than 140 papers and book chapters we analysed for the DMP knowledge base, research designs and methods were only briefly

reflected upon. This section takes a deeper look into the methodological approaches that constitute current research on SMCS in DMP. This methodologically oriented analysis provides transparency and an extra layer of reflection that enables us to critically assess and review existing research as well as to position the potential contribution of the DMP methodology within this larger field of study.

We argue in D3.1 (p.26) that most research is based in a North American context, which is illustrated in Figure 5. Studies are also carried out across South East Asia, Europe and Oceania whereas only very few studies investigate SMCS and disaster governance in the Middle East, in Africa and Central Asia. Such a dominant focus on particularly North American and South-East Asian contexts in the literature creates a bias towards the types of disasters and SMCS platforms these specific contexts tend to experience and use (e.g. hurricanes and Twitter in the context of North America).

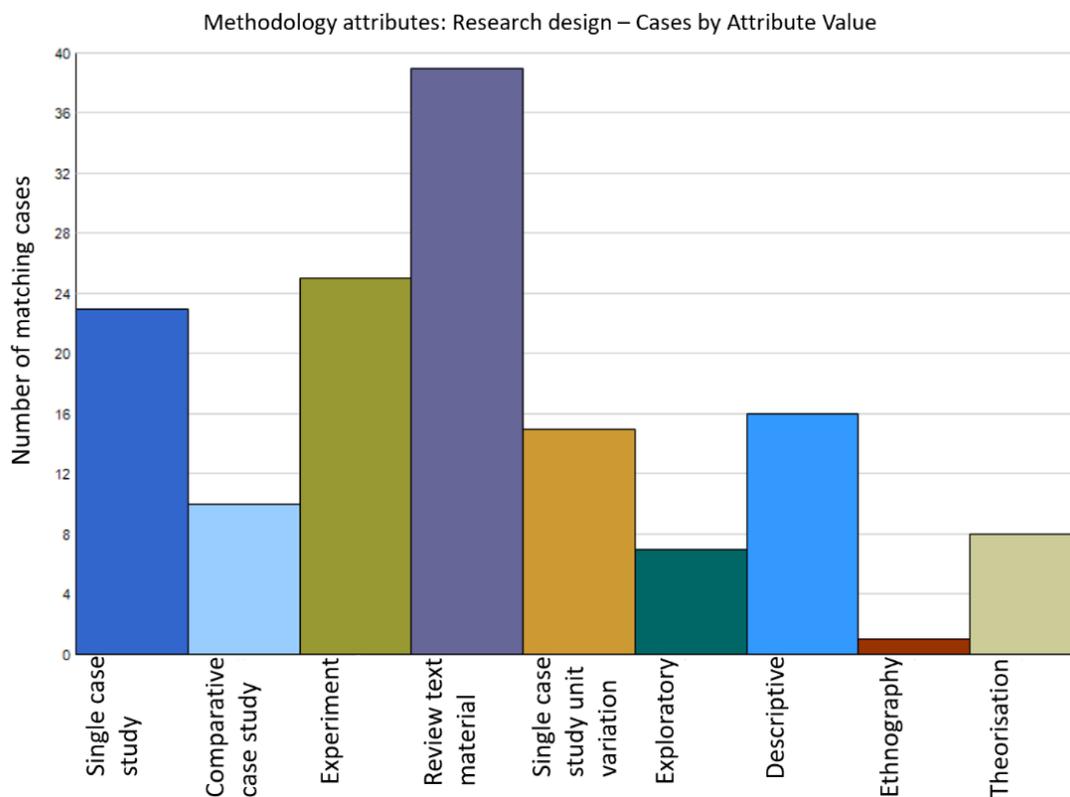
Figure 5: Geographical Focus in Research on SMCS in DMP



Source: Authors' analysis of D3.1 literature

The majority of the research is based on single case studies of a particular platform (social media, crowdsourcing or crowdsourcing through social media) used to prepare or respond to particular events (e.g. Hurricane Sandy). The few cross-country and multiple case studies show the potential of such approaches and the need for caution when applying insights from existing studies to speak broadly about SMCS in DMP – an issue that we thoroughly consider in the context of the LINKS case-based assessments in Section 4 and Section 5. Figure 6 below provides a visual overview of the research design trends identified in the analysed academic literature.

Figure 6: Distribution of Research Designs in studies of SMCS in DMP



Source: Authors' analysis of D3.1 literature²

² The categories included in Figure 6 cover the following:

Case study. Single: bounded study of a specific phenomenon or entity. With unit variation: study of different sub-units of the case. Comparative: Study of multiple bounded cases in comparison.

Text analysis: Review: archive studies, scoping reviews and systematic reviews. Theorisation/commentary: Building a critical argument based on existing theory and concepts.

Experiment: Testing a SMCS tool. *Descriptive*: describing a SMCS tool. *Exploratory*: Investigation of emerging developments of SMCS use in DMP. *Ethnography*: Thick descriptions of particular cultures, societies or communities.

A large majority of data sources are of secondary nature, essentially interpreting, analysing, or summarising text material (e.g. research, reports). More primary research is needed to increase the provision of raw information and first-hand evidence. Another common research design is the experimental approach where technology systems and applications are designed, developed, and tested. The third most frequent research design is the single case study providing an in-depth understanding of a particular case, often a specific disaster or country. A limited number, around one-third, of the single case studies include a unit variation, meaning that DMP is investigated across different levels or sectors, thus allowing for comparison of outcomes within a specific context.

The few multi-sited and comparative studies show the potential of such approaches and the importance of understanding SMCS within greater socio-political contexts and the difference between these. Research that wants to take the two suggested 'turns' seriously will thus have to consider comparative and multi-sited approaches and in-depth analysis of the interaction between phases of activities related to long-term recovery and prevention. The options to provide new insights on the SMCS/governance nexus is, without doubt, many and with large potential to bring important insights for the use of SMCS in policy and practice.

4. RESEARCH QUESTIONS AND OPERATIONALISATION

This section presents the research questions (RQs) that guide the development of the first version of the LINKS Framework and the first round of case-based assessments. The section also reflects upon how these questions are investigated through a set of operationalised concepts identified in the DMP knowledge base (D3.1). This section provides:

- Overarching RQs guiding the research conducted as part of the first round of case-based assessments within the DMP knowledge domain (Section 4.1);
- A process of operationalisation through which key DMP concepts integral to the proposed RQs become applicable for empirical investigation (Section 4.2).

Together, the RQs and the operationalised concepts guide the further research design of the DMP methodology (Section 5) and ultimately the research instruments applied in the case-based assessments (Section 6).

4.1 Overarching Research Questions of the DMP Methodology

The overall purpose of all the LINKS knowledge domains is to explore and consolidate knowledge on **how the use of SMCS can be strengthened in diverse social (DRPV), institutional (DMP) and technical (DCT) landscapes**. While many of these aspects interact, the main focus of this methodology is to explore the institutional aspects of this resilience-building aim.

Recall from D3.1 that the DMP knowledge domain focuses on the institutional dimensions of resilience and that we define institutions as the rule-like governance structures that guide human behaviour and social interaction (Hodgson, 2006; Scott, 2001; Tyler & Moench, 2012). Institutions are thus relatively stable structures that reduce uncertainty in decision-making and maintain continuity of social order (Scott, 2001; Ostrom, 2015). Institutions are both formal and informal and important because they are determinants of collective security, vulnerability and resource allocation (Adger, 2000a; Pelling, 2010). To narrow this scope down further, we focus on *formal institutions* or what Scott (2001) characterises as the regulatory institutional notion and how these formal institutions interact with technology systems, here SMCS, for improved disaster resilience. Formal institutions prescribe how agents such as a disaster risk management organisation should behave following regulations, policies, official guidelines, procedures and organisational standards. As such, formal institutions emphasise conformity to legal and formally articulated procedures and organisational infrastructures, which in turn create legitimacy and trust in certain processes and practices (Scott, 2001). This explicit focus on institutions provides insight into barriers in policy and practice in applying and implementing the use of SMCS in the management of disasters.

Consequently, this first DMP methodology aims to *describe* and *explore* such formal institutional infrastructure across several sites in a European context. Following the results of D3.1, the DMP methodology presented in this document has two overarching objectives:

- First, to enable a continuous mapping of the formal governance processes in relation to SMCS and disasters within the local institutional context of the LINKS case assessment countries;
- Second, to create a methodology that allows to critically engage with the suggested analytical turns, theoretical assumptions and conceptual frameworks provided in the DMP knowledge base. This includes the further exploration of the four essential drivers for institutional resilience identified in D3.1.

Having these two objectives in mind, we ask:

- **How are European disaster risk management organisations applying social media and crowdsourcing in disaster management processes across the phases of the disaster management cycle (RQ1)?**
- **What are the limits and potentials of this application associated with institutional resilience (RQ2)?**
- **Following the two first questions, how can the application of social media and crowdsourcing in disaster management processes be further strengthened (RQ3)?**

The first question aims at creating a comprehensive overview of the actors that apply SMCS in DMP as well as the institutions that guide these complex governance processes. It thus speaks directly to the second major knowledge gap identified in D3.1 where we argue that most studies have an almost exclusive focus on response. To understand the potential of SMCS to strengthen resilience, we thus argue for a methodology that includes all four phases of the DMC.

Because of our limited knowledge on how DMOs apply SMCS in DMP, we suggest a descriptive and explorative analysis of SMCS in DMP that helps us develop an overview – *a DMP-landscape* - of institutions governing SMCS use across the DMC. Besides, covering the formal institutions, as initiated in the first version of the DMP knowledge base (the registries), the DMP landscape will visualise DMOs, practices, experiences and scenarios in which SMCS are successfully applied in DMP. The registries developed within D3.1 serves as the first step of this mapping of the existing knowledge on SMCS regulations and guidelines in DMP.

The first research question, and its long-term objective of creating a DMP-landscape, is strongly interconnected with the DCT knowledge domain and our common aim of understanding SMCS application by DMOs (see Figure 7 and 8 below and D4.2). But the domains differ in a crucial aspect. While the DMP domain is mainly interested in the formal governance processes that steer the application of SMCS in DMP, the DCT domain focuses heavily on the technical aspects of this

application. The interconnectedness of the two domains is further illustrated by the development of a DMP-landscape through the DMP knowledge domain and the development of a DCT-landscape in the DCT knowledge domain. The development of the two landscapes will be closely coordinated and eventually merged to provide a fully consolidated overview of SMCS in DMP.

The second question aims to explore the meaning and experiences associated with the use of SMCS in DMP and calls for an explorative in-depth approach to investigate the contextual conditions of disaster governance that shape – and are being shaped by – the use of these new technologies and processes. By asking this explorative question, we get one step closer to understand the potential impact of SMCS in DMP in both theory and practice. Embedded in the second research question is a wish to understand the techno-political conditions that characterise SMCS in DMP. This second research question thus aims at filling the first major knowledge gap identified in D3.1 by being explicitly sensitive to the changing dynamics between DMOs and people. Placing people and power at the centre for analysing SMCS in DMP relates directly to key questions explored in the DRPV methodology (D2.3) as both methodologies are interested in understanding the extent to which the use of these new technologies by DMOs is sensitive to diverse groups and different risk perceptions (see Figure 7 below).

The third question then aims to provide recommendations for how disaster governance can be strengthened through the use of SMCS in DMP. The answer to this question is provided by combining the descriptive and explorative ambitions of the two first research questions.

As indicated in the above text, the three knowledge domains are strongly interconnected. And while the DMP knowledge domain focuses on institutions, the research questions guiding the first round of assessment will also generate findings of interest to the other domains. These overlapping interests are illustrated in Figure 7 below.

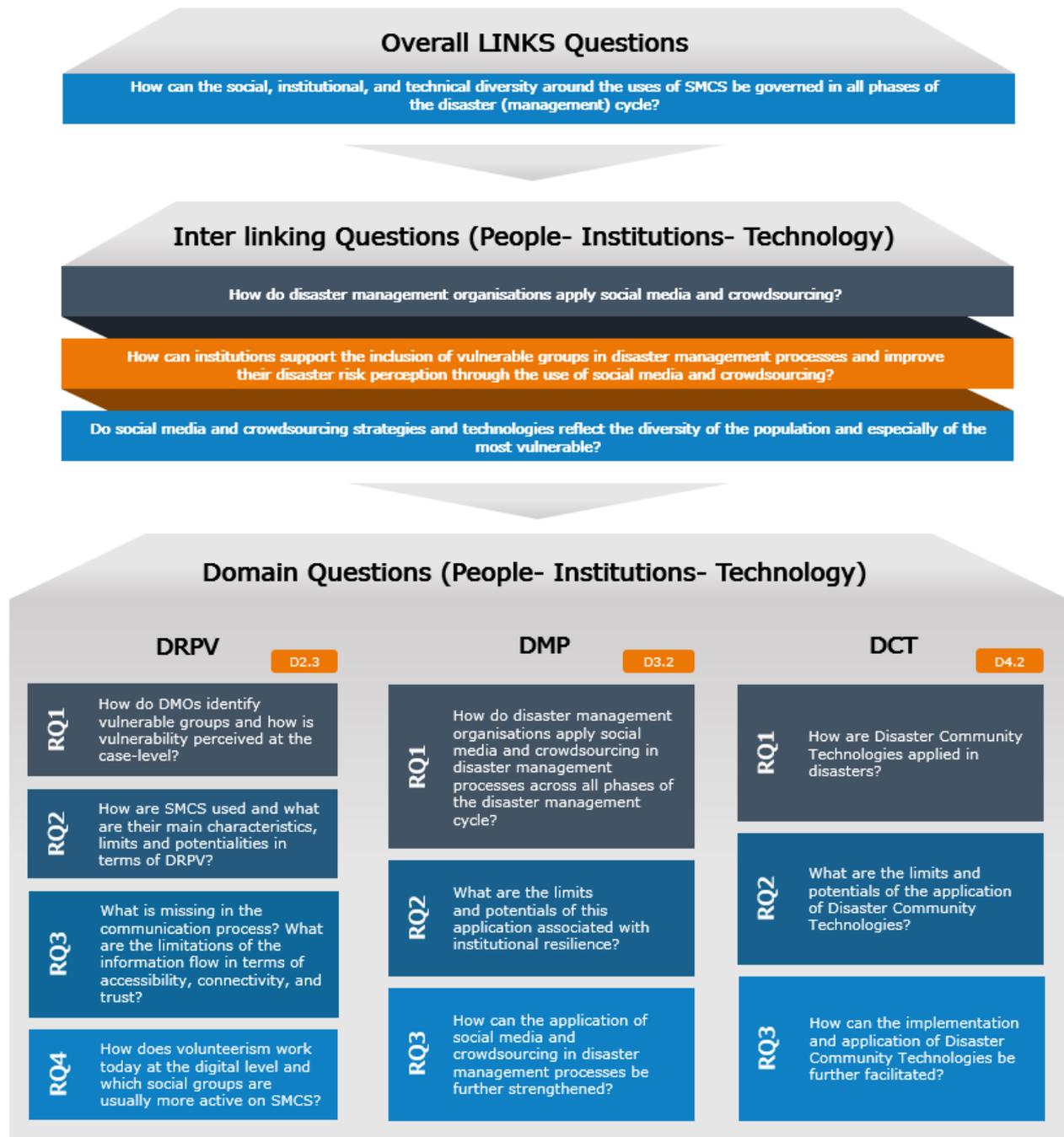
Figure 7: Inter-linking Research Questions



Source: Authors' contribution in collaboration with WP2 and WP4

This next figure (Figure 8) summarises all the research questions presented across the three methodologies (DRPV, DMP, and DCT). It provides an overview of how different layers of research questions feed into achieving the overall objective of the LINKS project. While these are not strict hierarchies, there are a number of cross-cutting questions that will be approached from the respective domains.

