

## KEY INFORMANT INTERVIEWS

### DELIVERABLE 2.3

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# Key informant interviews

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### Preface

This report presents the work that has been performed by SCORCH partners to create insights in the functioning of European heatwave plans.

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# 1. Introduction

## Background & objectives of SCORCH

Extreme temperatures, including heat and cold waves, are climatological hazards. Both in the EU as in EU-Neighbourhood countries, research has shown that heatwaves cause a rise in morbidity and mortality. Since heatwaves are not restricted to country borders, a cross-border approach is required to ensure collective preparedness and response to mitigate the impacts on communities and limit the financial and health costs.

The overall objective of SCORCH is to reduce the impact of heatwaves on vulnerable, urban populations through improved risk communication strategies based on existing EU plans and guidelines. In addition, we will measure risk perception and behaviour in communities in EU-neighbourhood countries through surveys and foster a cross-country culture of prevention and cooperation.

## Why key informant interviews?

The SCORCH project aims to make use of existing knowledge and strategies for preparing and responding to heatwaves. Therefore, we started out by collecting and analysing existing heatwave plans and strategies (D2.1) and with a scientific literature review on articles related to the effectiveness of these plans (D2.2). In this report, we continued on this effort by conducting and analysing key informant interviews with stakeholders involved in the development, implementation and evaluation of national heatwave plans. Through these interviews, we aim to gain insights into the functioning of the national heatwave plans from those involved. The interviews were conducted in nine European countries. The analysis in this report is descriptive, and only based on the results from the interviews.

## 2. Methodology

### 2.1. Selection of participants

The key informant interviews focus on stakeholders who play an important role in the development, implementation or evaluation of national heatwave plans. To focus our efforts, we selected 9 countries from the 15 that were included in the first deliverable, D2.1. In the selection of these 9 countries, we aimed to include different types of plans (e.g. legislative versus guidelines, running for multiple years vs. newer) and countries in different parts of Europe.

The interviews were conducted by the three partners involved in this work package: UCL, INCHES and Evaplan. Each partner was responsible for the interviews in three countries (table 1).

Table 1 – Target countries and responsible partner

PARTNER	TARGET COUNTRIES	NUMBER OF INTERVIEWS PER
		COUNTRY
Evaplan	Germany (DE)	7
	Spain (ES)	8
	Portugal (PT)	7
INCHES	Belgium (BE)	7
	Netherlands (NL)	6
	United Kingdom (UK)	10
UCLouvain	France (FR)	8
	North Macedonia (MK)	8
	Switzerland (CH)	7

For each of the selected countries, we aimed to have at least 6 interviews with stakeholders from national, regional and local levels. In addition, we aimed to select respondents with different types of roles (see chapter 3.3):

- Author (A)
- Activator (Ac)
- Coordinator (C)
- Informer (I)
- Monitor (M)
- Implementer (Im)
- Evaluator (E)

The key informants were identified based on the analysis of the national heatwave plans (D2.1), snowballing and internet searches. For those stakeholders who are active on other levels than the national, our efforts focused on the countries' capitals. This was both motivated by pragmatic reasons (to limit travel time) and by research considerations. Capitals are usually larger cities and thus more likely to work on topics such as heatwaves, and by focusing on capitals we can compare more easily between countries. Since we only interviewed 6-10 stakeholders per country, the results from this analysis are not representative. Nevertheless, they provide an interesting exploration into the application of national heatwave plans by different stakeholders and on different levels.

After identification, the stakeholders were contacted by email with a brief explanation about the SCORCH project, and a request to participate in an interview. Non-responders were reminded after 1-2 weeks via email and telephone.

Table 2 defines the different types of stakeholders that we interviewed, and that are involved in the national heatwave plans. This classification is based on a general description of the stakeholders and their role in society. Overall, we aimed to create a general classification that is applicable to all countries involved in this report. Therefore, we also include two general types, authorities and agencies, to account for the differences between countries. For instance, the role of the ministry of health in one country, can be filled by another ministry in another country. By only indicating that a certain role is played by a ministry without specifying which, the information can be translated to other countries with different governance and political structures.

In addition, it is important to note that each type of stakeholder can in reality represent multiple stakeholders. For instance, some countries have multiple public health agencies (governmental and non-governmental) and each country has as many local authorities as it has municipalities and cities.

Table 2 – Definition of the different types of actors involved

TYPE OF STAKEHOLDER	DEFINITION
Authority	Refers to an entire government or one of its departments who is responsible for policy development
Local authority	Operates specifically on the level of a municipality or city
Regional authority	Operates on the level of a region within a country (e.g. federal state in Germany or canton in Switzerland)
Ministry (health or other, e.g. environment)	Operates on the national level
Agency	Refers to a governmental, non-governmental or corporate organisation that provides a particular service
Local agency	Operates specifically on the level of a municipality or city
Cross-government agency	Operates in the vacuum between regions of a country; can be composed of stakeholders from the different regions
National agency	Operates on the national level (e.g. environmental agency)
Crisis agency	Governmental or non-governmental agency responsible for assessing and/or managing a crisis situation; sometimes created in reaction to a crisis and disbanded after the crisis
Meteorological agency	Governmental or non-governmental agency that provides services relating to meteorological observations and weather forecasting
NGO in health	NGO that provides health services (e.g. Red Cross)
Public health agency	Governmental or non-governmental agency that provides public health services and/or conducts research on public health
Research	Governmental or non-governmental agency that conducts research which is not specifically focused on health, e.g. statistical institute
Care provider	Organisation that provides care to the general public and/or vulnerable groups; e.g. hospitals, elderly homes, nurseries, ...
Community group	Group that is created by or for the members of a community to provide a specific service
Emergency service	Organisation that responds and deals with emergencies when they occur; e.g. fire brigade, ambulance service, police
Social institutions	Governmental or non-governmental institutions that provide services targeted to specific vulnerable groups; e.g. homeless or prison

Table 3 provides an overview of the participating stakeholders per country. A total of 68 key informant interviews were conducted between May and October 2019. The majority of the interviews were conducted face-to-face in a (semi) private space at the workplace of the key informant. They were conducted in either the respondent’s native language or English. Each interview was audio recorded and lasted between 20 and 90 minutes. Interviews conducted via phone, email or skype were conducted in a similar manner. However, they were more often in English instead of the respondent’s native language.

To protect anonymity of the respondents, their names and those of the organisations they represent were omitted from this report. Instead, specifically for quotes, the respondents are referred to as follows: “type of stakeholder, country name”. Throughout the text we summarise the perceptions of the respondents per country, and will always refer to the respective country or countries between brackets. For instance, “respondents (BE, MK, PT, ES, UK) perceive that vulnerable people are aware of the health risks and recommendations”. This means that respondents from Belgium, North Macedonia, Portugal, Spain and the United Kingdom said something concerning this, and that respondents from other countries did not.

Table 3 – Overview key informant interviews

COUNTRY	TYPE OF ACTOR	DATE	LANGUAGE	INTERVIEW FORMAT
BE	1. Public health agency 1	18/07/2019	Dutch	Face-to-face
	2. Cross-government agency	10/07/2019	English, Dutch	Face-to-face
	3. Public health agency 2	10/07/2019	Dutch	Face-to-face
	4. Public health agency 3	10/07/2019	English	Face-to-face
	5. Meteorological agency	10/07/2019	Dutch	Face-to-face
	6. Care provider	22/10/2019	Dutch	Face-to-face
	7. NGO	22/10/2019	Dutch	Face-to-face
FR	8. Care provider 1	17/06/2019	French	Face-to-face
	9. Social institution	17/06/2019	French	Face-to-face
	10. Public health agency 1	19/06/2019	French	Face-to-face
	11. Care provider 2	18/06/2019	French	Face-to-face
	12. Meteorological agency	19/06/2019	French	Face-to-face
	13. Public health agency 2	18/06/2019	French	Face-to-face
	14. Local authority	02/07/2019	French	Phone
	15. NGO	20/08/2019	French	Email
DE	16. Social institution	07/08/2019	German	Face-to-face
	17. Care provider	07/08/2019	German	Face-to-face
	18. National agency	05/08/2019	German	Face-to-face
	19. Ministry	24/07/2019	German	Face-to-face
	20. Emergency services	08/08/2019	German	Face-to-face
	21. Meteorological agency	19/07/2019	German	Face-to-face
	22. Public health agency	03/09/2019	German	Phone
MK	23. Meteorological agency	04/09/2019	English	Viber/email
	24. Public health agency 1	20/08/2019	English	Face-to-face
	25. Public health agency 2	20/08/2019	English	Face-to-face
	26. NGO	20/08/2019	English	Face-to-face
	27. Ministry	10/09/2019	English	Skype
	28. Crisis agency	03/09/2019	English	Email
	29. Emergency services	17/09/2019	English	Phone
	30. Local authority	24/09/2019	English	Phone
NL	31. Public health agency	23/07/2019	Dutch	Face-to-face
	32. Ministry	13/08/2019	Dutch	Face-to-face
	33. NGO	19/07/2019	Dutch	Face-to-face
	34. Meteorological agency	02/09/2019	Dutch	Face-to-face
	35. National agency	17/07/2019	Dutch	Face-to-face