Figure 8: Overview of Research Questions for the First Case-Based Assessments



Source: Authors' contribution in collaboration with WP2 and WP4

4.2 Operationalisation: Moving from Research Questions to Case-Based Assessments

A key concern when designing a methodology is how to best link concepts with empirical observations (Adcock & Collier, 2001). In other words:

- How we describe the application of SMCS by DMOs across DMC in practice;
- How we explore the experienced potentials and benefits of this application associated with institutional resilience (RQ2).

For the DMP knowledge domain, the key concepts to make this connection between the research questions and the cases-based assessments were thoroughly developed in D3.1. The central conceptual framework of the DMP knowledge base, the DMP Resilience Wheel, is applied as an operationalizing tool that links the suggested analytical turns with what we will explore on the ground through the case-based assessments. The Wheel translates how complex theoretical concepts such as “decision-making”, “vulnerability”, “credibility” and “learning” resonate with empirical specificities. The Wheel is thus paramount for ensuring the connection between theory and empirics within the DMP knowledge domain and is actively used in both designing (Section 5) and conducting (Section 6) research across the five LINKS cases.

The Wheel is illustrated in Figure 9 and all included concepts are thoroughly described in Section 4 in Deliverable 3.1 and Annex I in this deliverable.

Figure 9: The DMP Resilience Wheel



Source: Authors' adaption based on Tyler & Moench (2012) and the Rockefeller Foundation & Arup (ny).

4.2.1 Operationalisation Approach

We approached this operationalisation in three ways:

- In D3.1 we started this process by assigning each of the four resilience drivers with concrete characteristics for each driver (see Annex I);
- We validated the four drivers and sub-characteristics through the methodological taskforce to ensure that the theoretical concepts resonated with local practices across the LINKS cases and that these concepts can be used actively in designing and applying the research instruments suggested for the methods (Section 6);

- We consulted with the CATs in each case country and mapped out key questions across the themes to directly bridge the most meaningful concepts provided by the DMP Resilience Wheel with local concerns and needs (Annex II).

To the first point, the relationship between concepts was already developed within D3.1 and illustrated in the Resilience Wheel. The DMP Resilience Wheel is thus an explicit attempt to link the overall goals of the LINKS DMP knowledge domain (increasing institutional resilience) with a systemised approach to exploring these goals. Consequently, the four drivers reflect central concepts for SMCS use in DMP at its broadest level while providing key definitions of how we understand broad and abstract concepts within LINKS. The inner circle of the wheel then represents the characteristics of the four aggregated drivers.

To the second point, the question of operationalisation is addressed by asking what is needed to capture the use of SMCS in DMP across the LINKS cases. This process was described in detail in Section 2 but entailed a series of workshop sessions where local concerns from the LINKS cases were linked to the DMP Resilience Wheel. The very purpose of the DMP Wheel was for it to be a tool that allowed discussion on limits and potentials among local research teams and practitioners and for them to introduce new conceptual ideas during this process. While this process will continue during the case-based assessments, most of the drivers and their characteristics resonated well with the CATs. We identified a few issues concerning how to distinguish between the different categories in practice. This speaks to the need for refinements of the characteristics included in the Wheel (see Annex I).

Finally, and to the third point, we took contextual specificities into account when designing the methodology. This is a concern that arises when concepts turn out to be valid in one context and invalid in another (Adcock & Collier, 2001). While strong contextual sensitivity may lead to limited application of the concept outside the context itself, too abstract and universal applications of concepts and theoretical ideas may be deemed irrelevant and misleading when applied to particular cases. This paradox is paramount to the LINKS project where we wish to compare and describe SMCS application in DMP across five very different settings. Consequently, there is a chance that the Wheel and its conceptual categories are understood differently across the cases, are seen as irrelevant from the CATs point of view or that the Wheel simply does not capture particular characteristics or drivers present in certain contexts. As such, an inductive approach to validating the concepts are important to ensure the longevity of the Wheel; both as a tool for local DMP resilience assessments and the Wheel as a methodological tool for the case-based assessments.

To overcome this issue of local specificity, we decided that sensitivity to the local context would help us adjust the characteristics (as described above) as well as linking local needs and concerns directly with the conceptual drivers described in the Wheel. For this purpose, we engaged the CATs

through the methodological taskforce and mapped out the main questions that CATs perceived as relevant for the local case assessment. We created a set of wheels with localised questions (one for each of the five cases), which are all included in Annex II of this document.

4.2.2 Outcome: Linking the Wheel with Local Specificities

This extensive mapping exercise proved to be valuable in several aspects for the further development of the DMP Resilience Wheel as a tool for assessing institutional resilience in the technology/governance nexus, but it also supported our understanding of the particular contexts of the case-based assessments important for the research design.

First, we found that similar needs and concerns in relation to SMCS usage in DMP were expressed across all CATs and that these directly relate to the characteristics of each driver. Among issues related to credible information, successfully managing fake news, ensuring reliability of information as well as user safety and privacy, and developing effective information dissemination strategies are major preoccupations. Regarding decision-making procedures, improving coordination and communication across actors, increasing inclusion and participation of citizens, strengthening social media data management, and preventing or mitigating technical constraints such as lack of time and resources or legal barriers to SMCS utilisation, are priorities. Key areas of focus in relation to institutional sensitivity to vulnerability include raising awareness, identifying vulnerabilities and vulnerable groups, ensuring that communication material is inclusive, accessible, and specifically targets vulnerable groups, providing tailored support and protection services for vulnerable groups, addressing digital isolation and unintended consequences such as causing panic or framing vulnerable groups. Lastly, promoting continuous learning, sharing best practices, establishing feedback and evaluation system, training authorities, and integrating the use of SMCS beyond emergency response are the main objectives associated with learning across DMC phases.

A detailed overview of the main overlapping themes is found in Table 1 below.

Table 1: Emerging Themes across the Resilience Wheel

Drivers/CATs	Denmark (flooding)	Italy (earthquake)	Germany (drought)	Germany (terrorism)	Netherlands (chemical spill)
Credible information	Management of fake news, User safety and privacy, Information reliability, Information dissemination	User safety and privacy	Information dissemination	Management of fake news, Information reliability, Information dissemination	Transparency paradox
Decision-making procedures	Inclusion and participation of citizens, Coordination across actors, Data management	Inclusion and participation of citizens, Coordination across actors Technical, constraints	Coordination across actors, Data management, Communication across actors	Coordination across actors, Data management, Technical constraints	Coordination across actors, Communication across actors
Institutional sensitivity to vulnerability	Awareness raising, Inclusive and accessible communication, Vulnerability assessment, Support and protection of vulnerable groups	Inclusive and accessible communication, Vulnerability assessment	Awareness raising	Inclusive and accessible communication, Vulnerability assessment, Support and protection of vulnerable groups, Unintended consequences	Awareness raising, Inclusive and accessible communication, Digital isolation
Learning across DMC phases	Continuous learning, Best practice sharing, SMCS beyond response	Feedback and evaluation, Authorities' training	Continuous learning, Authorities' learning	Best practice sharing, SMCS beyond response	Best practice sharing, Feedback and evaluation

Source: Authors' contribution

Simultaneously, we found that many of the local concerns were specifically tied to the context. In the German terrorism case, for example, there is an interest to understand how to signal to the general public when authorities have the situation under control (see the Wheel in Section 5). In

some contexts (e.g. terrorism and industrial hazards), local DMOs have experience with actively using SMCS in DMP and need better evaluation infrastructure. In other contexts (e.g. drought), the very usage of SMCS in DMP seems new. We thus begin from different entry points in each of the LINKS case assessment localities, which affects the overall research design as well as the topic of research in each context.

Second, all CATs focused on certain aspects of the Wheel. Whereas the Italian CAT was very focused on vulnerability and institutional sensitivity towards diversity, rights and entitlements through SMCS usage, the German drought-focused CAT was mostly concerned with questions related to decision-making procedures. The same holds true for the Dutch industrial hazard-focused CAT who was mostly concerned with questions related to the coordination between public and private authorities. This speaks to the fact that organisational affiliation is important for how you read the Wheel. It may not be surprising that Save the Children in Italy is concerned with the vulnerability and empowerment of children and a first responder from a fire brigade is concerned with questions of efficiency, coordination and inclusion. Nevertheless, it points to the dynamic potential of the Wheel as a tool for assessment as well as its ability to point towards “blind spots”.

Finally, the context-specific mapping created reflections around the difficulties of fitting complex realities into particular categories. It thus made us aware of the need to further specify the boundaries between the characteristics of each driver as well as emphasising the most important aspects of each of these characteristics. These are elements that we will consider in building the research instruments and in re-designing the Wheel as an assessment tool for organisations (see Figure 4).

4.2.3 Implications for the Case-based Assessment

By using the DMP Wheel as an operationalisation tool, it made it clear that we need a flexible approach going forward with the DMP methodology. On the one hand, such an approach needs a comparative component that allows us to explore the similarities across the different contexts that, in the longer term, allows us to produce generic recommendations for SMCS application in DMP (e.g. developing the characteristics in the DMP Resilience Wheel). On the other hand, it also revealed the need for a methodology, which is sensitive to the contextual specificities and which takes local experience and practice as its starting point.

As such the operationalisation process manifests directly in the research design that we present in the next section. Here we suggest a two-pronged approach that builds on a) comparative and multi-sited design principles (cross-case assessments) and on b) grounded design principles where the locality itself is taken as the departure point (deep dive assessments).

In addition, the many insights that we collected during the operationalisation process support the choice of research instruments (Section 6) and their further development as we move beyond the methodology (Section 6 and Section 7).

5. RESEARCH DESIGN FOR THE DMP METHODOLOGY

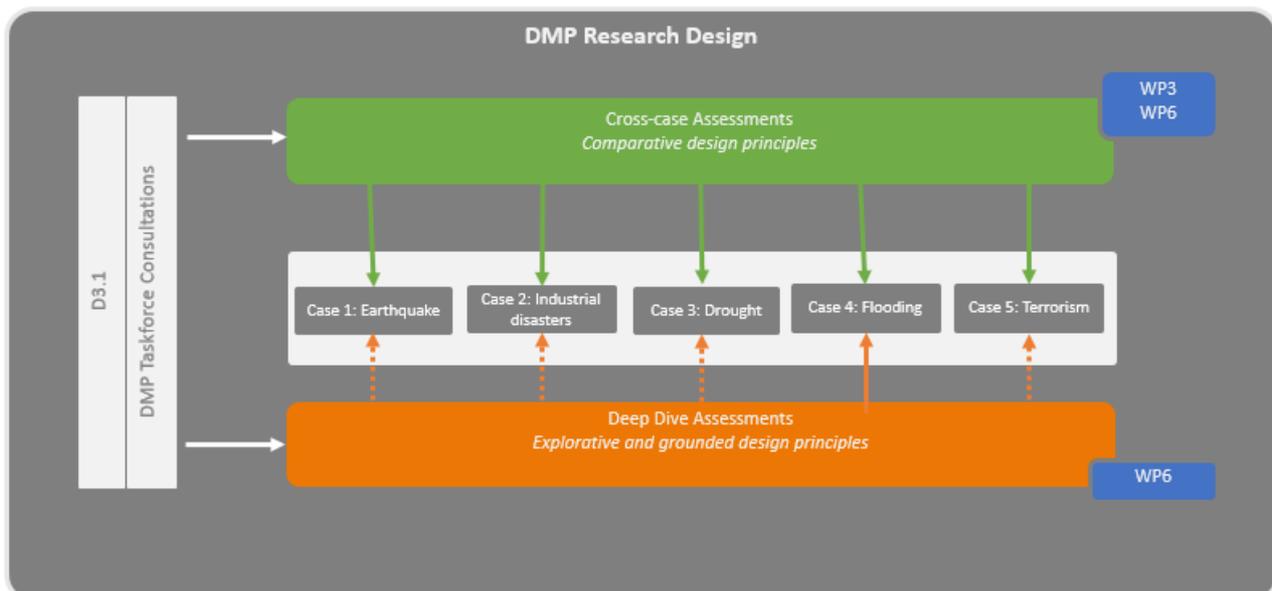
Building directly on the research questions and the operationalisation process described in Section 4, we call for a flexible research design with both deductive and inductive design principles. We need a comparative multi-sited component that systematically seeks to answer the DMP research questions across sites (see also Section 3 for support of this argument). This comparative and multi-sited design allows us to describe the current use of SMCS in DMP across the DMC (RQ 1) and to explore the challenges and opportunities associated with this application (RQ2) across diverse locations. Simultaneously, we need a design, which is sensitive to the contextual specificities and which takes local questions and concerns as its starting point.

To address the needs of both comparing and going in-depth, we adopt a two-pronged approach:

- A *cross-case assessment* designed around comparative multi-sited design principles;
- A *deep dive case assessment* designed around in-depth design principles.

The cross-case assessment is a multi-sited design that allows us to both quantitatively and qualitatively address the research questions by looking at the similarities and differences in policy and practice of the various dimensions reflected in the DMP Resilience Wheel. The deep dive assessment is an in-depth design that allows the CATs to explore certain aspects of the DMP Resilience Wheel in-depth within their local context.

Figure 10: Research Design



Source: Authors' contribution

5.1 The Cross-case Assessments

The cross-case assessments are joint efforts between WP2-4 and investigate the specific knowledge domains across different contexts while exploring interacting themes. The cross-case assessments are thus both an attempt to explore domain-specific questions through a comparative lens and an attempt to explore the interdependent questions cutting across knowledge domains.

For the DMP knowledge domain, the cross-based assessments have the purpose of informing the research questions deducted from the DMP knowledge base provided in D3.1 (See Section 4.1). Subsequently,

- To describe the application of SMCS by DMOs across DMC (RQ1);
- To explore the experienced potentials and benefits of this application associated with institutional resilience (RQ2).

Moreover, the cross-case assessments provide a much-needed opportunity to generate empirical data from more than one context – something which the current literature on SMCS in DMP will benefit from (Section 3).