COUNTRY	TYPE OF ACTOR	DATE	LANGUAGE	INTERVIEW FORMAT
	36. Local agency	16/08/2019	Dutch	Face-to-face
PT	37. National agency	07/08/2019	Portuguese	Face-to-face
	38. Regional authority	05/08/2019	Portuguese	Face-to-face
	39. Care provider	07/08/2019	Portuguese	Face-to-face
	40. Ministry	05/08/2019	Portuguese	Face-to-face
	41. Meteorological agency	07/08/2019	Portuguese	Face-to-face
	42. Local agency 1	08/08/2019	Portuguese	Face-to-face
	43. Local agency 2	08/08/2019	Portuguese	Face-to-face
ES	44. Care provider	28/06/2019	Spanish	Face-to-face
	45. Meteorological agency	25/06/2019	Spanish	Face-to-face
	46. Regional authority	26/06/2019	Spanish	Face-to-face
	47. Ministry 1	28/06/2019	Spanish	Face-to-face
	48. Local authority	22/07/2019	Spanish	Email
	49. Ministry 2	27/06/2019	Spanish	Face-to-face
	50. Local agency	27/06/2019	Spanish	Face-to-face
	51. Social institution	27/06/2019	Spanish	Face-to-face
CH	52. Public health agency	04/09/2019	English	Skype
	53. Meteorological agency	04/09/2019	English	Phone
	54. Regional authority 1	17/09/2019	English	Skype
	55. Care provider 1	19/09/2019	English	Phone
	56. Ministry	02/10/2019	English	Email
	57. Regional authority 2	09/10/2019	English	Phone
	58. Care provider 2	15/10/2019	French	Email
	UK	59. Local agency	01/07/2019	English
60. NGO		29/07/2019	English	Face-to-face
61. Meteorological agency		29/07/2019	English	Face-to-face
62. Public health agency 1		29/07/2019	English	Face-to-face
63. Community group		30/07/2019	English	Face-to-face
64. Public health agency 2		03/07/2019	English	Face-to-face
65. Emergency services		29/07/2019	English	Face-to-face
66. Public health agency 3		29/07/2019	English	Face-to-face
67. Public health agency 3		09/07/2019	English	Phone
68. Public health agency 3		29/07/2019	English	Face-to-face

## 2.2. Interview protocol

In order to ensure comparability across countries and interviewers, we developed an interview protocol (annex 1), which also included an interview guide (annex 2). The interview guide used a semi-structured approach allowing the interviewer to ask a standard set of questions across interviews, with the possibility to diverge from these questions based on the respondents' answers. For those interviews conducted in the native language (see table 3), the interview guide and consent forms were translated to the respective language. All interviews were recorded, transcribed and translated to English by the responsible interviewer.

Prior to each interview, we obtained consent (annex 3) from all key informants. Preferably this consent was given in written form. All consent forms are kept by UCLouvain. In some cases, e.g. phone interviews, this was not possible and we recorded the verbal consent.

## 2.3. Analysis

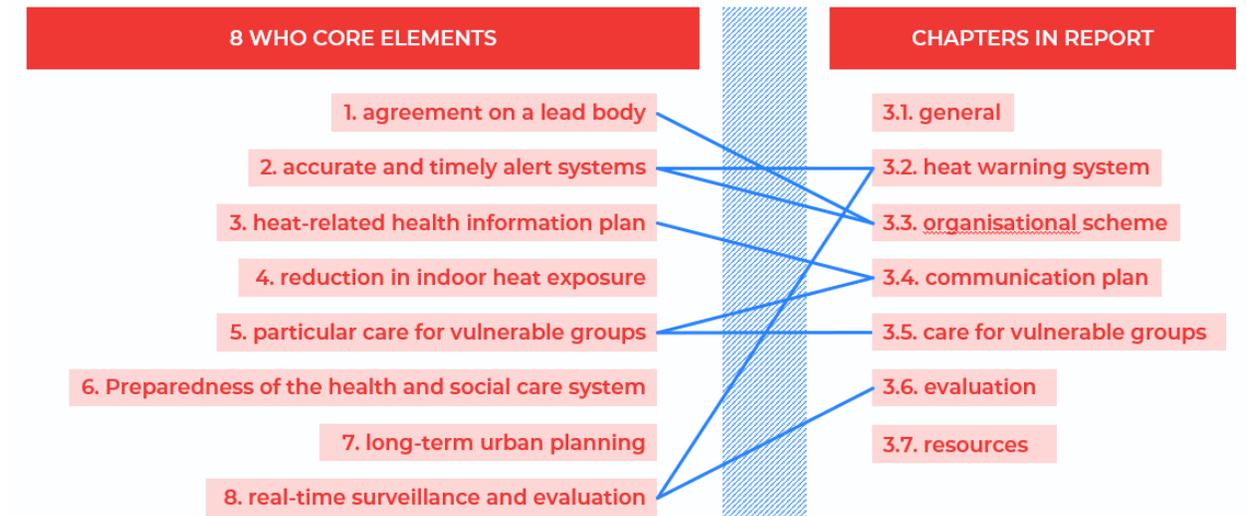
The transcribed and translated interviews were imported and analysed inductively in NVivo, a software program for conducting qualitative analyses. The analysis of the interviews further builds on the analysis of the national heatwave plans and the literature review. Specifically, the same approach and codebook were used. We used axial coding (i.e. a qualitative research technique based on grounded theory used to make connections between data (Bryman and Burgess 1994)) to organise the content of the interviews under the same themes that were identified in the analysis of the national heatwave plans and literature.

This approach will allow us, in deliverable 2.4, to compare the outcomes of the different analyses and identify differences and similarities between the plans and stakeholder's practices and perceptions.

## 2.4. Report

Similar to deliverables 2.1 and 2.2, the structure of this report is based on the eight core elements that were identified by the WHO as important to the successful implementation of heat-health action plans (Bittner et al. 2013; WHO Regional Office for Europe 2008).

Figure 1 – link between WHO core elements and report



### 3. Key informant interviews

#### 3.1. General

##### 3.1.1. Familiarity with and use of the national plan

###### *Familiarity*

In order to implement a heatwave plan, it is important that stakeholders involved in the plan are aware of its existence and actually use the plan. We find that in France, North Macedonia, The Netherlands and the United Kingdom all respondents were familiar with the national heatwave plan of their respective countries. In Belgium, Portugal, Spain and Switzerland all but one of the respondents were familiar with the plan, and in Germany the plan was only known to respondents active on the national level.

Overall, it seems that national stakeholders are usually aware of the plan, whereas regional or local stakeholders (e.g. care providers) are less likely to know of the plan.

Table 4 – Familiarity with national heatwave plan ((N)F=(not) familiar with national plan / U=use national plan / A=use an adapted version / O = use a different heatwave plan)

TYPE OF ACTOR	COUNTRY								
	BE	FR	DE	MK	NL	PT	ES	CH	UK
Care provider	F - O	1) F - A 2) F - A	NF			NF	F - A	1) NF 2) NF - O	
Community group									F - A
Crisis agency				F - U					
Emergency service			NF	F - U					F - A
Cross-government agency	F - U								
Local authority		F - A		F - U			F - A		
Local agency					F-U	1) F - A 2) F - A	NF		F - A
Meteorological agency	F - U	F - U	F - U	F - U	F - U	F - U	F - O	F - U	F - U
Ministry (health or other)			F - U		F	F - U	1) F - U 2) F - U	F - U	
Public health agency	1) F - U 2) F - A 3) F - A	1) F - U 2) F - U		1) F - U 2) F - U	F-U			F - A	1) F 2) F - U 3) F - U
Regional authority						F - A	F - A	1) F - A 2) F - U	
National agency			F		F - U	F - U			
NGO	NF	F - A		F - U	F - U				F - U
Research			F - U						
Social institutions		F - A	NF				F - A		

##### 3.1.2. Priority of heat

The respondents were asked to what extent they perceive heatwaves to be a public health priority (table 5). The majority of the respondents do perceive heat as a high public health priority (56%), and all

respondents from national agencies, NGOs and local authorities believe so. However, there is no country where all respondents perceive heat as a high priority.

Table 5 – Heat as a public health priority according to the respondents (L=low / M=medium / H=high)

TYPE OF ACTOR	COUNTRY								
	BE	FR	DE	MK	NL	PT	ES	CH	UK
Care provider	L	1) M 2) H	L			H	H	1) L 2) L	
Community group									H
Crisis agency				M					
Emergency service			L	M					H
Cross-government agency	H								
Local authority		H		H			M		
Local agency					L	1) H 2) M	L		H
Meteorological agency	H	M	H	H	H	M	M	H	L
Ministry (health or other)			H		L	H	1) H 2) M	L	
Public health agency	1) H 2) H 3) H	1) H 2) M		1) H 2) H	H			H	1) M 2) M 3) M
Regional authority						H	M	1) H 2) H	
National agency			H		H	H			
NGO	H	H		H	H				L
Research			H						
Social institutions		H	L				L		

In Belgium, everyone considers heat a high priority, except for one care provider who perceives it to be a low priority. In France, North Macedonia and Portugal heat is considered either a high or a medium priority. In these countries, no respondents consider it to be a low priority, implicating that everyone sees the need to address this issue. In Germany, the Netherlands and Switzerland, the respondents tend to extremes and either consider heat to be a high priority or a low priority. In Spain and the United Kingdom, responses vary from high to low.

Overall, we find that of those respondents that perceive heat as a low priority, most are operating on a local level. As these stakeholders often have limited resources, their usual tasks supersede additional tasks such as those that come during a heatwave.

*But I am more concerned about contagious infectious diseases of the population. Or, for example, the issue of mental health. [...] Because we cannot forget, we are talking about heatwaves., but, why do not we talk about homeless people? Why do not we talk about homeless people, who are the object and the main problem? The problem is not the heat, the problem is the homelessness, it is the process. (social institution, ES)*

### 3.1.2. Heatwave plans on different levels

The respondents report the existence of heatwave plans on different levels: national, regional, municipal or organisational. Usually, this implies that the national plan is adapted to local circumstances but still mirrors the national heatwave plan. Table 6 describes the different types of plans used by the respondents.

Table 6 – Use of different types of plans by the respondents (N=national / R=regional / M=municipal / O=organisational)

TYPE OF ACTOR	COUNTRY								
	BE	FR	DE	MK	NL	PT	ES	CH	UK
Care provider	O	1) O 2) O	-			-	O	1) O 2) O	
Community group									R
Crisis agency				N					
Emergency service			-	O					R
Cross-government agency	N								
Local authority		M		N			M		
Local agency					N	1) M 2) M	R		R
Meteorological agency	N	N	N	N	N	N	O	N	N
Ministry (health or other)			N		N	N	1) N 2) N	N	
Public health agency	1) N 2) R 3) R	1) N 2) N		1) N 2) N	N			N	1) N 2) N 3) N
Regional authority						R	R	1) R 2) N	
National agency			N		N	N			
NGO	O	O		N	N				N
Research			N						
Social institutions		M	O				R		

The Netherlands is the only country where respondents solely use the national heatwave plan. In all other countries, care providers use an organisational heatwave plan, which may or may not be based on the national heatwave plan and is either only focused on heatwaves or on emergencies in general. Meteorological agencies, ministries and public health agencies usually use the national heatwave plan, except the meteorological agency in Spain who have their own plan and public health agencies in Belgium who use regional plans. All regional authorities have and use a regional heatwave plan, though one regional authority in Switzerland reported having no regional plan and not using the national plan. In France, it is legally required for regional authorities to develop regional heatwave plans.

*The national heatwave plan is actually a plan of the French state, so we know it in these outlines. We ... In fact, it is adapted to Paris. We have a departmental plan, like all the French departments. It is an obligation of the French law. So, we know the main lines, but in fact the national heatwave plan is not extremely precise. That's it, so we adapt it, that is to say that we implement it with some Parisian specificities. (social institution, FR)*

Regional, local and organisational plans often differ in some ways from the national heatwave plan. Usually, because they describe activities in much more detail, and because they are adapted to the local context. In addition, also the national plan is sometimes implemented a bit differently than prescribed, for instance when certain opportunities present themselves or when issues occur.

*We have a certain freedom in our mission, we can fill it in. We propose something to the authorities, because we think that is how it is best implemented. And then see in*

*the course of a year that somewhere something is an opportunity, or somewhere something does not work at all. (public health agency 1, BE)*

The warning system is a central part of the national heatwave plans discussed in this report. In some cases, however, stakeholders use their own warning system instead. This may be a further elaboration of the warning system included in the national heatwave plan (FR), or a completely different system that fits better with their own procedures and services (BE, FR, PT, ES). The latter can lead to confusion for both stakeholders and the public. For instance, the warnings may mean different things but can be issued at the same time as the heatwave warning from the national heatwave plan.

*The alerts that we issue are sometimes contrary to those of the [ministry]. The [ministry] provides temperature information on its website and also gives alerts. It is just that often, it is hard to explain, we are not in tune with the alerts and we have some difficulty in understanding the criteria the [ministry] followed to issue that level of alert. So, there is often no consistency between what the [ministry] issues and what we issue. (regional authority, PT)*

In several countries (FR, DE, PT, ES, CH), the national heatwave plan recommends or requires other stakeholders (e.g. local or regional authorities) to develop their own plan. In Germany and Switzerland, where this is only a recommendation, not all regional authorities have done so: some have already developed a plan and are implementing it, while others are only now starting to give the issue more attention.

In the remainder of this report, our focus is on the national heatwave plans. The information described does not relate to other heatwave plans unless specifically mentioned.

### 3.2. Warning system

#### 3.2.2. Warning parameters

##### *Monitoring warning parameters*

Table 7 and 8 provide more information on the parameters that are monitored as part of the warning system, according to the respondents. Table 7 provides an overview of the parameters monitored in each country, and table 8 provides more detail on what is exactly monitored and the stakeholders who are responsible for the monitoring.

Overall, we find that temperature and mortality are monitored in all countries. Morbidity might also be monitored in all countries, but this is not entirely clear based on the interviews. Respondents from Belgium and the Netherlands do mention morbidity data, but they do not provide any information on whether this happens in the context of the national heatwave plan and about who is responsible. One respondent from Belgium mentions a Eurreg database on emergency services, but it is unclear how and whether this database is used in the context of heatwaves. In Germany, there is not yet a system to monitor morbidity.

The monitoring of other parameters varies greatly between countries. In addition, some countries monitor some of the other parameters, but do not do so in the context of the national heatwave plan. For instance, in the United Kingdom air pollution is monitored by the meteorological agency, but this is not linked to the national heatwave plan and heat-related health impacts.