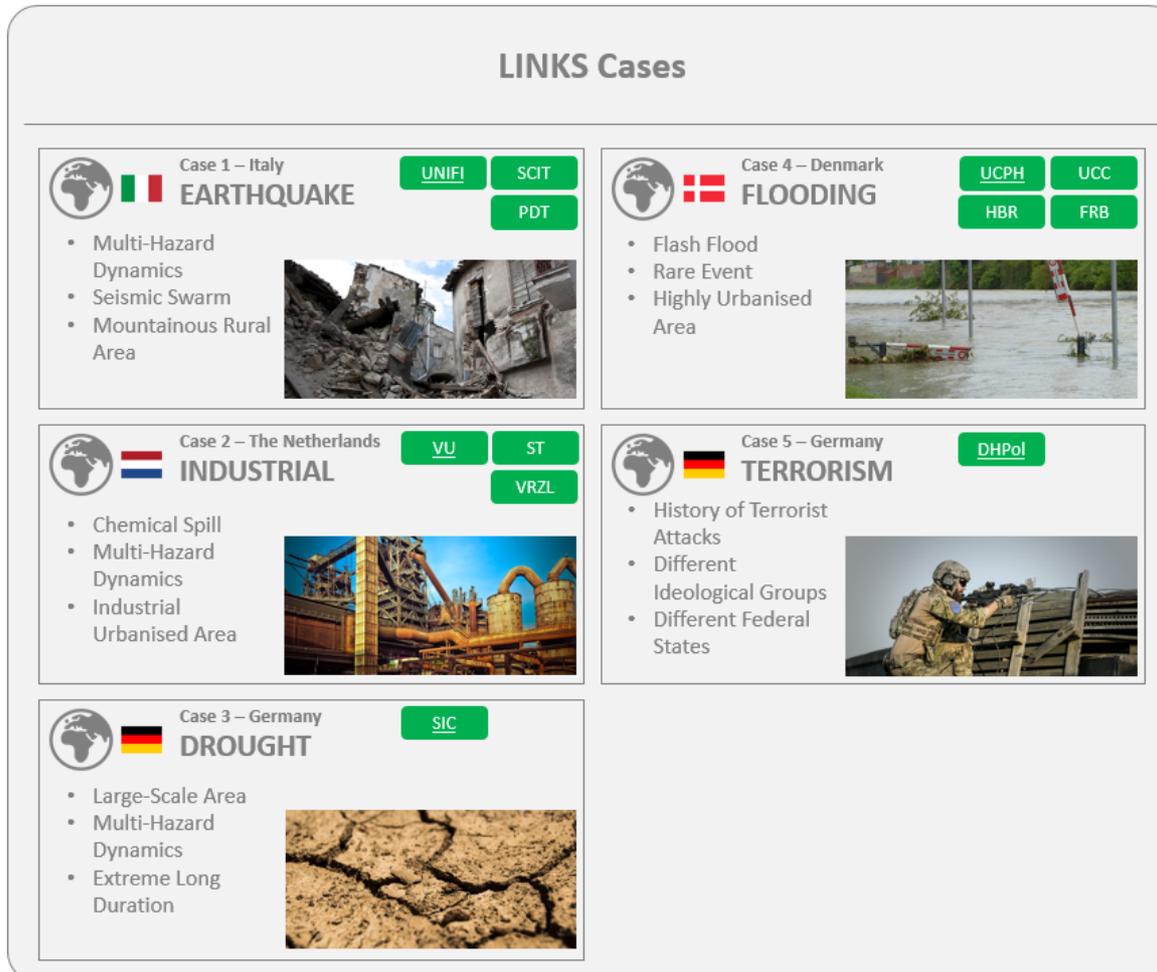
To achieve this we draw on the five LINKS cases, which first and foremost provide sites that we expect to be especially informative and rich in experiences that we can draw lessons from. In other words, the cases have the potential to inform the main DMP research questions (Flyvbjerg, 2006). They provide a basis for elucidating policy and practices of SMCS use in DMP (RQ1), to understand limits and potentials that ultimately can inform key concepts and tools for improved disaster resilience (e.g. the DMP Resilience Wheel) that may have some relevance in other contexts (RQ2).

The five cases are

- Earthquake in Italy;
- Industrial disasters in The Netherlands;
- Drought in Germany;
- Flooding in Denmark;
- Terrorism in Germany.

The LINKS cases represent diverse hazards, geolocations, as well as socio-cultural, demographic contexts, from urban to rural, and finally, socio-economic context. The cases and are illustrated in Figure 11 below.

Figure 11: LINKS Cases



Source: Authors' adaption from the original proposal

A number of methodological challenges are associated with studying institutions and their impacts on disaster governance. A large amount of scholarly work has engaged substantially with challenges of studying institutions and, in particular, the central issue of whether their association with other social phenomena, such as technology and disasters, are endogenous to institutions themselves (Gallagher et al. 2006; Roeder, 2009; Rohrbach 2020). The same issue concerns information technology, such as those used for SMCS, which both shape and constrain how disasters are governed while being outcomes of the ideas and preferences of the actors that design and implement the technologies themselves. This creates a methodological conundrum with implications for the case-based assessments and the extent to which and with what certainty we can trace the impacts of SMCS in DMP (Anderson 2013).

Explorative and case-based research designs and methods, however, provide an approach that favours the engagement with the complex interactions between people, institutions, technology and disaster risk governance and how these play out in different socio-political context within Europe. Factors that are difficult to operationalise in large comparative studies, such as social, historic and hazard-specific, are easier included and accounted for in case studies such as the one suggested in this methodology.

For this reason, the methodology is not designed to provide a strict comparative analysis across the cases but rather to allow for a qualitative multi-sited research approach. Such approaches are well documented in exploratory research (Corley et al., 2013; Grodal et al., 2020). Here the objective is not to generalise the findings across the cases, but rather to create a discussion around potential connections, similarities and differences in light of the diverse contexts in which the research has taken place. A key dimension of the case selection concerned the characteristics of the specific hazard in specific countries. We selected the cases to represent ideal-typical hazard scenarios in those countries, which are theoretically constructed situations capturing empirical realities that, despite variations, show similarities on key aspects that are meaningful for SMCS in hazardous environments and at times of disasters (Eisenhardt & Graebner, 2007; Dooley, 2002). Our selection of ideal-typical scenarios thus enables the generation of insights that are potentially valuable to other situations in similar contexts.

An overview of the most important case features, reflecting the contextual similarities and differences important to the DMP knowledge domain, is provided in Table 8 in Annex IV.

5.2 Deep Dive Case Assessments

The DMP “deep dive” is a particular approach to the case-based assessments that takes the local specificities of each LINKS case-countries as their departure point. The deep dive case assessment can be associated exclusively with the DMP knowledge domain or investigate a theme that cuts across more than one of the LINKS knowledge domains. Consequently, for the DMP knowledge domain, each CAT is invited to develop an in-depth study on gaps and needs identified in the local context, which relates to the themes identified in the DMP knowledge base (D3.1).

Instead of thinking of the deep dive case assessments as studying a case in depth (a noun) as often seen in traditional single case studies (e.g. Yin 2009; Gerring 2008), we think of the DMP deep dives as *casing* (verb) a study. As such, the DMP deep dives are explorations of particular settings where the CATs attempt to answer the open question “what should I treat this as a case of?” (Soss, 2018, p.21). And further to understand how this fits with DMP questions and concepts. This stands in contrast to conventional case-study methods where the case is selected a priori according to its contribution to answering a particular research question. Casing provides a unique grounding in the

context that the CATs operate in and an opportunity to “advance insights, understanding and explanation” by conceptualising the particular, and sometimes surprising, into general insights relevant to the DMP knowledge domain (Soss 2018, p.23).

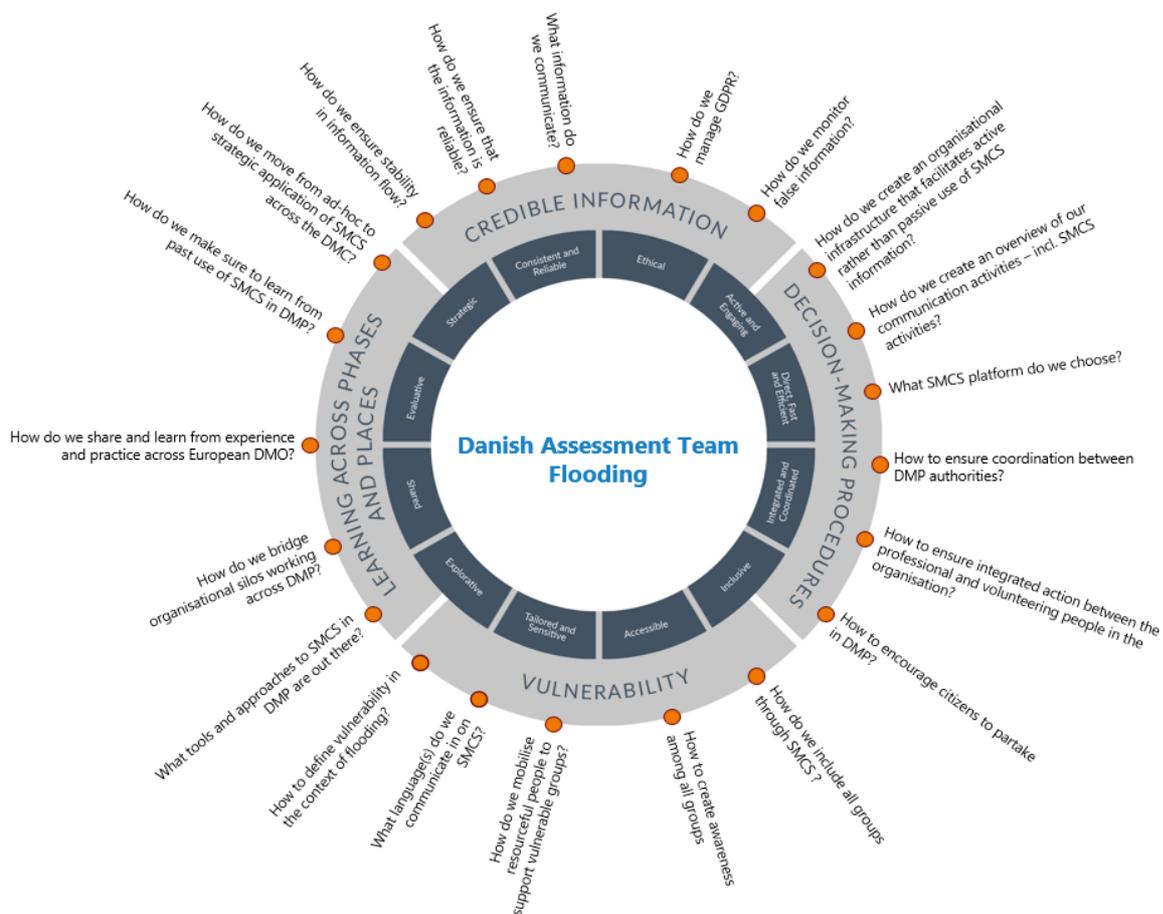
5.2.1 Approaching the Deep Dive Assessments

The strength of the deep dive case assessments is that it takes place in context and provides a unique opportunity to supplement the theoretically informed design (the cross-cased assessment) with something that is truly grounded and potential surprising. The core purpose of this design is to make decisions and collect data with participants and create room for new and unexpected perspectives on DMP. As such, this process is voluntary for the CAT and needs to be initiated locally with support from the DMP knowledge base team (WP3).

This first step of this casing process was initiated while designing the DMP methodology as part of the operationalisation of the DMP research questions and concepts (see Section 4).

First, we used the DMP Resilience Wheel (Section 4) to connect local concerns and questions with the DMP knowledge domain. We mapped local questions, concerns and needs with the characteristics allocated to each of the four resilience drivers. This generated five different case-specific DMP Resilience Wheels: one for each of the LINKS cases. These five context-specific wheels are included in Annex II. An example is provided in Figure 12 below for the deep dive in the Danish flooding case.

Figure 12: Example of Contextualised DMP Resilience Wheel



Source: Authors Contribution

Second, departing from these casings, the five contextualised Wheels now provide an overview of the potential research questions that can be investigated in depth in each locality. This is now up to the local CAT to decide whether they want to continue investigating one or more of these questions

and how they want to approach it. At the same time, the Wheels indicate how local needs and concerns relate to the broader research field associated with the DMP knowledge domain.

Third, each CAT, with support from WP3 is now free to decide if they want to move forward with the DMP deep dives. This can be done by researching themes that cut across the LINKS knowledge domains (e.g. questions of inclusion of vulnerable groups in DMP – a question concerning both WP2 and WP3) or by linking research activities directly with the DMP knowledge base.

Fourth, the CATs who decide to engage in the DMP deep dives will be supporting in the planning and coordination process by WP3 and WP6.

In the context of the Danish flooding scenario, the Danish CAT has decided to design a deep dive assessment that explores local decision-making processes in depth. A complete example of how a DMP deep dive assessment can be designed, structured and coordinated is provided in Annex III.

6. RESEARCH INSTRUMENTS

The research instruments are presented in this section which comprises the final building block of the DMP methodology. We only turn to the instruments that will be applied in the cross-case assessment to analyse the overarching DMP questions identified in Section 4. As explained in Section 5, the DMP deep dive case assessments are developed through a grounded approach by CATs who are interested in working more in-depth with the DMP knowledge domain. If the local CAT wants to get more deeply involved with some of the questions identified in the case-specific DMP Resilience Wheels (Annex II), they will need to identify appropriate research instruments that allow them to answer the questions in mind. In Annex III, we show how this process was done in the Danish context of flooding where the local CAT engages directly with the DMP knowledge domain through four specific questions identified in the DMP Resilience Wheel. This example also provides some general description of other instruments which could be applicable, such as participant observation and social media analysis (see Annex III).

Consequently, this section describes the methods and practicalities involved in generating data, including how the survey is designed, the DMP approach to interviewing and what needs to be considered when using each of these research instruments.

Table 2: Overview of RQs, Design and Methods

Cross-case Assessments	Deep dive Assessments
<p>Research questions</p> <ul style="list-style-type: none"> • How are disaster risk management organisations applying SMCS in DMP? • What are the main limits and potentials in the current application of SCMS in DMP for increased institutional resilience? • And how can this application of SMCS in DMP be further strengthened? 	<p>Research questions</p> <ul style="list-style-type: none"> • Potential research questions for each of the LINKS case settings are carefully mapped out across the four resilience drivers in the Resilience Wheel. A complete overview of those are enclosed in Annex II
<p>Operationalising tool</p> <ul style="list-style-type: none"> • Themes in the DMP Resilience Wheel 	<p>Operationalising tool</p> <ul style="list-style-type: none"> • Themes in the DMP Resilience Wheel
<p>Instruments</p> <ul style="list-style-type: none"> • Survey • Interviews (explorations, experience and practice) 	<p>Instruments</p> <ul style="list-style-type: none"> • Designed by the CATs with support from WP3 depending on their capacity to engage deeper with DMP knowledge domain

Source: Authors' contribution

6.1 Research Instruments for the Cross-case Assessments

This section presents two research instruments that are to be applied across all five of the LINKS cases (the cross-case assessments). The two research instruments are designed together with WP2-4 and comprise an online survey and qualitative research interviews. The instruments are mandatory for all CATs to translate and apply to their local cases with assistance from WP2-4. The instruments presented below are tailored specifically to address the needs of the DMP knowledge domain. Similarly, the tools for DRPV and DCT are presented in 2.3 and 4.2 respectively.