Table 7 – Overview of the parameters monitored

WARNING PARAMETERS	COUNTRIES								
	BE	FR	DE	MK	NL	PT	ES	CH	UK
Air pollution									
Fire									
Indoor temperature									
Medical capacity									
Morbidity									
Mortality									
Other parameters									

Temperature									
Other meteorological factors									
Ozone levels									

Respondents from Portugal mention the monitoring of ozone levels, but based on their accounts it cannot be determined whether this is part of the national heatwave plan and who is responsible for this. Also, in Portugal, care providers monitored indoor temperature in the past. In facilities that now have air conditioning systems this is no longer considered necessary.

Table 8 demonstrates that most monitoring is carried out at national or regional levels. Important stakeholders in all countries, include meteorological agencies, public health agencies, ministries of health and regional authorities. At the local level, care providers such as hospitals or elderly homes contribute to the collection of data by regularly informing regional or national authorities about certain parameters. In addition, they might also monitor some local parameters themselves, such as indoor temperature or patients' water intake.

Table 8 – Overview of the parameters and the stakeholders involved

WARNING PARAMETER		STAKEHOLDERS INVOLVED IN COLLECTING AND ANALYSING DATA
Air pollution	Monitor air pollution (MK, PT) Monitor smoke and air pollution in relation to fires (PT)	Meteorological agency (PT) Ministry of environment (MK) Ministry of spatial planning (MK) National agency (PT)
Fire	Monitor wild fires and forest fires (PT)	Emergency services (PT)
Indoor temperature	Monitor indoor temperature and implement measures when it surpasses 26°C (BE) Calculate indoor conditions (DE) Monitor indoor conditions (ES)	Care providers (BE, ES) Meteorological agency (DE)
Medical capacity	Use of facilities and equipment, such as beds (PT) Monitor need for complementary care and response capacity (PT) Mortuary capacity (UK)	Emergency services (UK) Local agency (PT) Public health agency (PT)
Morbidity	Calculated expected morbidity (CH) Monitor hospital transfers (ES) Monitor pathologies (FR, MK, ES) on a daily base (MK) Monitor visits to emergency departments (FR, PT) with 1-3 days delay (FR) Number of calls to emergency services (FR, PT, ES, CH, UK) Number of medical service visits (MK, CH, UK) Number of people that visit cooled locations monitored on daily base (FR) Review morbidity at the end of the season (ES) Syndromic surveillance system (UK)	Care providers (FR, ES) Local authority (FR) Local civil protection agency (ES) Emergency services (FR, MK, PT) Ministry of interior affairs (ES) Ministry of health (PT) Municipal steering committee (FR) Regional authority (ES, CH) Public health agency (FR, MK, CH, UK) Statistical institute (NL, CH, UK)
Mortality	Calculate expected mortality (DE, PT, CH) Monitor mortality daily (ES, UK), with 2-3 weeks delay (BE, CH, UK), monthly (FR, MK), or post-heatwave (NL) Use of Bio Meteorological Indicators (FR)	Local civil protection agency (ES) Meteorological agency (FR) Ministry of health (MK, ES) Public health agency (BE, FR, MK, PT, ES, CH, CH, UK) Regional authority (ES, CH) Statistical institute (DE, NL, CH, UK)
Other parameters	Monitor water intake by elderly (ES)	Care provider (ES)

WARNING PARAMETER		STAKEHOLDERS INVOLVED IN COLLECTING AND ANALYSING DATA
	Monitor attendance of patients to day care centres (ES)	
Temperature	Average temperatures (MK, NL) Consider night temperatures and urban heat islands when alert is activated (BE) Daily weather forecasts (BE, FR, DE, MK, NL) Minimum and maximum day and night temperatures (FR, PT, CH, UK) Minimum and maximum predicted and observed temperatures in one city (BE) Minimum and maximum predicted temperatures in provincial capitals (ES) Perceived temperature (DE, NL)	Meteorological agency (BE, FR, DE, MK, NL, PT, ES, CH, UK) Regional authority (CH) Risk agency (BE)
Other meteorological factors	Humidity (BE, NL, PT, CH) Particulate matter, SO <sub>2</sub> , NO <sub>2</sub> (BE) Pollen (DE, MK) Solar radiation (BE, DE) Solar temperature (MK) Sun index (MK) UV (DE, MK) Weather sensitivity (DE) Wind speed (BE, NL)	Cross-government agency (BE) Meteorological agency (BE, FR, DE, PT, CH) National agency (DE) Public health agency (MK) Risk agency (BE)
Ozone levels	Daily and hourly ozone levels (BE) Monitor ozone levels (CH, PT)	Cross-government agency (BE) Regional authority (BE, CH, PT)

### Possible improvements

During the interviews, most respondents also reflected on how the monitoring of parameters could be improved from their perspective. Table 9 provides an overview of possible improvements per parameter.

Table 9 – Suggestions to improve monitoring of warning parameters in the future

WARNING PARAMETER	POSSIBLE IMPROVEMENTS
Indoor temperature	Expand indoor monitoring to include schools (BE) Monitor indoor temperature (CH, PT)
Medical capacity	Develop monitoring of mortuary capacity (FR)
Morbidity	Create predictive, big data models based on morbidity data (ES) Develop morbidity monitoring, on e.g. hospital admissions, use of emergency services (BE) Improve methods for morbidity monitoring and for identifying heatwave as a cause (DE, UK) Online accessible data for quicker response (DE) One database that gathers all information (NL) Morbidity monitoring is currently a pilot project that would ideally be implemented in all hospitals (ES) Need for real-time data (BE) Solve the issues of data protection and privacy regulations (DE)
Mortality	Ensure comparability of mortality data collected by different stakeholders (DE) Need for real-time data (BE, FR, DE) Online accessible data for quicker response (DE) One database that gathers all information (NL) Solve the issues of data protection and privacy regulations (DE)
Temperature	Confirm established thresholds (ES) Consider developing separate thresholds for regional and urban areas (NL)

WARNING PARAMETER	POSSIBLE IMPROVEMENTS
	Consider other methods to measure temperature, e.g. sensitivity measurements such as WBGT (BE, NL) More resources (budget and equipment) are required for effective monitoring (MK)
Other meteorological factors	Monitor solar radiation (BE) More resources (budget and equipment) are required for effective monitoring (MK)

In many countries, morbidity monitoring is considered important as it allows interventions at an early stage before irreversible health consequences occur. However, respondents (BE, DE, ES, NL, UK) mention it is very difficult to monitor morbidity. Two main reasons are mentioned: because it is difficult to attribute health problems to heat and because it is hard to ensure that doctors include heat as a cause for health consequences in the patients' files.

*Particularly our statisticians and our epidemiologist are finding it very difficult, because it's morbidity data. You know, how would that, how would you know that it's related to a heat wave? (public health agency 1, UK)*

A third and more recent difficulty relating to morbidity data, are privacy restrictions. Finally, another issue that is brought forward multiple times by respondents (BE, FR, DE), is the need for real-time data. This issue also pertains to mortality data. Currently, the analysis of morbidity and mortality data often takes place with a delay ranging from a few days to a few months. This hinders quick responses and prevents stakeholders from intervening effectively.

### 3.2.3. Communication flows

Figure 2 presents a generalisation of the communication flows that we identified based on the interviews. Communication takes place vertically, often in two directions, and horizontally between stakeholders on the same level. Downstream communication generally relates to the activation of the warning system. Upstream and horizontal communication is used to exchange information on warning parameters and on the implementation of certain actions.

The interviews reveal that the warning systems are activated in several communication steps, flowing through 3 levels.

The communication starts with the activation of the warning system (1 in figure 2). In all participating countries, the activation process starts when the meteorological agency issues a heat wave warning. This warning is first sent to the (national or regional) stakeholders who actually activate the plan (a cross-government agency, the ministry of health, a public health agency or the regional authorities). Only in the United Kingdom is the plan activated immediately by the meteorological agency. The heatwave warning and subsequent activation are usually communicated directly to pre-determined stakeholders over telephone, SMS or email. In Spain, for instance, this communication is programmed automatically, which lessens the workload for staff. This is, however, not attainable in all countries due to limited resources (e.g. MK).