To roll out each of these instruments across the five cases, a package of assessment guidelines will be shared with the CATs. These are developed by WP2-4 and WP6 together. These assessment guidelines will provide the CATs with detailed information on each of the tools and a process map for the next steps after data collection. An overview of the timeframe for the cross-case assessments is provided in Section 6.2.

6.1.1 Online Survey and its Role in the DMP Knowledge Domain

Table 3: Overview of the Online Survey

Online Survey	
An internet-based data collection method consisting of a set of questions sent to a strategically selected sample. Applied across all LINKS cases to collect a broad level of information on SMCS application in DMP.	
Targeted Number of Participants	Research Participants
40+ per case 200+ overall	Practitioners
Case Relevance	Language
All case-based assessments	English, Danish, Dutch, German, Italian
Lead	Data
WP2, WP3, WP4, WP6	quantitative
Level of Information	Participants Engagement
broad	low
Total Questions	Runtime
(approx.) 30	4-6 Weeks
Benefits	
<ul style="list-style-type: none"> • No interviewer effects • No effects of social desirability • No errors due to manual recording • Highly standardised • Low financial cost • Expansion of the participants only requires minor effort 	

Research Objective (WP3)	
<ul style="list-style-type: none"> To map which SMCS are used across different DMOs To map and understand the extent to which DMOs have strategies that consider SMCS use in DMP To map formal institutions associated with SMCS use in DMP 	
Risk	Mitigation
<ul style="list-style-type: none"> High non-response rate Problems of intersubjectivity 	<ul style="list-style-type: none"> Help by trusted research institutes or umbrella organisations Pre-testing

Source: D4.2

The primary aim of the online survey from a DMP perspective is to expand our understanding of the DMP-landscape. The online survey serves, in particular, to shed light on the first research question presented in Section 4: How do DMOs apply SMCS in DMP? The online survey thus also serves the joint WP3/WP4 aim of mapping DCTs, experiences, policies and practices concerning SMCS use in DMP and informs the DMP and DCT landscapes. For the DMP knowledge domain, special attention is given to formal institutions existing in this DMP-landscape. Online surveys are suitable for collecting representative and large amounts of data, which is not bound to specific locations and times. (Wagner & Hering, 2014). Consequently, this research instrument enables a comprehensive, continuous and ambitious mapping of the formal governance processes in relation to SMCS and disasters. Through the online survey, we can engage directly with RQ1, how European DMOs apply SMCS in DMP and get one step closer to uncovering the formal institutional landscape – a process initiated in D3.1.

6.1.1.1 Process for Conducting the Online Survey

This process of conducting the online survey is described in detail in D4.1. The WP4 team will be in charge of facilitating the survey process with assistance from both WP2, WP3 and WP6. The analysis of the survey data will be a collaboration between WP2-4 as each knowledge bases have different entry points to the data.

The design and set-up of the survey comprise two different processes:

- First, a process that takes place across WP2-4 where a questionnaire is designed and an online platform is selected (June 2021). Here, The WP4 team led by SIC is responsible for the general design and set-up of the online survey, while the questionnaire is designed in close consultation with WP2 and WP3 to ensure that interconnected thematic areas are

thoroughly addressed. An important aspect of the success of the online survey is that the questions do justice to the complexity of the research instrument. This means that the depth level of the questions and thus also of the answers should be rather straightforward (Wagner & Hering, 2014).

- Second, since the survey is conducted in the respective national language of the LINKS cases under WP6, the questionnaire will be translated after its completion and given to the CATs. The translations are carried out in cooperation with the CATs to prevent the wrong usage of terms (July 2021). To ensure that the online survey runs smoothly, it will be pre-tested in cooperation with the CATs. This is expected to be done by the end of July.

Following the design and set-up of the survey, the survey needs to be rolled out across the five different cases in four different countries. CATs are responsible for rolling out the survey locally, however, in close consultation with WP2, WP3 and WP4 who support the entire process. This consultation process is supported by the methodological taskforce (See Section 2 and Section 8).

6.1.1.2 Selection of Research Participants for the Online Survey

The survey is intentionally broad and intends to reach as many organisations as possible. Due to its explorative approach and the timeframe (see Section 6.2), the online survey is scheduled relatively early for the LINKS project and will run from August or September of 2021.

The desired participants of this online survey are people in DMOs that work strategically with disaster risk management as well as those in charge of social media communication. The CATs are in charge of identifying potential participants based on the questionnaire and a short description of the intended participants. To steer this process, the descriptions will be developed as part of the assessment guidelines provided by the teams responsible for the three methodologies (WP2-4). The assessment guidelines are developed in cooperation with CATs through the methodological taskforce and consist of concrete guidance on how to implement the cross-case assessments.

6.1.2 Qualitative Research Interview and its Role in the DMP Knowledge Domain

Table 4: Overview of the Qualitative Research Interview

Qualitative Research Interviews	
A method based on qualitative questions and responses facilitated by a semi-structured guide. Applied across all LNKS cases to generate in-depth knowledge on people's opinions, thoughts, experiences, and feelings towards SMCS use in DMP.	
Targeted Number of Participants	Research Participants
10-20 per case	Identified by each CAT in collaboration with WP2-4 – see the section on selection of research participants (6.1.2.2)
Case Relevance	Language
All case-based assessments	English, Danish, Dutch, German, Italian

Lead	Data
WP2, WP3, WP4, WP6	Qualitative
Level of Information	Participants Engagement
Deep	High
Type of interview	Time
Semi-structured	45-60 minutes
Benefits	
<ul style="list-style-type: none"> ● Generation of rich and contextual knowledge ● Flexibility to explore emerging topics ● Low financial cost 	
Research Objective (WP3)	
<ul style="list-style-type: none"> ● To understand similarities and differences in practice and experience of SMCS use in DMP across the five LINKS case countries ● To explore experiences, perceptions and ideas of using SMCS in DMP across the four themes provided by the DMP resilience wheel 	
Risk	Mitigation
<ul style="list-style-type: none"> ● Confirmation bias; ● Time demanding in terms of preparing and organising; ● Requires experience and knowledge to go beyond the popular narrative; ● Access to experts can be difficult. 	<ul style="list-style-type: none"> ● Open and narrative approach; ● Timely and structured planning; ● Pilot interviews; ● Local knowledge of circumstances and events.

Source: Authors' contribution

Qualitative research interviews are one of the main methods for collecting data across the five LINKS cases. Through an interview, we get an insight into how people make sense of social phenomena, their experiences, opinions, their memories and perceptions (Brinkman and Kvale, 2014). In social sciences, the qualitative research interview is commonly used when aiming for in-depth and rich accounts of a social phenomenon (Yin, 2009), and thus an obvious choice for answering the DMP research question related to exploring and describing the strength and weaknesses associated with SMCS application in DMP. Methods more closely associated with ethnographic traditions, such as participatory methods and observation, is perhaps better suited to get in-depth and thick descriptions (see for example Geertz, 1973). The comparative ambition of the cross-case, however, assessments calls for an approach that allows for both contextual engagement and exploration of similarities that exists across the different sites (see Section 5). Here, the qualitative research interview provides a good option.

Following Brinkman and Kvale's (2014, p. 33) ideals for the qualitative research interview, we strive to:

- Uncover how DMOs subscribe meaning to experiences of using SMCS in DMP;
- Be qualitative and thus obtain nuances and rich accounts of these experiences in different geographical and socio-political settings that allow us to compare how SMCS are experienced and made sense of across contexts;
- Utilise the flexibility embedded in the interview and be open to unexpected and diverse accounts of the way SMCS are used and not used in DMP;
- Focus on particular themes (as reflected in the DMP Resilience Wheel) rather than a strict set of questions.

Having these benefits of the qualitative research interview in mind, the interview study supports the data-collection done through surveys and focus groups by adding in-depth insights to barriers and opportunities of SMCS use in DMP across DMOs operating to support disaster risk management in the five cases.

6.1.2.1 Interview Process and Guide

As with all qualitative research interviews, semi-structured interviews require substantial preparation and processing for the data to be trustworthy.

First, this requires an interview structure and a guide that fits the purpose of the interview. For the cross-case assessment, we design semi-structured interviews that are designed around the themes provided by the DMP Resilience Wheel. Semi-structured interviews are here understood as loosely structured conversational interviews that focus on participants retrospective reflections concerning the four drivers found in the DMP Resilience Wheel. This includes focus on:

- What participants associate with making decisions, ensure credible information, considering vulnerable groups and learning across phases of the DMC in DMP;
- How they describe and explain developments and current state of affairs of applying SMCS in disaster governance;
- Their visions and suggestions for improved disaster resilience in DMP.

The interviews are thus designed based on general themes provided by the Resilience Wheel that guide the interview through open-ended questions that invite for stories and narratives (Magnusson & Marecek, 2015). Through this approach, we ensure to cover questions related to aspects of vulnerability and the DRPV domain as well as shared research interest with the DCT-knowledge domain related to decision-making and credibility concerns. At the same time, the concrete interview guide needs to be developed having the local context in mind as well as the research participant's relation to the hazard and position in the fields.

Demonstrating knowledge about the research participant's context and organisational positioning (organisational, political, academic context) supports a professional atmosphere as well as a space

for sharing views, feelings and experiences (Brinkmann & Kvale, 2014). As such, interview guides need to be tailored for the particular contexts as well as for the research participant the guide will address. The extensive contextual knowledge held by the CATs will help them engage in-depth with the unfolding of past events and existing policies and practices and yield nuances during the interviews. As argued above, it is also important to allow for surprises and new directions in the interview and to create a space for participants to voice strong opinions, tell anecdotes and reveal insights into the inner workings of the organisations they represent.

Second, because the interview is co-constituted of circumstances around the interview situation (the interviewer, the dynamics between the interviewer and the participant, the place the interview takes place, the recorder and the topics that end up being explored), it is important to be reflective during the entire research process and to be transparent about the circumstances around the interview.

The WP3 team will provide assessment guidelines for the interviews during the preparation phase, which is designed in consultation with the CATs. This process is facilitated through the DMP methodological taskforce and takes place from June to September 2021 (see Table 5 in Section 6.2). The assessment guidelines will provide examples of how to use the Wheel to design open-ended questions (agreed on between WP2-4) that then need to be tailored to the local contexts and each interview situation. Furthermore, the assessment guidelines will provide a set-up for how each CAT can structure their reflexivity over the interview process.

6.1.2.2 Selection of Interviewees

The qualitative research interviews will be designed as semi-structured conversational interviews with people representing various actors important for understanding SMCS use in DMP.

In terms of the number of interviews, no firm rules can be appropriately applied, however, 10-20 interviews are often enough to provide a degree of saturation where similar accounts start to appear in the interviews. That said, the volume of interviews also depends on the time and resources available for the CATs, which need to be balanced with other research activities associated with the survey and the deep dives.

The strategy for selecting interviewees is a strategic selection of actors that have a position where they can reflect on the DMOs application of SMCS in DMP. These actors can represent different organisations or interest in the local context where the case assessments take place and a strategic and meaningful selection will vary across the different case-assessment localities. Consequently, who is deemed a relevant actor in one locality may be less relevant in other localities and depends highly on the contextual conditions characterising each case. Representatives from the local water utility company are, for example, highly relevant for understanding flood prevention in Denmark,

however, a local water company may be less central for understanding DMP associated with terrorism. Furthermore, all CATs have strong networks they can use to identify relevant research participants or act as “gatekeepers” to participants located both higher and lower in the organisational hierarchy.

A detailed description of this process and how to locate the participants will be included in the assessment guidelines for the interview study (see timeline in Table 5).

6.1.2.3 Pilot Test

To test the approach of using the DMP Resilience Wheel as an overall approach to guide interviews undertaken by CAT, we assigned the Danish CAT to do a pilot test where the Danish CAT used the DMP Resilience Wheel to design specific questions relevant for the Danish context. The interviews were all scheduled to last for an hour, they all took an hour, and the experience of both interviewee and interviewer was that the subject could have been explored in more detail and that the conversation and dialogue will continue throughout the LINKS project. The questions defined in D3.2 are relevant to the Danish practitioners, and from the bilateral meetings with the other LINKS partners concerning their scenarios, it seems that the defined subjects of D3.2 will be applicable for the practitioners in Germany, Netherlands, and Italy and that there is a solid base for comparative dimension across the cases.

The feedback from the Danish CAT is that the use of the interview guide structured around the DMP Resilience Wheel provided a good insight into the practices and challenges of the professionals in two DMOs in the Danish context. Based on a preliminary analysis, the professionals seem to have numerous reflections and practices related to decision-making procedures and they hold a variety of concerns on securing credible information. The question of credible information concerns both matters of the incoming information gathered from social media and assessment if the information can be relied on and concerning the organisations’ own credibility in society in general. Questions concerning the reach of vulnerable groups through targeted information activities and the dimensions of learning across phases, placed and organisations were less reflected upon and it seems that the interviewees are less focused on these dimensions.

A central finding is that the bridging of all residents and stakeholders and the coordination between sectors, organisations, institutions and divisions in both an inter-organisational and intra-organisational perspective is a challenge not least in the management of incidents with sudden onset (acute incidents).

In addition, one interview has been carried out with a Frederiksberg resident. Since the conditions of residents are different to that of professionals, the interview guide was different yet developed in accordance with the themes provided by the DMP Resilience Wheel. The interviewee does not

speak or understand Danish and the interview focused on a recent incident where the use of tap water was restricted on Frederiksberg due to pollution of the water with E-coli bacteria. The interview gains good insights into the ways that residents perceive a hazard, even though the authorities do not aim to communicate in other languages but Danish, and how some residents' sense-making of risk heavily relies on social media networks in such a situation. The interview guide focused on water pollution as the latest emergency, on the interviewees understanding of risks and hazards on Frederiksberg in general, on the perceived risk of flooding, on the communication from Danish authorities in general – and the municipality specifically. The main findings are parallel to research on risk perception in general: laypeople's perception differs from one of the authorities, and that citizens are not always aware of the efforts done by the authorities to communicate.

The interview guide developed for this study can be found in Annex V.