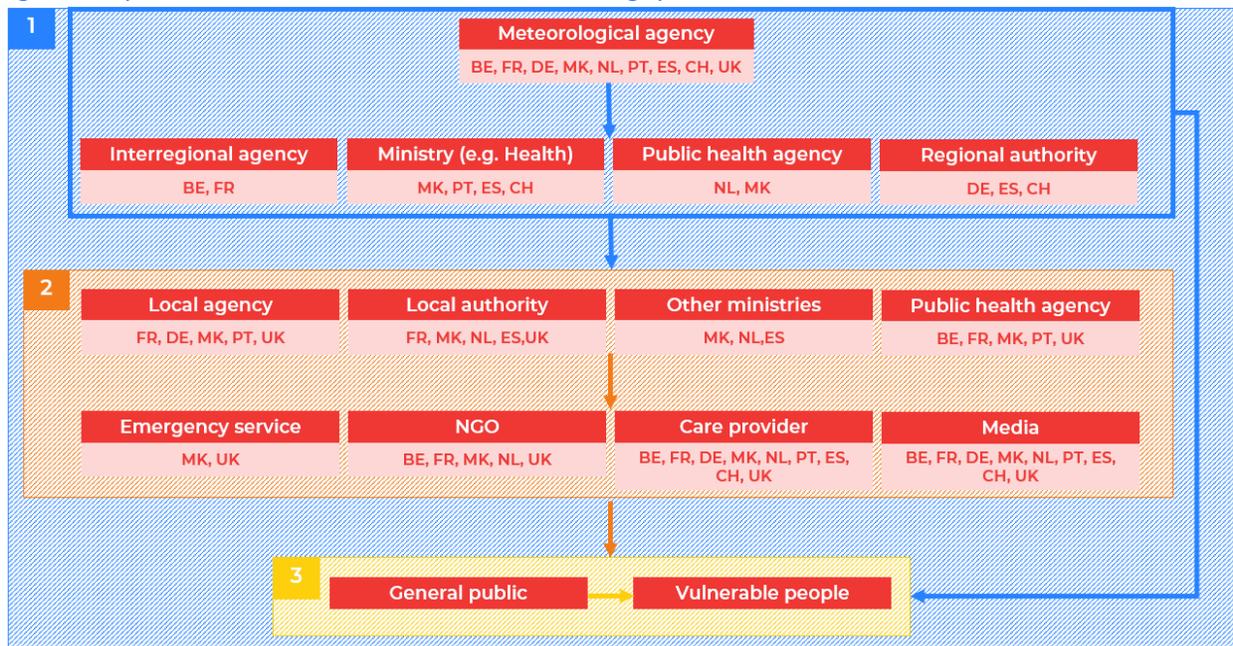
*Before I was in charge of alerting everyone, but now it's not necessary. Because everyone has now downloaded the application of the Community of Madrid [regional authority] where you jump the alerts in the mail. So, I'm not going to be repetitive, telling my partner that I was going to the Home Care Service: "Barbara, remember that*

*you have ..." Because she already receives it and the companies, everyone has already activated the alert sent to you by the Community of Madrid. (local authority, ES)*

After the plan has been activated, the warning is sent to other stakeholders (2 in figure 2) and the general public (3 in figure 2), alongside the message to implement the plan and information on protective measures. The communication to level 2 is directed at multiple stakeholders at the same time. Especially as each type of stakeholder (e.g. local authority) actually comprises of a myriad of real-life stakeholders (e.g. all municipalities within a country). In addition, stakeholders in level 2 can also be responsible for informing other stakeholders in the same level, and the general public in level 3 can also participate in informing vulnerable people (e.g. relatives or elderly people).

Regional authorities (CH, ES) and stakeholders in the top-row of level 2 (FR, ES) are often also responsible for activating a local heatwave plan, if such a plan exists (see 3.1.2.).

Figure 2 – Synthesis of communication flows in the warning systems



### 3.3. Organisational scheme

#### 3.3.1. Stakeholders and their roles

##### *Roles performed according to the respondents*

In deliverable 2.1, we have identified 7 possible roles that stakeholders may perform in the context of a national heatwave plan:

- Author (A): responsible for developing and setting up the (national) heatwave plan (see also table 1);
- Activator (Ac): responsible for triggering the heatwave warning system (e.g. by sending a warning to stakeholders) and/or activating the plan;
- Coordinator (C): responsible for coordinating the implementation of the plan and/or cooperation between stakeholders
- Informer (I): (co)responsible for diffusing information to other stakeholders and/or end users;
- Monitor (M): responsible for monitoring warning parameters and informing other stakeholders or end users of the values of warning parameters;
- Implementer (Im): responsible for implementing the heatwave plan to ensure health of vulnerable people and the general public with respect to heat;
- Evaluator (E): responsible for documenting, monitoring/or and evaluating the heatwave plan and course of action.

In table 10 below, we describe the roles that are mentioned by the respondents during the interview. We also mark those roles that are not mentioned in the national plan (\*) and those that are performed in the context of another heatwave plan (\*\*). The cells of respondents are coloured red, those of other stakeholders are left white. The information in the cells is based on the accounts of the respondents concerning their own roles, or the roles of other stakeholders that are not respondents in this study.

Table 10 – Stakeholders and their roles

TYPE OF ACTOR	COUNTRY								
	BE	FR	DE	MK	NL	PT	ES	CH	UK
Care provider	Im	1) Im 2) Im	Im	Im	Im	Im	Im	1) Im 2) Im	Im
Community group									A** I** Im**
Crisis agency				A* C* I* M					
Emergency service			C Im	A* I		Im			Im
Interregional agency	Ac I M	Ac							
Local authority	I	I Im	A** I**	I Im			A* C* E* Im* M*		
Local agency		I			I* Im	1) I Im 2) I Im	I Im		Ac* C**
Meteorological agency	I M	I M	A* Ac I M	Ac I M	Ac I M	I M	I M	Ac I M	Ac I M
Ministry (health or other)			A C E M		A	A* Ac* I M	1) Ac A I Im 2) M* E I	Ac C* I	
Public health agency	1) M* E* 2) I Im 3) I E*	1) A C E I Im M 2) A C E I Im M		1) I Im 2) Ac I Im M	Ac C* I			A	1) E 2) E I Im M 3) E I Im M
Regional authority						Ac** I M	A** Ac** C** I Im M**	1) Ac** I M 2) I	
National agency			A		A I	C I			
NGO	Im*	Im		I Im	A* I		I		Im
Media	I	I	I	I		I	I	I	I
Research	M		A*				M		
Social Institutions	Im	I* Im*	Im		Im I		I Im	Im I	C I Im

Based on the information from the interviews, we find that in all countries care providers and social institutions are usually implementers. In some countries (NL, ES, CH, UK) social institutions are also informers and coordinators. Meteorological agencies are in all countries responsible for monitoring warning parameters and informing other stakeholders on parameter thresholds. By informing others when parameter thresholds have been reached, they take the first step in activating the plan. The actual activation of the plan, however, is usually decided on by other stakeholders, except in the United Kingdom. In other countries the Ministry of Health (MK, PT, ES, CH), a cross-government agency (BE, FR) or a public health agency (MK, NL) make this decision.

In several countries (BE, FR, MK, UK), there is more than one public health agency that plays a role in the national heatwave plan. Public health agencies can be both governmental or non-governmental organisations. Finally, local agencies can perform the role of informer and implementer (NL, PT, ES) or they can be responsible for activating and coordinating local plans (UK).

Most respondents believe that the national heatwave plan clearly describes their role and responsibilities. Three issues are identified. First, some respondents (FR, PT) point out that the plan sometimes lacks detailed information on roles and responsibilities. As a result, some stakeholders may take up roles that are not included in the national heatwave plan.