6.1.3 Complimentary Cross-case Assessments: Focus Groups

Due to the COVID-19 emergency, in agreement with the other methodological partners, it was decided to avoid the mandatory use of research instruments (especially participatory research instruments) that could be affected by restrictions or whose results could be biased in case they cannot be adequately carried out in all the local cases. Thus, in the first case-assessments phase focus groups are planned to be a complementary instrument to follow up the data carried out through qualitative research interviews and the survey. The focus groups will be organised and carried out directly by the WP2 team at a cross-national level. WP3 and WP4 will support the process, providing inputs to identify the subjects to discuss and the research participants. CATs will be consulted on defining the purposes as well as research participants. Accordingly, the focus groups will follow the other two methods and at the moment they are planned to be carried out between February and March 2022. The preparatory phase is expected to take place between December and January when the preliminary survey results are available along with some first results from the qualitative research interviews.

6.2 Timeline for Cross-case Assessments

Table 5: Timeline for Cross-cased Assessments

Date	Activities	WPs
June 2021	Detailed planning at case level (mid -June)	WP2-6
	Design of the online survey	WP4 in collaboration with WP2-3
	Design of the semi-structured interviews	WP2-3 in collaboration with WP4

	Identification of the online platform for the survey (ethics/data management)	WP4
	Identification of research participants, expectations setting, minimum requirements at case level	WP2-6
June – August 2021	Operationalisation of the semi-structured interviews in local cases	WP2-6
July 2021	Translations of the survey and pre-test in all languages/countries	WP6
	Refinement	WP2-4
	Guidelines for conducting surveys and cover letters in all languages	WP2-4 with the support of WP6
August-September 2021	Online survey rolled out in all five cases	WP6
	Identification of interviewees, expectations setting, minimum requirements at case level	WP2-6
	Case-specific Covid-19 mitigation strategies	WP6 (CATs: case coordinators with the support of WP2-4)
	Translations of semi-structured interviews and pre-tests in all languages/countries	WP6
	Guidelines for conducting semi-structured interviews; templates for data collection, informed consents	WP2-4 with the support of WP6
October 2021	Translation of the survey results	WP6
	Draft version of the LINKS Framework (D5.3) and of the second work plan for the five cases (D6.2 guidelines and templates)	WP5-6
October 2021-January 2022	Semi-structured interviews carried out in all cases	WP6
November 2021	Delivery of the first version of the LINKS Framework (D5.3) and of the second work plan for the five cases (guidelines and templates: D6.2)	WP5-6
January- February 2022	Translations of the semi-structured interviews	To be announced
February – March 2022	Data analysis of the semi-structured interviews	WP2-4
April 2022	Analysis sent to WP6	WP2-4
May 2022	Consolidation of results in the first LINKS case report (D6.4)	WP6

7. LIMITATIONS AND ETHICAL CONSIDERATIONS

7.1 Limitations

The DMP methodology is associated with a number of limitations. The limitations directly concerning research design and specific methods proposed are reflected upon in the above sections under the particular research instruments. Thus, this section deals with limitations associated with the feasibility of implementing the research designs and instruments across the LINKS case countries. Two main concerns are important to highlight:

First, the COVID-19 pandemic continues to pose significant limitations to most research activities that require on-site engagement (e.g. focus groups, observation, and interviews). Because the vaccination campaign in the different countries involved in the project is at different stages, it is not possible to estimate how the emergency will impact the research in the next months. Further considerations will be provided in Deliverable 6.2 (forthcoming). Since COVID-19 could make it difficult to do interview activities as planned in the DMP methodology, interviews may also be done using online platforms and technological tools.

Second, this methodology sets out an ambitious plan for researching several settings using various research instruments. The feasibility of the methodology thus depends on a timely and detailed planning and implementation process that is well-structured and well-coordinated (see timeline in Section 6.2). To ensure such a process, we continue the methodological taskforce, which provides an infrastructure for planning and coordination across the many work packages involved in the implementation of the methodology.

7.2 Ethical Considerations

In carrying out research, LINKS partners have the responsibility to ensure that, at all times, measures have been put in place to protect the health, safety, and well-being of the people participating in research and project activities (see Deliverable 1.5 (Bonati & Morelli, 2020) and D10.1 (Bonati & Graziani, 2020)). This implies that minimum standards and procedures must be respected in all phases of the project, from planning to execution and during the monitoring and evaluation of the work done. This also includes the required steps taken by partners for the management and security of research data as defined in the LINKS Data Management Plan (DaMP). For guidance and uncertainty for the ethical requirements related to the application of the instruments and procedures defined in this deliverable, LINKS partners should contact the LINKS Ethics Advisory Board.

The authors of this document will be responsible for guiding the designing the qualitative research interviews. In this regard, a few ethical consideration is worth highlighting:

- All interview participants are sufficiently informed about the aim and purpose of the interviews so that they can consciously choose whether and how to participate. This is done through tailored and translated interview sheets (template included in 1.5);
- Informed consent is ensured for all research interviews and in the language of the participant. This includes permission to any use of recording devices. An informed consent template is enclosed in D1.5.;
- Confidentiality is taken seriously and all interview participants are anonymised or pseudonymised;
- Research interviews are conducted in a respectful and friendly manner. This includes substantial preparation that ensures the understanding of local commitments, values and cultural practices;
- Interview participants' point of views are taken seriously and respected in the data processing process;
- All interview data is securely handled and stored according to the standards presented in the LINKS Data Management Plan;

WP2-4 are guiding the implementation of the ethical principles through the methodological task force as well as the assessment guidelines which are to be developed as part of the preparation of the case-based assessment (see Figure 13 in Section 8 for an overview of this future process).

8. CONCLUSION

8.1 Summary

Based on the DMP knowledge base (D3.1), this document presents a dedicated DMP methodology to guide and support the development of the LINKS Framework (WP5) and the five case-based assessments of the LINKS Framework (WP6). The DMP methodology structures the research that will be conducted to develop the DMP knowledge domain and, subsequently, this first methodology is primarily aimed at addressing the gaps in the existing knowledge that has been identified in D3.1. However, these gaps are systematically matched with the experiences and concerns of the LINKS consortium partners. This is facilitated through the DMP methodological taskforce ensuring a methodology that is theoretically sound yet grounded in practice.

The DMP methodology presented in this document has two overarching objectives:

- First, to enable a continuous mapping of the formal governance processes in relation to SMCS and disasters within the local institutional context of the LINKS case assessment countries. The aim of producing a comprehensive overview of SMCS in DMP is shared with WP4 and coordinated accordingly across the two methodologies;
- Second, to create an overall methodological frame that allows the upcoming work under WP5 and WP6 to critically engage with the knowledge gaps and theoretical assumptions identified in D3.1 through the case-based assessments. This includes the further exploration of the four essential drivers for institutional resilience identified in D3.1.

Together, the aim is to achieve an extended and improved version of the DMP knowledge base where the European and case-specific contexts are at the heart of the generated knowledge. These outputs feed into the ongoing development and evaluation of the LINKS Framework.

The methodology is carefully crafted through three different steps to ensure sound and trustworthy results (see also Figure 2 in Section 2).

First, we move from the knowledge base presented in D3.1 towards a set of research questions and a set of operationalised concepts building on the conceptual framework, the DMP Resilience Wheel, from D3.1. We identify three overarching DMP research questions, which speak to both the DRPV and DCT knowledge domains, however, have institutions at the centre:

- How are disaster management organisations applying social media and crowdsourcing in disaster management processes across the phases of the disaster management cycle (RQ1)?
- What are the limits and potentials of this application associated with institutional resilience (RQ2)?

- Following the two first questions, how can the application of social media and crowdsourcing in disaster management processes be further strengthened (RQ3)?

Based on an operationalisation process, we develop a research design, which can provide a methodological infrastructure for answering the research questions. Here we point to a two-pronged design consisting of a comparative component (cross-case assessments) as well as an explorative and grounded component (deep dive case assessments). The cross-case assessments are multi-sited designs that allow us to both quantitatively and qualitatively analyse the similarities and differences in policy and practice of the various dimensions of institutional resilience. The second assessment is an in-depth design (a deep dive) that allows the CATs to explore certain aspects of the DMP Resilience Wheel in-depth within their local context.

Finally, we propose research instruments that will be applied to explore the use of SMCS in DMP and answer the proposed research questions. Two of these research instruments, surveys and interviews, will be applied to all the five LINKS cases and has a comparative ambition. Additionally, we explain how a deep dive assessment was developed by the Danish CAT as an illustrative example of how all CATs are invited (not a mandatory task) to do in-depth research that concerns local specificities associated with the DMP knowledge domain.

8.2 Future Directions for the DMP Knowledge Domain and Methodology

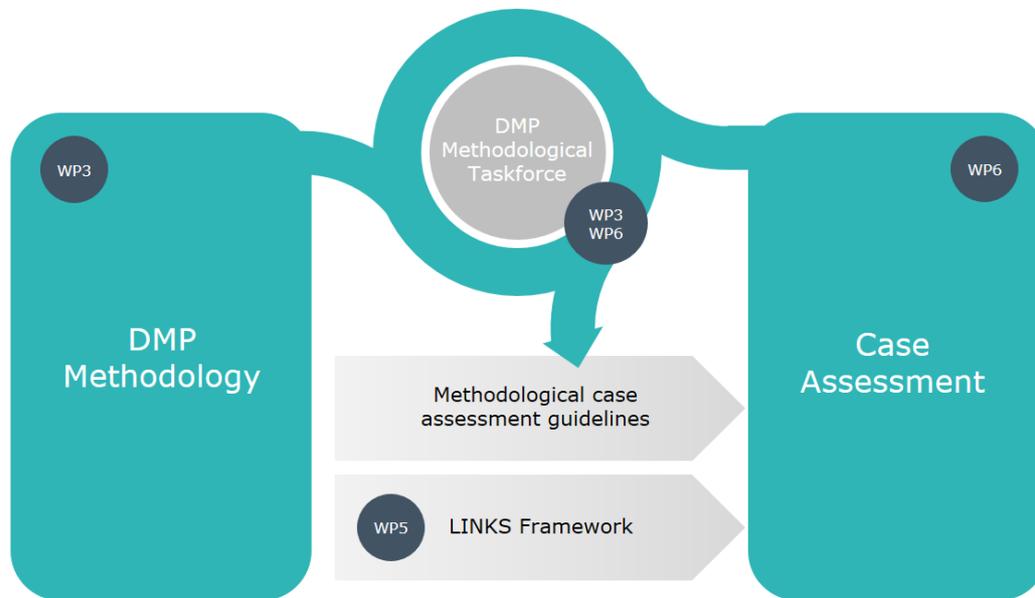
The first version of the DMP methodology (D3.2) aims at improving the DMP knowledge base with two tangible outputs to be tested in the second round of assessments:

- A tailored conceptual model, the *DMP Resilience Wheel*, which supports the further assessment of the current and future use of SMCS in DMP;
- Registries comprising existing policies, guidelines, frameworks, practices and experiences guiding SMCS use in DMP (the DMP landscape).

In addition, the methodology aims at collecting further knowledge on the use of SMCS in DMP in a European context and to compare results generated in the LINKS cases with the large bulk of literature compiled for the first version of the LINKS knowledge base

The long-term aim is to inform and refine the DMP knowledge base through the case-based assessments of the Framework conducted in WP6. This will be done through an analysis of the findings from the assessment guidelines of the LINKS Framework and the case-based assessments. The findings of this analysis will feed into refining and extending the DMP knowledge base, the second DMP methodology.

Figure 13: Future Directions for the DMP Knowledge Domain



Source: Authors' contribution

8.3 Future Directions for the LINKS Framework

The knowledge bases and the methodological deliverables (developed in WP 2, 3 and 4) are the building blocks of the LINKS Framework (WP5). Moving forward, dedicated workshop activities are planned to discuss how each of these domain-specific methodologies is consolidated for the first version of the LINKS Framework. As shown in Figure 13 above, the methodological deliverables provide the foundation for supporting the assessment guidelines (WP6) and for developing the first version of the LINKS Framework by:

- Operationalising the theoretical concepts identified in the knowledge bases deliverables;
- Identifying central research questions for improving all knowledge bases;
- Creating a research design for answering the RQs through the first case-based assessments of the LINKS Framework.

Consequently, these methodological deliverables inform an overarching research design applied across the LINKS cases. This research design is also part of the first version of the LINKS Framework.

The three methodologies, together with the knowledge bases and case-based assessments, feed into the key aim of creating outputs for sustainable advanced learning. The learning dimensions in the project will be addressed both at the overall project level and the specific case level through the learning materials that will feed into the second version of the LINKS Framework. These learning materials are one of the backbones of the LINKS Framework and will be made available through the LINKS Community Center (LCC). The first version of the learning model for the Framework, including the learning objectives of the Framework, and the case-specific learning objectives will be part of D5.3.

Overall, the learning materials will be designed based on the knowledge gained in the first case-based assessments: the critical reflections on different social, institutional and technological elements will shed light on the needs and challenges that the Framework aims to address. The outcomes from the cross-case and the deep dives will inform the future steps for the development of the Framework. Addressing both the cross-domain questions and the domain-specific questions explored through the deep dives will directly inform the design and the selection of the materials.

The knowledge gained in the first evaluation phase will be paired with the knowledge which has begun to emerge in the meetings and workshops (cross WP5-6) carried out with the practitioners involved in LINKS (more information and preliminary results are provided in D5.1 and D6.1). Common themes across the cases have been identified but more work is needed to understand how this knowledge can be implemented in the second evaluation of the Framework.

The knowledge and learning processes enabled through LINKS will be open to everyone, and will also provide pathways for bridging institutional learning into interactions with other relevant groups for strengthening societal resilience, such as citizens and the private sector.

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10. ANNEXES

The following five annexes (Annex I-V) contain material that supports the DMP methodology in various ways.

- 1. The DMP Resilience Wheel:** This annex provides a short description of the DMP conceptual model – the DMP Resilience Wheel and explains the categories included in this model.
- 2. Context specific DMP Resilience Wheels:** This annex contains all the context-specific resilience wheels that we developed for the DMP methodology.
- 3. Overview of the research instruments planned for the Danish deep dives:** This annex contains an overview of the research instruments planned for the Danish deep dive case: Participant observation and SM analysis. This was made by the Danish CAT and is included in the annex for the sake of providing an example of how a local CAT has designed a deep dive case. It may serve as inspiration for other CATs that want to investigate the relationship between DMROs and citizens in depth.
- 4. Case features important for the DMP research design:** This annex provides an extensive table of the many diverse features important for exploring the use of SMCS in DMP. It provides an overview of the many context-specific DMP processes and provides a departure point for analysing similarities and differences across the five cases for the case-based assessment.
- 5. Interview guide for the pilot study:** This last annex contains the interview guide used to conduct the pilot test interviews for designing the cross-case research interviews.

10.1 Annex I: The DMP Resilience Wheel

The DMP Resilience Wheel is a conceptual model built to support the assessment of institutional resilience across the five scenarios investigated in the LINKS project. The DMP Resilience Wheel draws on two important streams of inspiration, which is adapted from the findings presented in the state-of-the-art (Section 4).

- First, the four drivers, decision-making procedures, sensitivity to vulnerability, credible information and learning, were all identified by reviewing theories on the relationship between resilience and institutions and linking this to the question of technology systems and SMCS in particular. These four drivers were initially inspired by Tyler and Moench's (2012) empirical investigation of institutional dimensions enhancing climate resilience, and adapted here to the context of SMCS use in DMP;
- Second, visually and conceptually, the DMP Resilience Wheel is inspired by Arup's City Resilience Index (The Rockefeller Foundations & Arup, ny). The City Resilience Index is a conceptual policy tool that helps cities understand and respond to urban resilience challenges in an integrated and systematic way.

Against this backdrop, we suggest a model supporting disaster management organisations in their planning for use of SMCS in DMP. The four drivers - decision-making procedures, credible information access, vulnerability, and learning and application of new knowledge (identified in Section 3) - provide us with the first step towards understanding where the focus is needed for enhancing institutional resilience in the context of SMCS use in DMP. The next step is to characterize how resilience manifests in policy and practice when SMCS are successfully integrated with DMP. While this task is not finished with this deliverable, the state-of-the-art, gives us some initial answers to how we can characterise DMP aimed at enhancing institutional resilience through SMCS use in policy and practice.

Figure 14: The DMP Resilience Wheel



Source: Authors' contribution based on Section 4, Tyler & Moench (2012) and the Rockefeller Foundation & Arup (ny).

While a detailed account of these four drivers for institutional resilience is provided in D3.1, the very characteristics associated with these drivers are identified from the state-of-the-art and presented here. Consequently, the systematic and integrated use of SMCS in DMP must have the following characteristics:

Credible information

- SMCS use is *strategic* and its purpose and audience are taken into consideration;
- Information communicated through SMCS is *consistent* and *reliable*;
- The use of information obtained through SMCS platforms is grounded in *ethical* principles concerning privacy and data protection.

Decision-making procedures

- SMCS use is *active* and *engaging*. This maximises the potential in creating awareness and coordinating action and counters false information;
- SMCS use is *direct, fast* and *efficient* in communicating information and allocating resources in DMP;
- SMCS is *integrated* across DMP and coordinated with all actors working with DMP.

Institutional sensitivity to vulnerability

- SMCS use is *inclusive* when involving diverse communities, citizens and the private sector in DMP;
- Information communicated through SMCS is made *accessible* to all citizens across digital divides. This includes considerations about the extent to which information provided through SMCS also must be provided via other means for those outside the digital world;
- The use of SMCS is carefully *tailored* to diverse risk cultures and *sensitive* to a broad range of actors with different cultural, social and economic dispositions characterising the particular context.

Learning³ across phases of the DMC

- Learning requires an *explorative* approach towards SMCS use in recovery and prevention phases;
- Learning must be based on *shared* practices and experiences of SMCS use across phases and places;
- Authorities should take on an *evaluative* approach to lessons learned within and across organisations working with SMCS use in all phases of the DMP

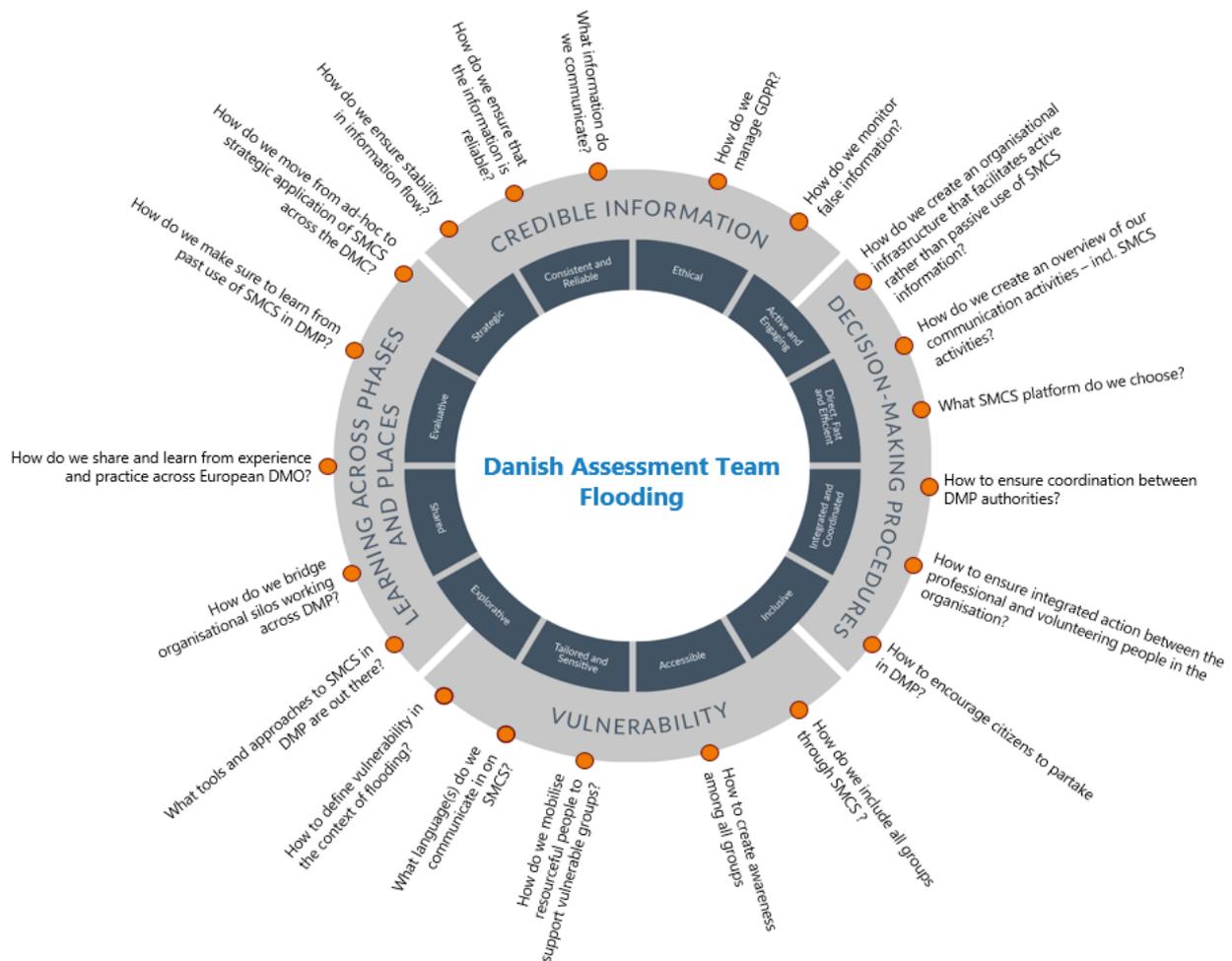
³ This approach to learning also feeds into the broader approach to the sustainable learning concept and LINKS learning model currently being developed (see D5.1)

10.2 Annex II: Context Specific DMP Resilience Wheels

10.2.1 Flooding in the Greater Copenhagen Area

Frederiksberg experienced a severe cloud burst on July 2nd in 2011, which was an eye-opener and a warning for future climate change-related incidents. The incident had a massive impact on the infrastructure, it created a need for comprehensive emergency management operations, flooding of buildings in basements and on ground level were experienced by many residents and landlords, wide-ranging traffic breakdown both in public and private transport led to the extensive disturbance for several days. The CAT wants to collect and share data among public authorities, first responders, citizens, and other relevant entities to improve warnings, improve public awareness, engagement and preparedness, and better understand community risk patterns. Furthermore, there is a need to understand the interactions between disaster risk reduction and climate change adaptation efforts.

Figure 15: The Danish DMP Resilience Wheel

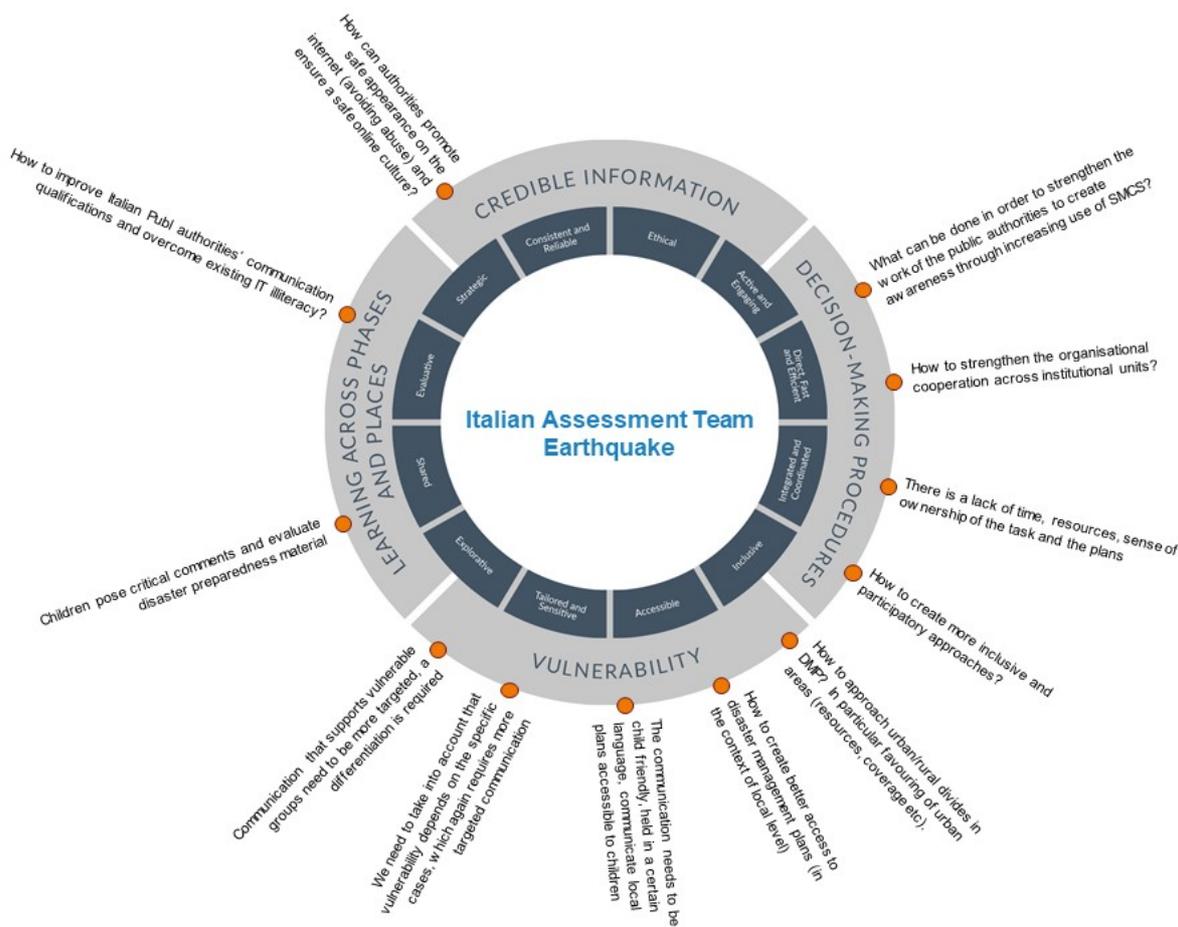


Source: Authors and the Danish CAT's contribution

10.2.2 Earthquakes in Italy

Central Italy is characterised by a moderately high seismic hazard. Between 2016 and 2017, a series of earthquakes devastated over a hundred municipalities in four different regions, following two other earthquakes in 2009 and 2012. These disastrous seismic events highlighted the weaknesses of traditional disaster communication mechanisms, especially for vulnerable groups in precarious socio-economic conditions. The Italian Assessment Team seeks to better understand vulnerabilities in disaster, and the potential of SMCS in increasing awareness and participation and strengthening the protection of vulnerable groups, including children and the elderly.

Figure 16: The Italian DMP Resilience Wheel

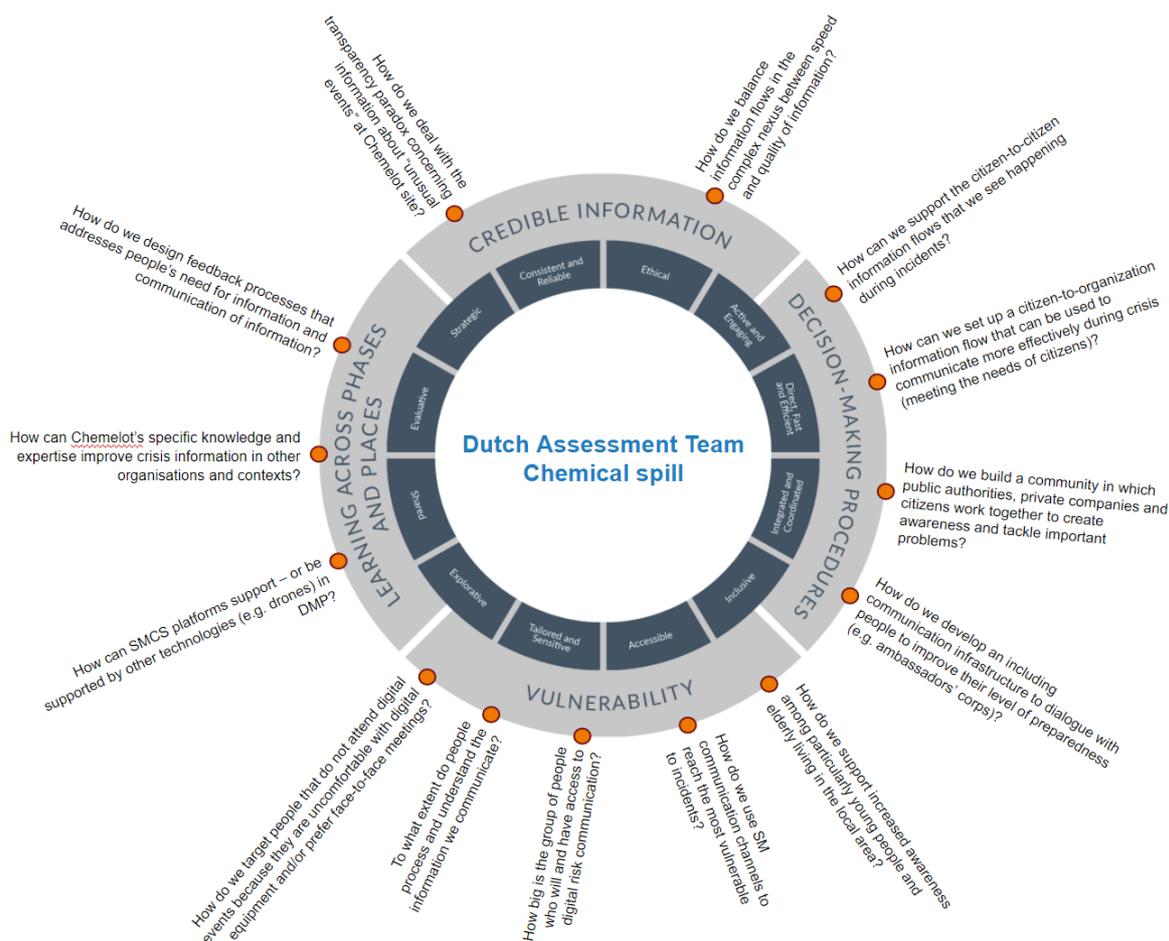


Source: Authors and the Italian CAT's contribution

10.2.3 Chemical spills in the Netherlands

The Sitech industrial site, embedded in the Safety Region Zuid Limburg, produces chemicals, performance materials and sustainable materials for a very wide range of applications and markets. Comprising its own port and rail terminal, the chemical cluster is located right next to the main road network and pipelines and connects with Antwerp, Rotterdam and Rhine, Ruhr area. The Dutch Assessment Team wishes to explore how new technologies such as SMCS can improve their communication strategies and further educate and prepare local communities. The Team emphasises the need for both vertical and horizontal information flows to enhance citizen feedback and risk communication.