*In the heat wave plan it roughly says that the [crisis agency of the ministry of health] works with [the meteorological agency] and [the public health agency]. Eventually it is said that there is a vigilance card that is broadcast once or twice a day, but here it is not said how. How are we organised - is it the professionals who make it work? And who adjusts the procedures, the procedures. The heat wave plan, it does not detail all that. It does not go to the last level of detail. After that, it's the organizational document of each operator that continues that. (meteorological agency, FR)*

In addition, this creates a need for local plans in which further elaborate roles and responsibilities of local stakeholders. This is further confirmed by respondents from local organisations and care providers, who point out that their role is not explained in detail within the national plan. Table 10 also reflects this, as it shows that many respondents take on roles that are not mentioned by the national heatwave plan (\*) or that are performed in the context of a local plan (\*\*).

A second issue, is that some respondents (PT, ES) believe that their organisations – usually active on the local level – lack the autonomy to perform their tasks fully or that they are restricted by their official task description. Stakeholders are often part of a hierarchy, in which resources are decided top-down. Yet, without access to these resources, stakeholders are limited in the measures they can implement. Other respondents (ES, UK), however, believe they do have the autonomy to make necessary adjustments.

*So, the plan is one of the many activities that we carry out and then even in terms of material resources, sometimes we have difficulty in responding to what is recommended in the Plan and to perform our role. We cannot guarantee it, because we do not have the autonomy to do it. But we try to alert people that infrastructure, for example, is not always prepared to respond to the extent we would like. (local agency 1, PT)*

Finally, a third issue is the need for (and sometimes lack of) good coordination. For the heatwave plan to function well, national and local coordinators must be appointed. However, in some countries (DE, MK, NL, PT) respondents feel that this is still missing. Without good coordination, stakeholders may not be mobilised (in time) and decisions may not be made. Moreover, good coordination requires certain resources, which are not always available.

### 3.3.2. Collaboration between stakeholders

The respondents point out a broad range of collaborations that can be top-down or two-directional, and between stakeholders on different levels (e.g. public health agency and local hospital) or stakeholders on the same level (e.g. between ministries). These collaborations can have many purposes: activating the warning system, exchanging information, supporting in the development of a plan, supporting in the implementation of measures, joint implementation of measures, coordinating the implementation, and evaluating the implemented measures. Overall, stakeholders collaborate with others that have skills, information or connections that they do not have themselves.

*The levels [i.e. parameter thresholds] are defined by [the public health agency] and [the meteorological agency] jointly. [...] So, it's really a work in common between us. Because [the public health agency] works on mortality issues and we are working on the physical issues of the atmosphere. And it is in crossing both domains, that we can define the thresholds. (meteorological agency, France)*

Some collaborations are considered to be more important than others. For instance, collaborations between central stakeholders such as the meteorological agency and ministry of health are vital in some countries for ensuring that all relevant stakeholders know in advance of an approaching heatwave. Nevertheless, all collaborations are considered necessary to implement the national heatwave plan as no one stakeholder has the capacity to do this by themselves.

In general, the current collaborations seem to be going well according to the respondents (DE, MK, PT, ES, UK). None of the respondents point out large problems or any kind of conflict. Collaborations are usually welcomed, as they allow different stakeholders to exchange information and to make maximum use of each other's capacities.

Nevertheless, there is room for improvement. First, collaborations across sectors are considered to be important (BE, FR, DE, MK, CH, PT), but can be difficult to establish. For instance, respondents from Germany note that if the ministry of health is not the author of the plan, this can pose certain challenges to find entry into the health sector. The ministry of health usually has connections within the health and medical sector that are valuable for implementing plans with a health focus, such as a national heatwave plan. Possibly, more intersectoral collaboration can be realised by organising a “heat commission” that comprises of representatives from all sectors. Such a commission or group already exists in Belgium, North Macedonia, France and Switzerland. In these countries, the commission convenes multiple times per year (BE, MK, CH) or daily (FR) during a heatwave. Some countries (e.g. DE) may already have such working groups in the context of climate change. These groups could incorporate discussions on the health impact of heatwaves as well.

*It's a group of stakeholders that represent the different institutions. So, they're part of this group all year round, it's key. We have a meeting in the spring to coordinate, and then we also meet again in the fall to have a kind of feedback and exchange what went well and what didn't go well. [...] These key individuals are then responsible if we increase the level of warning on the heatwave plan. Then they're responsible for communicating within their organisations. (regional authority 1, CH)*

Specifically, respondents (BE, MK, NL, PT, ES) point out the need for more and better collaboration (and engagement) within the health system itself, and between the health system and other stakeholders. Collaborations with social institutions are considered to be especially valuable for reaching specific vulnerable groups (i.e. homeless, socially isolated). In addition, to promote the plan and increase the priority of heat, some respondents (DE, MK, NL, PT, ES) point out it can be interesting to increase collaborations with schools, civil society (e.g. trade unions, sports club, events), NGOs or citizen organisations (e.g. school strike for climate). One respondent from the Netherlands points out, however, that before more collaborations are created, the organisational scheme (i.e. a description of roles and responsibilities for all relevant stakeholders) must be set. If not, this may be an excuse for organisations to not take ownership of the heat problem.

Second, some relations are very top-down and could benefit from more collaboration (FR, MK). For instance, in France public health agencies are tasked by the ministry to develop heat health recommendations, which another public health agency will then implement in a campaign. This can lead to misinformation as the recommendations may be misinterpreted. This could be avoided if there was a more collaborative relation between the ministry and the public health agencies, in which there was more room to exchange information and expertise between all actors. A similar remark is made in North Macedonia, where respondents feel that there is a need for more collaboration between national and regional public health agencies.

A third issue is that many heatwave plans roughly describe which collaborations should take place, but they do not detail how this should be organised. The respondents (FR, PT) point out that each stakeholder has to determine how these collaborations will take place, which can lead to confusion. This may be addressed by including a more detailed organisational scheme within the heatwave plan, or by having strategic protocols that exist outside the heatwave plan (e.g. UK).

*So, what is described are the actions of each partner. It's not necessarily how we're going to articulate it. It doesn't say how often we're going to meet or what we're going to discuss. This is not in the plan. (local agency 1, PT)*

A fourth issue that respondents (MK, PT) point out, is that collaboration between organisations is dependent on individuals. Collaboration can become difficult when people do not have the same views or interests.

*We have already had some disappointments [...]. With some people who at that time were in charge [...]. Now things are much better. There was a moment when we had immense difficulty with one of the municipalities. We were having difficulties in establishing articulation, but now there is more openness. With other people who are leading. (local agency 2, PT)*

Finally, it is not always easy for stakeholders to establish new relations due to administrative or bureaucratic reasons (ES). For instance, a respondent from Spain points out that they want to establish a new relation, but this requires the signing of a collaboration agreement which has to be approved by third parties as well. In addition, collaborations between organisations are dependent on individuals.

### 3.3.3. Ensuring continuity of care during a heatwave

Heatwaves can put a huge strain on care providers and their staff. During a heatwave, the inflow of patients may increase and existing patients may need additional care (see also chapter 3.5). This gives rise to several challenges, mostly for care providers and other implementers. Table 11 provides an overview of the identified challenges, which are then described in more detail below. Only the respondents from the Netherlands do not mention any challenges regarding ensuring continuity of care.

An overarching challenge pointed out by several respondents (BE, DE, CH, MK, ES, UK), is the potential disruption of energy and water supplies due to heat stress and drought. In Portugal, a respondent also pointed out that the coincidence of heatwaves and wildfires can disrupt telecommunications. In the past, this has created a situation in which the response to a heatwave event in remote areas was affected by the difficulty to communicate by phone.

Table 11 – Challenges to continuity of care

CHALLENGES	COUNTRY								
	BE	FR	DE	MK	NL	PT	ES	CH	UK
Energy and water supply									
Medical capacity									
Human resources									
Stock of equipment and material									

#### Medical capacity

The increase in patients admitted to care facilities during a heatwave, may stress their capacity for treating everyone. In order to deal with this issue, respondents (FR, PT, CH, UK) point out that it may be necessary during heatwave periods to increase the number of beds, to extend emergency care beyond emergency services or to open additional treatment spaces. This challenge can be mitigated with organisational contingency plans, and daily monitoring of available beds and organisational capacity.