Figure 17: The Dutch DMP Resilience Wheel

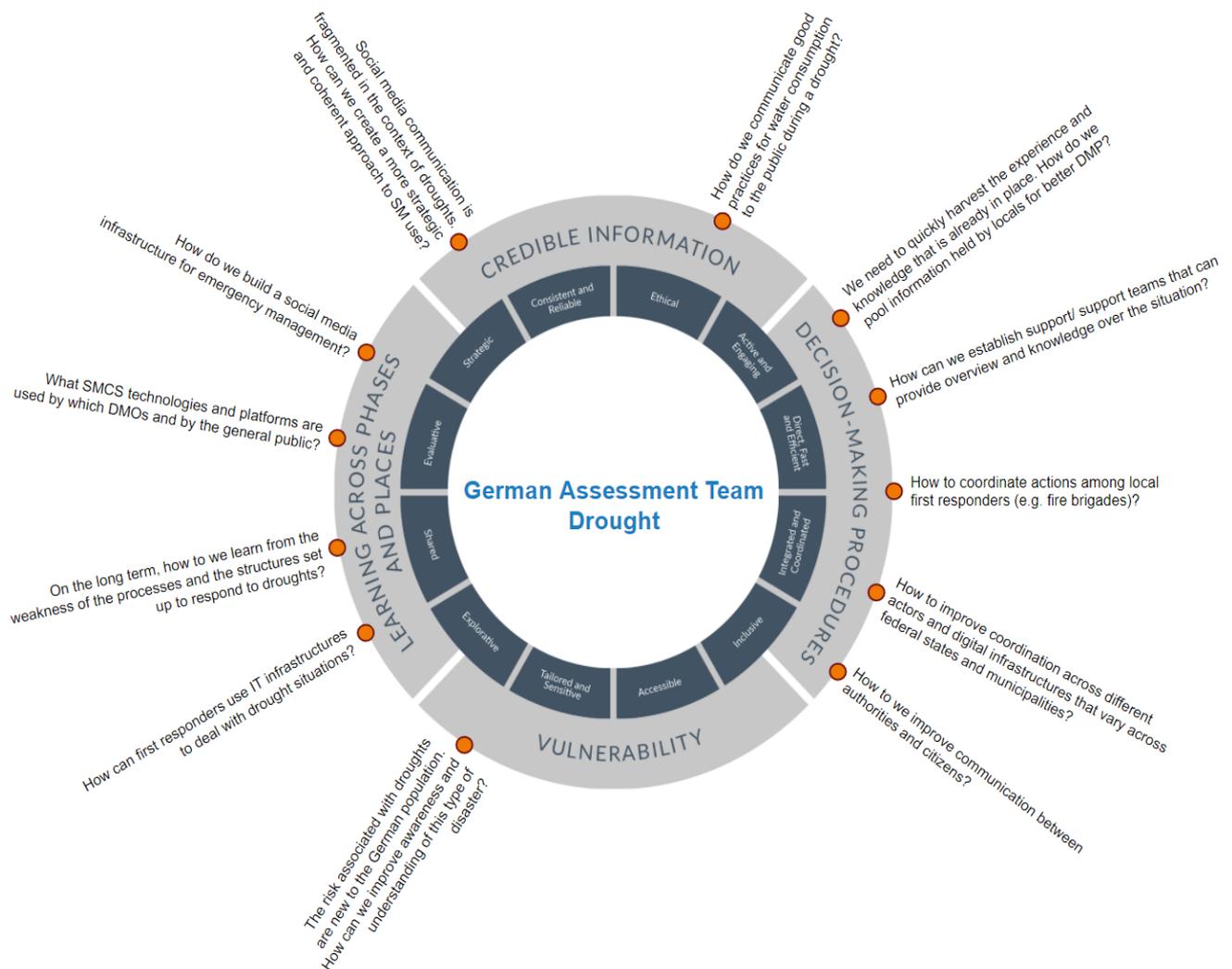


Source: Authors and the Dutch CAT's contribution

10.2.4 Droughts in Germany

Germany experienced two years of extreme drought and heat in 2018 and 2019, which severely damaged agriculture and caused significant economic loss. Risk of drought is predicted to increase worldwide, thus improvements in mitigation, prevention, response, and recovery are pressing, including in areas yet not prone to droughts. The German Assessment Team for droughts therefore aims to capitalise on new technologies such as SMCS in order to effectively harvest drought management knowledge and improve national response.

Figure 18: The German DMP Resilience Wheel (Drought)

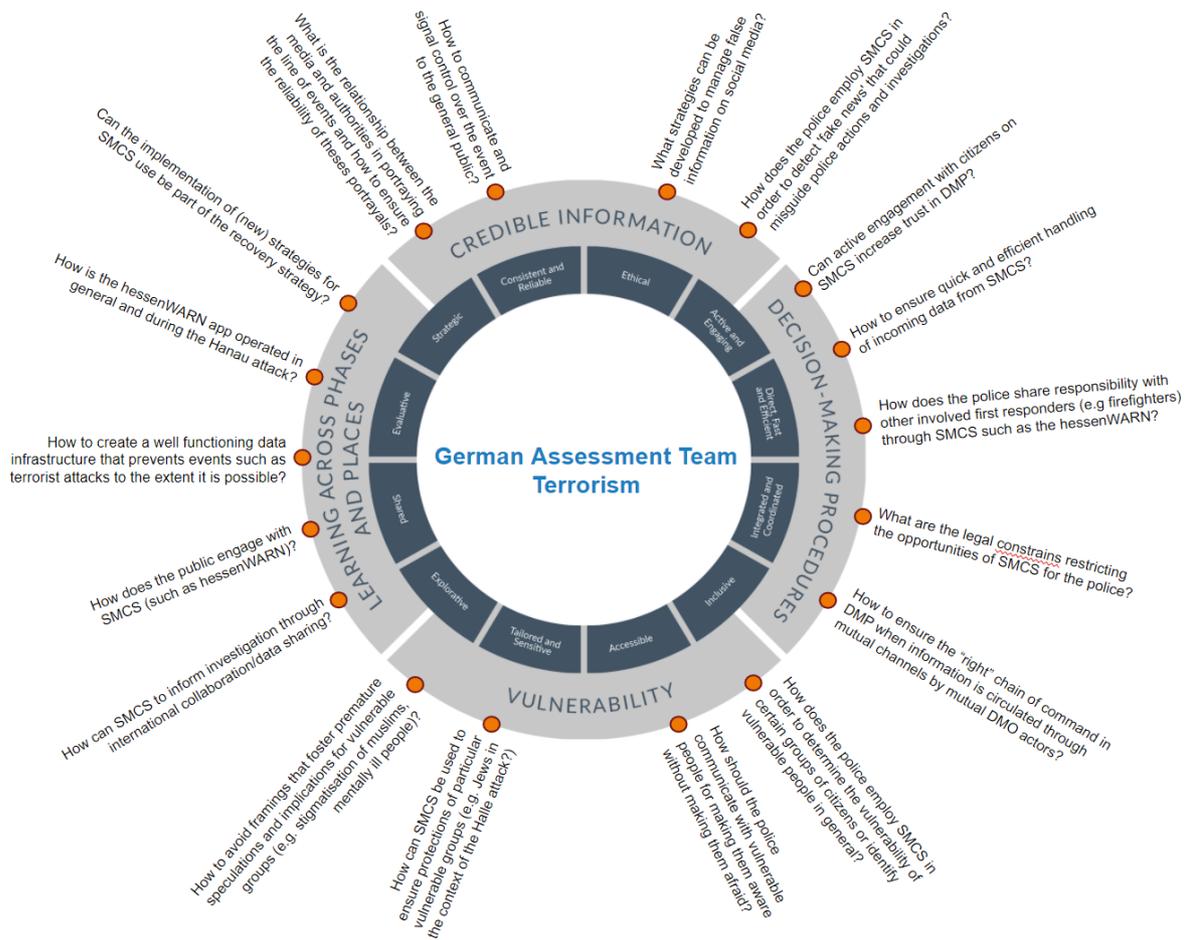


Source: Authors and the German CAT's contribution

10.2.5 Terrorism in Germany

Like other European countries, Germany has experienced a rise in terrorist attacks over the past years. Major concerns must be addressed in relation to the lack of information standards and accountability mechanisms, information overload, interoperability between information and communication technologies used by the first responders and underdeveloped skills to analyse gathered data. The German Assessment Team is particularly concerned with the SMCS potential in informing investigations, improving reliability of information, and enhancing prevention and recovery.

Figure 19: The German DMP Resilience Wheel (Terrorism)



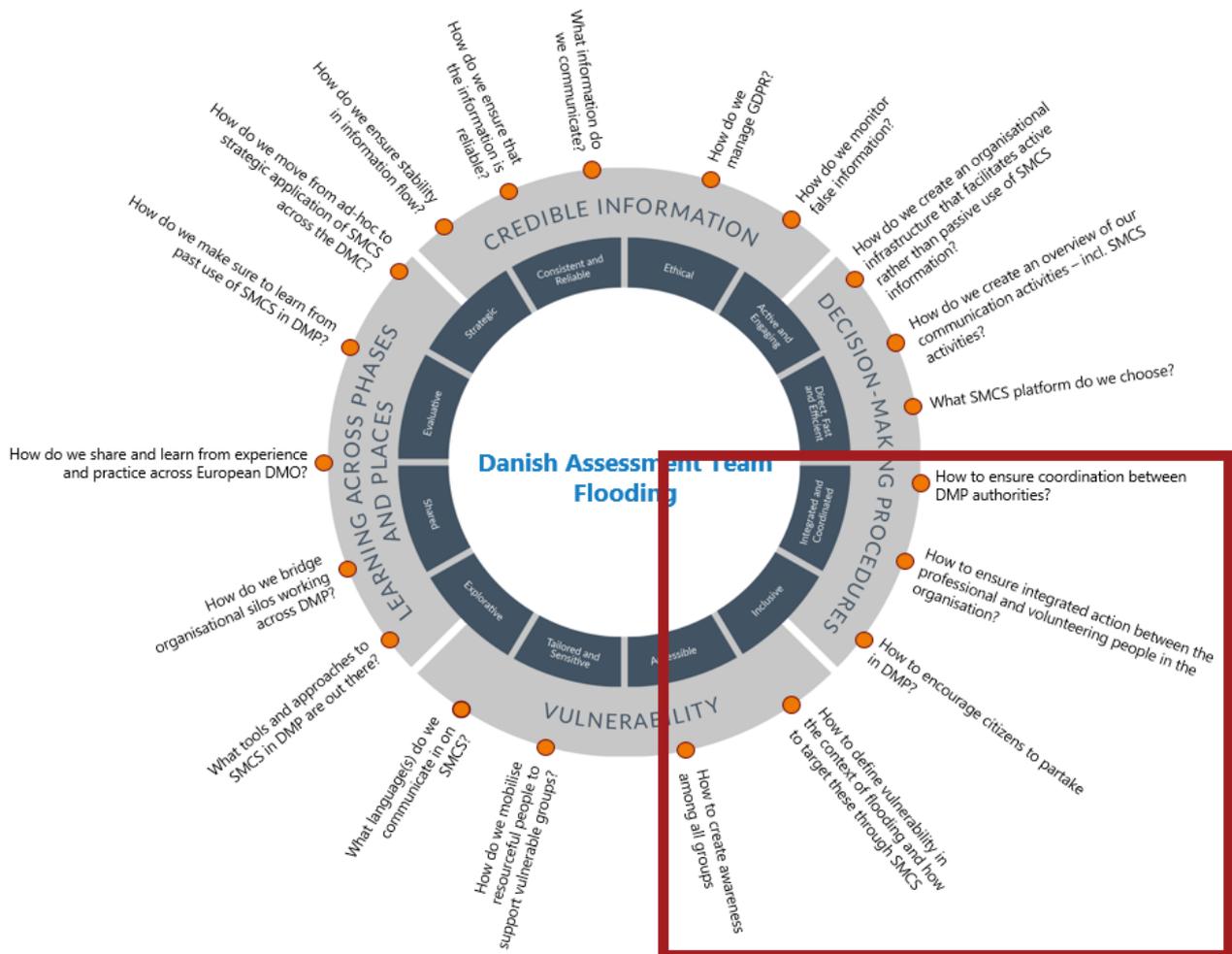
Source: Authors and the German CAT's contribution

10.3 Annex III: Deep Dive Design and Research Instruments Designed by the Danish CAT

This annex provides an example of how the Danish CAT has decided to zoom in on a few of the questions identified in the casing process (see Section 5). This thus provides an example of how a deep dive for the DMP knowledge domain could look like. It must be emphasised that this is not a fixed recipe for the deep dive case assessments nor mandatory for CATs to implement.

After several consultations with the Danish CAT, it became clear that the CAT wanted to focus on decision-making processes as one out of the four drivers in the DMP Resilience Wheel as well as the sensitivity to vulnerability in relation to how DMOs tailor their communication for creating risk awareness. These are issues that FRB and HBR (both part of the Danish CAT) as central challenges for their organisation and an area where they see a potential for using SMCS for improved disaster risk governance. This focus is illustrated in the Figure below.

Figure 20: Research Questions for the Danish Deep Dive



Source: Authors' contribution

For the CAT to answer these selected questions, they have decided to do a study of the risk and crises communication efforts of the two DMOs, which are members of the Danish CAT. Both of them are integral actors for preventing, preparing and responding to flood incidents and thus provide unique opportunities for studying the engine room of flood risk governance from the perspectives of those organisations.

The study centers on two types of events that both allow collection of data in real-time:

- A study of a planned risk awareness campaign which takes place in June and July 2021. In week 26 (first week of July) it has been a decade since a severe flash flood hit Frederiksberg and Copenhagen. In relation to this remembrance, Frederiksberg plans a week-long campaign with the intention to raise awareness of the risk of flash floods at Frederiksberg and to make people reflect on the hazard. In relation to this campaign, the Danish CAT plans to carry out research on the activities and the influence of the mediated activities on the public debate, and the public uptake of this campaign among elected groups of residents at Frederiksberg.
- A planned study for rapid response. In case of a flash flood emergency at Frederiksberg – or related incidents in the area of Greater Copenhagen Fire Department – the Danish CAT has been granted access to follow the response having a particular focus on communication efforts, data collection and coordination among actors involved in the response.

Two types of research instruments, observation and social media analysis, will be used to carry out these studies and are described in detail.

10.3.1 Participant Observation and its Role in the DMP Knowledge Domain

Table 6: Overview of Participant Observation

Participant Observation	
A qualitative method applied to explore practices in micro settings, often among professionals gathered around tasks that involve a high level of interaction	
Envisaged Number of Participants	Research Participants
5-15 per setting	Practitioners
Case Relevance	Language
Potentially all case-based assessments	English, Danish, Dutch, German, Italian
Lead	Data

WP3, WP6	qualitative
Level of Information	Participants Engagement
Specific for the context and the setting	low
Total Questions	Runtime
Overall research questions from the case specific wheels developed in D3.2. will guide the participating researchers' focus and findings. In addition, other topics relevant in practice appear	1-2 day per unit to be observed
Benefits / Challenges	
<ul style="list-style-type: none"> • Highly context specific insights • Deep insight into the complexity of practice • Insight into ambiguity • Findings depend on the observing, researchers experience and knowledge • Potential bias due to participants possible wish to appear accountable to the researcher • Effects from manual note-taking • Low standardization and need of awareness concerning comparability 	
Research Objective (WP3)	
<ul style="list-style-type: none"> • Potentials and weaknesses in applying guidelines, policies and procedures concerning SoMe and SMCS in real-time 	
Risk	Mitigation
<ul style="list-style-type: none"> • Insights into an infrequent event, missing ordinary practice 	<ul style="list-style-type: none"> • Repetition of observation to secure the significance of findings

Source: Authors' contribution

The main purpose of applying participant observations in relation to the Danish DMP deep dive case is to get a deep insight into the intra-organisational and inter-organisational cooperation among professional and organised stakeholders concerning both prevention activities and real-time disaster management, where social media are often applied as a tool to transmit information and convey messages to the public. Participant observations of disaster management processes among groups of professionals provide a comprehensive insight into the possibilities and constraints of the existing practices and create insight into the ways that the LINKS Framework can strengthen resilience through SMCS in the future work of the institutions successfully. The method gives insight into actual practices and not only formal procedures concerning DMP, and thereby a closer comprehension into the challenges of implementing the LINKS Framework knowledge and learning processes among practitioners. The benefit of the method is to get insight into the informal practices that often differ from the principles in written policies. In addition, it exposes all the conditions for DMP in the different cases that are crucial to understanding the constraints and possibilities for effecting a new framework.

10.3.2 Process for Participant Observation

Participant observations of an institutional practice like disaster management will first require that the researcher be acquainted with the institution (workplace, setting etc.) where the observations will take place. The researcher needs *access* and acceptance among the ordinary participants in order not to create disturbance and influence the interactions (Hammersley & Atkinson 1983). In addition, it takes an effort to obtain *rapport* (Spradley 1979), meaning the participants accept the researcher and acknowledge her or his appearance.

A variety of points of foci can be applied in the observation, and decisions of which approach to apply need to be taken when preparing the observations. One often applied distinction is that between a focus on *language* or *action* – Schatzki (2002) applies the division between 'doings' and 'sayings' to help the researcher to decide what parts of the many and complex interactions and tasks to take into account (and which to leave out) among practitioners working together e.g. in an emergency room.

Another analytical division that researchers are encouraged to decide upon is if the focus is dedicated on the one hand to the individuals handling of their practices, and how tasks, decisions etc. are negotiated through conversation and interaction, which stems from the ethnomethodological tradition (Gubrium & Holstein 1997). Or if the analytical endeavours on the other hand are devoted to an analysis of the ways the practices are institutionalized, and how the microcosmos of an institutional setting with few participants are embedded and guided and through macro-level values and structures (Goffman 1971).

On a third axis of analysis, the observations will be guided by the specific research focus of the LINKS project. Here it is apparent that the point of departure is taken in the DMP Wheel described in this deliverable. Depending on the institution and setting, the choice is made in advance concerning the attention given by the researcher.

10.3.3 Selection of Settings for Participant Observations

When participant observation is applied as a method, the choice of *participants* is not as relevant, since the initial methodological choice concerns what *setting* to observe. For the Danish deep dive, this setting is described in Section 6.2.1 and entails two events: a risk awareness campaign and an emergency in case one happens during the case assessment period.

In general, observation is well suited for institutional settings, and so the organisation of practitioners in working entities is an object of analysis (e.g. NGOs institutions, authorities, municipalities, fire departments).

Periods for observation have to be appointed. Disaster management occurs in different phases of the disaster cycle: some processes are planned, others appear unexpected. Scheduled events can

be related to disaster management preparedness activities (e.g. campaigning among citizens with the aim to raise awareness of a certain risk), and in an emergency management room crisis management exercises are planned in advance, just as scheduled arrangements (e.g. sports, demonstrations, prides) can be object of observation. Unscheduled events like e.g. accidents, fires, flash floods cannot be foreseen, but researchers participation can be secured in case appointments of 'rapid research response' are in place and relations are built between researcher and institution beforehand.

10.3.4 Social Media Analysis and its Role in the DMP Knowledge Domain

Table 7: Overview of Social Media Analysis

Social Media Analysis	
Text analysis of produced content on social media platforms, analysis of interactions in relation to content and analysis of the reach of content to target groups.	
Envisaged Number of Social Media	Social Media Platforms
10+ in DK case	Facebook Twitter Instagram
Case Relevance	Language
All case-based assessments	English, Danish, Dutch, German, Italian
Lead	Data
WP3/6	Qualitative and quantitative
Level of Information	Participants Engagement
broad	low
Total Questions	Runtime
Depends on research questions	Weeks
Benefits / Challenges	
<ul style="list-style-type: none"> • Easy access to open groups/Open platforms • Limited access to closed Facebook groups • No errors due to manual recording • Requires a strong focus on ethical concerns • Expansion requires minimum effort • Strong insight into public opinion among SoMe users • Requires coordination between cases to secure comparability 	
Research Objective (WP3)	
<ul style="list-style-type: none"> • Insight into the concept of 'bridging' (D3.1) and how knowledge of DMP is shared in public 	
Risk	Mitigation

<ul style="list-style-type: none"> • Lack of identification of relevant groups/hashtags • Lack of access and insight into closed Facebook groups 	<ul style="list-style-type: none"> • A thorough search for and identification of relevant groups/hashtags
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Source: Authors' contribution

This research instrument requires a comprehensive mapping of the use of social media among both practitioners, groups of citizens and legacy media in order to strengthen the case assessments. However, the use of social media, understanding risk perception and reach (or lack of reach) of mediated content to vulnerable groups are core obstacles identified in both D3.1 and D2.1, and this involves an understanding of the benefits and the inadequacies of social media use in present disaster management.

Several points of foci are relevant for a SoMe analysis:

- Qualitative analysis of the content in SoMe posts relating to disaster management to get an insight into the material and messages that contribute to people's risk perception;
- Qualitative analysis of the interaction that the content generates to understand how this has a potential influence on the risk perception among target groups;
- Quantitative analysis of the reach of posts on different platforms to understand the potential of SoMe in each case;
- Analysis of the target groups (including vulnerable groups) that the posts reach in the different phases of the disaster cycle.

An overarching question is how social networks like social media provide the opportunity not only for authorities and institutions to communicate to citizens, but also how citizens support each other, and to investigate if crucial knowledge among citizens is shared with professional and well-trained practitioners in disaster management (Palen et al 2007).

This approach refers closely to the D3.1 concept of *bridging* and will provide nuanced insight into the production and consumption of DMP information. It will inform LINKS partners of the present information traffic and character: In which cases official and institutionalised groups provide the dominant part of the content, and when it is produced by the citizens.

10.3.5 Process for Conducting the Social Media Analyses

The research field of 'crisis informatics' (Palen et al 2009) holds several of the analytical dimensions relevant for the Danish deep dive (and potentially others too).

The quantitative dimensions of Social Media Analysis concern the insight into the reach and the process of sharing of information can be observed relatively easily and gives insights into what

categories of content are shared – not least if dominant platforms, groups and institutions are identified in advance. In case of sudden incidents, it will require efforts to identify relevant hashtags, newly established groups and new dominant profiles (Ibid.)

A sample of texts including visuals from posts in different phases of the disaster cycle will be selected to secure a thorough qualitative insight into the texts produced by different groups of stakeholders and citizens engaged. A selection of a limited number of texts will provide the possibility to get a closer insight into the material.

This qualitative part of the analysis holds a content analysis focus and aims to understand the central organising ideas of the posts on the platforms (Gamson & Modigliani 1989), to get an insight into the possible power of the texts (Entman 1993), taking into account that the content contains competing frames (Vreese 2005). Several frames will possibly be identified in the material: E.g. offer of help, sharing of pictures, criticism, update of information on an incident. The character of the visuals is also analyzed (Kress & van Leeuwen 1996).

10.3.6 Selection of platforms, groups, and hashtags

The relevant combination of SoMe platforms concerning both the local and national setting need to be identified as well as the character of the hazard. In the Danish context platforms such as Facebook Instagram and Twitter are the most used to risk and crises communication in the context of Flooding and thus the departure point for the SoMe analysis. For each platform, a number of profiles from two to three stakeholders or institutions will be selected (e.g. municipalities, fire departments, emergency management, private companies, police). Two-three relevant influential citizen-organised groups (or hashtags) will be part of the sample also. Some of the citizen-driven groups on Facebook are open, and some are closed groups that require membership. Two-three relevant profiles from news media are additionally involved in the sample.

10.4 Annex IV: Case Features Important for the DMP Research Design

Table 8: Case Features Important for the DMP Research Design

Country	Hazard	Degree of centralisation of DRM decisions	Main DMOs responsible for management (across DRM phases) of the case-scenario	Experience with SMCS in DMP
Denmark	Flooding	Decentralised unitary monarchy DMP takes places across all levels of government. Response efforts are led by state authorities (police) whereas prevention and preparedness efforts are led by local municipal and regional actors.	Danish Emergency Management Agency, the Police, the Greater Copenhagen Fire Department and Frederiksberg Municipality	Frederiksberg municipality and HBR have experience using SMCS in DMP. In many instances, these are passive and fragmented initiatives and there is a potential for greater integration of SMCS in DMP.
Germany	Terrorism	Federal republic Decentralised system where the responsibility for crisis management lies with the Länder and each federal state's government has the right and responsibility for policy formulation in the area of civil security, typically through its Ministry of the Interior. When it comes to the municipal level, even though the federal states have the legislative and executive power, disaster relief is to a large extent planned and implemented on a local level	Federal Criminal Police Office (BKA) and the German Federal Police (BPOL), both under the German Ministry of the Interior and the Federal Public Prosecutor Federal Office for Civil Protection and Disaster Assistance (BBK) Municipalities	Active use of SMCS in DMP related to risk management of terrorist attacks. Few guidelines guide this, however, police, some federal district and some municipalities are launching both SM and CS initiatives to guide DMP.

Germany	Drought	<p>Federal republic</p> <p>Decentralised system where the responsibility for crisis management lies with the Länder and each federal state's government has the right and responsibility for policy formulation in the area of civil security, typically through its Ministry of the Interior. When it comes to the municipal level, even though the federal states have the legislative and executive power, disaster relief is to a large extent planned and implemented on a local level across all levels of government</p>	<p>Drought monitoring: Deutscher Wetter Dienst (DWD), Bundesanstalt für Gewässerkunde (BfG), The Helmholtz Centre for Environmental Research (UFZ)</p> <p>Drought prevention and response: Federal Office of Civil protection and Disaster Assistance (BKK), The German Ministry of Agriculture on the national and federal level, Fire Brigade, Fire Brigades</p>	<p>SM is mainly used for dissemination. Even though droughts are long-term events. SM communication is expected to occur at the peak of the drought and decrease rapidly</p>
The Netherlands	Chemical spill	<p>Decentralised unitary monarchy</p> <p>The main governmental agency responsible for DMP at the national level is The National Coordinator for Security and Counterterrorism under the Ministry of Justice and Security</p> <p>Depending on the kind of crisis/hazard various governmental agencies are involved and DRM takes place across all levels of government</p>	<p>Industries taking actively part in DRM (Chemelot)</p> <p>Regions (emergency response, emergency control room operation, risk analysis, crisis communication)</p> <p>Municipalities (crisis management, public order and safety)</p>	<p>SMCS in DMP is actively used but fragmented, ad-hoc and through a one-way communication approach (authorities to citizens). Few rules or guidelines guide the use of SMCS in DMP</p> <p>However, much is being done by the industry itself and by governments to use the current technology to</p>

				inform and prepare the public.
Italy	Earthquake	Decentralised unitary republic Coordination of prevention/response/recovery efforts belongs to the Italian National Civil Protection System where municipalities (and their mayors) are important for risk awareness and communication.	Municipal and Regional authorities NGOs, such as SCIT, play an important role in the particular area of x in preparing for earthquakes	Only in the last few years, with the arrival of social media, the sector of emergency media and communication started to be important within civil protection.

Source: Authors' contribution

10.5 Annex V: Interview Guide – Pilot Test

Number of pilot interviews: 7

Participants: Representatives from public DMOs

Case context: flooding

Interviewer: Nina Blom Andersen

Overall focus in the 7 pilot interviews among professionals in HBR and Frederiksberg takes departure from the flooding scenario – but there is an interest in experiences and practices concerning other incidents also.

1. Decision-making procedures – which procedures are present in the organization?
 - A Available procedures for handling tasks concerning cloud burst (or generic plans). Are the procedures easily accessible and simple to apply?
 - B How are other actors/institutions integrated (Who is defined as other actors? Stress that LINKS holds an interest in a broad range of actors)
2. Vulnerability – handling communication to vulnerable groups
 - A Which focus on inclusion of all groups of citizens in communication concerning cloud burst (or other incidents) - how are they included?
 - B How to ensure that all citizens get information?
 - C How to approach diversity among citizens?
3. Credible information
 - A How to frame information and communication on floods to citizens
 - B How is information disseminated – choice of channels, including SoMe media channels
 - C How to secure a uniform and integrated communication (coordination between the institutions and organisations involved)
 - D Do you monitor the overall coverage and communication related to cloud burst (or other incidents)? E.g. through SoMe crowd sourcing? In case of practice for monitoring, how do you do, what programs or systems are applied?
4. How do you improve and learn across phases, places and incidents
 - A How do you share knowledge and experiences – inter organizational and intra organizational?



- B How to bridge procedures on operational and strategical level?
- C How to bridge insights from incident to incident?
- D How do you evaluate?
- E How do you engage other actors and institutions in your work?
- F How do you update strategies, plans, procedures, politics?