*To assess whether it is necessary to increase the response capacity, we monitor the search for urgency together with the hospital. We discuss with the hospital whether or not they should activate their own contingency plan in case of excessive demand. (local agency 1, PT)*

Respondents (PT) point out that in regions where many tourists reside during the summer months, care providers can organise specific consultations to cope with acute health problems in this group. Furthermore, according to a respondent in the Netherlands, local initiatives can play a role in alleviating the burden for care providers and ensuring care for vulnerable people.

*You can see that around those developments in local heatwave plans, real-life social organisations are coming into the picture that may not be affiliated with a national structure. That can now mean something to those elderly people who still live at home,*

*for example, or to a multicultural society and people who do not speak Dutch. So, I think that is really new. (local agency, NL)*

Finally, also the capacity of mortuaries needs to be monitored in case of increasing mortality (PT, UK).

### *Human resources*

It is vital to ensure the availability of sufficient staff members during periods in which a heatwave may occur. Many respondents (FR, DE, PT, ES, MK, CH, UK), usually implementers, identify this as a challenge for ensuring the continuity of care. Heatwaves mostly occur during the summer period when many staff members are on leave, and also the staff members themselves can suffer from the negative health impacts of heat. As a result, some medical services may not be available or have to be limited.

To monitor the available staff at all times, some organisations work with a staff register, that shows which personnel is available on a daily base. Having such an overview, allows for quick interventions and changes. In other organisations there is an electronic system to quickly report internal issues such as staff shortages. In order to (temporarily) increase the number of staff members, several options are mentioned by the respondents (FR, MK, PT, ES):

- recall personnel from leave;
- mobilise retired personnel;
- temporarily reassign personnel from other departments or partner organisations;
- mobilise emergency services (e.g. fire department);
- hire additional personnel;
- deploy mobile teams; or
- employ volunteers.

Hiring personnel is not always an option due to limited resources. Moreover, respondents point out that finding sufficient candidates is a continuous challenge throughout the entire year.

*During an acute illness situation in primary care, I will have a professional schedule to guarantee an answer for that population. Then they will have to hire the number of personnel over hours to be able to guarantee a response. This is paid and will require its own budget. The ministry does not have a budget for this. (ministry, PT)*

Another option is to deploy mobile teams. These are medically trained staff who are assigned where they are needed. This allows for quick interventions and increases flexibility.

*When we do not have enough, some days in August when a lot of people are on leave, it gets a little complicated. We have a team here called the intervention team. They're flying agents. In fact, they're agents who do not have a fixed assignment but are assigned where there are needs on a regular basis. [...] They are put in cells like that to fill the holes a bit. (social institution, FR)*

Finally, organisations can make use of volunteers, though these must be properly trained first. This includes learning how to work with vulnerable people and gaining basic first aid skills.

### *Stock of equipment and material*

The sudden influx of patients during a heatwave can also put a strain on stocks of equipment and material. This challenge is particularly pointed out by respondents (FR, DE, UK) who are local care providers. To deal with this challenge, these organisations often have specific contingency plans. A main component of such plans seems to be the preparation of a minimal stock.

*During the month of May, just before heatwave periods, we will check the stocks at pharmacies. Because we know we're going to need more material and rehydration products, or similar equipment. So, we have stocks that are a little larger than usual during this period. [...] Moreover, usually there is a delivery that is preventive, it is a minimum quantity. And then, in need, it is added to. (care provider, FR)*

### 3.4. Communication plan

#### 3.4.1. Communication tools

Throughout all interviews, a total of 13 types of communication tools and/or media are named for communication with the general public (GP), targeted vulnerable groups (VG) and involved stakeholders (S). Tools that are mentioned by stakeholders of all nine countries, are printed material (e.g. flyers and leaflets), television, newspapers and radio, and websites of involved stakeholders. Table 12 provides an overview of the tools that are mentioned by the respondents to reach their target groups, and table 13 gives more information about each communication tool and what they are used for.

Table 12 – Communication tools and the target groups they are used for

TOOLS	COUNTRIES								
	BE	FR	DE	MK	NL	PT	ES	CH	UK
App			GP	GP	GP	GP	VG	GP	GP
Colour coded map	GP, S	GP, S	S	GP	S	GP, S			
Newsletter	S	GP, S	GP, S				GP		
Open Days			GP, S						
Phone, SMS, (e)mail	GP, S	VG, S		S	VG, S	VG, S	VG, S	S	S
Press release	GP, S		GP		GP		GP, S	GP, S	
Prevention kits		S							
Printed material	GP	GP, VG, S	GP, S	GP, VG, S		GP	GP	GP, S	GP
Social media	GP		GP, S	GP, VG		GP	GP		S
Television, newspapers and radio	GP, S, VG	GP, VG	GP, S	GP		GP, S	VG	GP	GP
Telephone hotline				GP, VG		GP, VG		GP	GP
Trainings	S	S		S	S		VG, GP		
Website	GP	GP, VG	GP, S	GP, VG	GP	GP, S	GP, VG, S	GP	GP

The choice for a specific communication tool generally depends on 3 things:

- who the message is targeted at;
- the type of message that is being disseminated; and
- the available resources.

The respondents indicate that certain communication tools are more useful to reach specific target groups than others. For instance, television and radio are perceived to be better tools to reach the elderly than the internet or social media; and printed material at pharmacies and GP waiting rooms are an easy way to reach those who are vulnerable to heat because of medical reasons (e.g. pre-existing illness or pregnancy).

*That is the most difficult thing about the entire process. There are certain target groups that are difficult to reach. Small children, yes, you have to reach all the caretakers. For the elderly it is always difficult to reach them via the new media. There are more and more of those, but the elderly are not on Facebook, not on Twitter. They look at the NOS news, but that is the only thing. (public health agency, NL)*

With regard to the type of message, mass media such as television and radio can be used to disseminate general warnings, whereas more detailed information can be provided on flyers, social media or websites.

Furthermore, some messages require direct personal communication over email or phone, such as informing relevant stakeholders of an upcoming heatwave. Finally, the use of communication tools is determined by the availability of resources. For instance, stakeholders in North Macedonia are interested in sending automatic alerts to the population (in a certain area) using text messages, but they currently do not have the budget to develop and implement such a system.

Table 13 – Communication tools and how they are used

TOOLS	USE
App	Phone application that contains a weather report and warnings for the population (DE, PT, ES, CH, NL) Phone application that gives warnings for extreme weather events and recommendations for protective behaviour (MK, UK)
Colour coded map	Geographic representation of the country with colour codes that indicate activation of certain alert levels (FR, DE, MK) The map is accompanied with a bulletin and text that explains the content (FR, PT) The map can be published online (FR) or as part of a report (DE) Weather maps and tables available to stakeholders and online (BE) Stress maps on community level that indicate local temperatures and locations of vulnerable people to allow targeted care (NL)
Newsletter	Information on the activation of certain alert levels (BE, FR, DE, ES) Information on protective measures (BE, FR)
Open Days	Use of Open Days as a platform to attract citizens and diffuse information material (DE)
Phone, SMS, (e)mail	Email with warning to people and organisations registered on a mailing list (BE) Letter from the mayor to vulnerable people with information about additional protective measures (e.g. meals at home) (FR) Preventive and informative text messages to the population in affected areas (PT) Relevant stakeholders are personally informed via email, phone or text message about the activation of certain alert levels (BE, FR, MK, NL, PT, ES, CH, UK) and protective measures (BE, NL) Telephone circle of vulnerable people that check on each other (NL) Video conference with relevant stakeholders (PT)
Press release	Release the results of studies (DE) Answer press questions about heat (DE, ES, NL) Interviews and appearances on tv or radio shows (ES, CH) Press release to inform about the activation of certain alert levels and to trigger the activation of plans by relevant stakeholders (BE, ES, CH) Press release to inform the population and inform about protective measures (BE, ES, CH)
Prevention kits	A collection of information material to be used by the staff of local institutions (e.g. elderly homes or schools) (FR)
Printed material (e.g. flyers, leaflets, posters)	Prints with tips to protect yourself from the heat (BE, FR, DE, MK, PT, ES, CH, UK) Prints with protective measures for specific vulnerable groups (BE, FR, MK) Prints with recommendations for medical staff and care providers (FR, MK, CH) Guidebook about the impact of climate change on health (DE) Manual for schools and kindergartens for natural disasters (MK) Distributed via care providers (e.g. waiting rooms or consultations) and pharmacies (FR, PT, ES), mobile teams in the street (MK), street stands or billboards (PT) or available online (Fr, DE, MK, PT)
Social media of involved stakeholders	Posts about the activation of certain alert levels (BE, DE, ES, UK) Protective measures for specific vulnerable groups (MK, PT) or the general public (BE, ES) Recommendations for medical staff and care providers (MK) Information campaign through social networks (ES)

TOOLS	USE
Television, newspapers and radio	Weather reports (BE, FR, DE, MK, PT) Information on the activation of certain alert levels (FR, DE, MK) Information on protective measures (BE, FR, DE, MK, PT, UK) Single official voice warning issued to communicate severe alert (CH) Specific public service news channel for the population of a city or region (DE) TV and radio spots for national and local broadcasting (PT)
Telephone hotline	Telephone service that is activated during a heatwave and people can use if they have questions (MK, PT, CH, UK) Automatic message during waiting time that informs about protective measures (PT)
Trainings	Educational talks organised by local care providers to inform vulnerable groups and their caretakers about symptoms and protective measures (ES) Presentation for medical staff about protective measures for vulnerable groups (FR) Trainings for volunteers on how to deal with vulnerable groups (FR, NL) Trainings for medical staff and volunteers about risk reduction for natural disasters (MK) Trainings in schools, nurseries and/or elderly homes (BE, NL)
Website of involved stakeholders	Alerts on Google maps about nearby weather events (UK) FAQ webpage to clarify common questions from the public (PT) Online weather reports (BE, FR, MK, PT, ES, CH) Online information on the activation of certain alert levels (BE, FR, MK) Online version of flyers and leaflets with protective measures (BE, FR, DE, MK, PT) Online information on protective measures (BE, MK, PT, ES) Restricted webpages with information for relevant stakeholders (PT, ES) Stream educational talks on YouTube (ES)

### 3.4.2. Type and content of the message

With regard to the message that is sent to the public, respondents from France, Portugal, Spain and the United Kingdom point out that it is important to communicate messages that are brief and coherent. First, respondents (FR) suggest that synthesised messages and messages that use visual elements (e.g. colour codes) are easier to read than long texts. Therefore, such messages may reach a wider public.

*We learned that people read very little text, they are mostly attracted by images. The first level of reading is colour, colour is the image. The second level of reading is a short synthesis of information. The third level of reading is possibly a more complete newsletter. The fourth level of reading is that of behaviour. In fact, very few do the whole thing. Very few read to the end. (meteorological agency, FR)*

Second, several respondents (PT, ES, UK) point out that it is very important that all involved stakeholders relay the same message to the public to avoid confusion. In most countries, multiple stakeholders are involved in warning the public and the interviews revealed that they do not always communicate the exact same message. A possible cause of confusion is when different warning systems are used in parallel. This can happen when different stakeholders independently develop a warning system and emergency plan. However, each warning system may have different parameters or different thresholds, causing warnings to be issued at different times or under different circumstances. Furthermore, even within the context of the same warning system, different stakeholders involved in a heatwave plan may have different interests and communication plans. This may lead them to communicate slightly different messages.

*But there was an interesting thing last week where I think our immediate team, so before the heatwave, they were always sort of saying like, you should put something*

out. And they went to use some of the graphics and messages from the IFRC heatwave guide. And we were a little bit unsure because some of them were not maybe like exactly the same as in the National Heatwave plan. And you felt that also in the media, some of the messaging was a bit confusing. So, some of the messages we cover enough that were put out, like, you know, there were some common ones but then there were also really weird ones. So yeah, it was a little bit messy last week. (Red Cross, UK)

To address this issue and to ensure more coherent and recognizable communication, some respondents (FR) suggest to use similar visual elements and similar messages. For instance, in France the same logos are used on printed material so that people easily recognize the message and where it comes from.

*The idea is that, as people are beginning to really know these posters, because it's been some years that they exist. The idea is that the different actors, if they want to use them in some other way, but with the same logos, etc. So that people recognize this or that in each display the message is the same. (public health agency 2, FR)*

### 3.4.3. Informing specific target groups: effectiveness and impact on behaviour

The communication strategy in national heatwave plans is usually oriented towards three different target groups: a) other stakeholders, b) the general public and c) vulnerable people (and their caretakers). Below we discuss per target group the respondents' perceptions on whether the communication effectively reached the target group and succeeded in changing their behaviour. Annex 4 provides more detailed information about the respondents' perspectives per country.

Table 14 describes whether the respondents perceive they are effective (E), partially effective (PE) or ineffective (I) in reaching target groups (whether these are other stakeholders, general public or vulnerable people). Some respondents didn't mention this, which is indicated with a "-". All respondents are marked with a red cell.

Table 14 – Perception of effectiveness in reaching target groups

TYPE OF ACTOR	COUNTRIES								
	BE	FR	DE	MK	NL	PT	ES	CH	UK
Care provider	-	1) E 2) E	-			E	E	1) - 2) E	
Community group									E
Crisis agency				E					
Emergency service			-	P					P
Cross-government agency	E								
Local authority		P		P			P		
Local agency					I	1) E 2) E	P		P
Meteorological agency	E	E	P	P	E	E	P	E	E
Ministry (health or other)			P		P	E	1) E 2) E	-	
Public health agency	1) E 2) E 3) E	1) I 2) E		1) I 2) E	E			P	1) I 2) E 3) P
Regional authority						E	E	1) P 2) P	
National agency			E		I	E			

Red cross	-	P		P	P				P
Research			-						
Social services		E	-				E		

### a. Informing other stakeholders

The interviews reveal that in Belgium, France, Germany, North Macedonia, the Netherlands, Switzerland and the United Kingdom respondents believe that not all stakeholders are adequately informed about the health risks of heat and protective measures. Moreover, some of the respondents report to not receiving any information (DE, PT, ES, CH) or even demonstrate a lower awareness about the health risks of heat compared to other respondents, specifically considering vulnerable groups (DE, ES). Three possible reasons are identified by the respondents:

- some stakeholders are not reached in dissemination process;
- some stakeholders receive the information but misinterpret it; and
- some stakeholders consider other risks as more relevant or urgent.

This can have negative consequences for the population and vulnerable people, as it implies that these stakeholders cannot pass on information adequately and cannot correctly implement necessary measures.

*The third error that persists is that we are insufficiently aware of the effectiveness of artificial cooling by misting water on the skin and making a draft. [...] the hyponatremia noted 1/3 of hospitalizations at the time of the last heatwave in France last year, which is still a lot. And why hyponatremia? Because we give liquids to people who do not need it [...] And after three days, I dutifully drowned you by bringing you water you do not need and you get oedema. And if you do not die of heat you will die of cerebral oedema that I have provoked in you. (public health agency 1, FR)*

Furthermore, some respondents (FR, DE) point out that the level of knowledge between (medical) staff members of involved stakeholders can vary. Some staff may have followed specific trainings to deal with heat-related health risks, but not everyone has. This can be especially problematic when the heatwave occurs at a time where not all trained staff is available, e.g. during vacation periods or weekends.

*The same applies to the heat action plans, when I only have an emergency staff in the homes at the weekend, and then a heat warning. They do not know what that means, that people then ... have to drink more, that the interaction of the drugs can be different, that we have twice as strong an effect on pain patches with morphine, that on the other hand insulin is broken down twice as fast. (ministry, DE)*

To improve awareness and knowledge of stakeholders and their staff, and to ensure the correct implementation of protective measures at all times, there is a need for education. Many respondents (DE, MK, NL, UK) specifically point out the need to educate care providers (medical and other) and their staff about the health impact of heat, protective measures and how to implement them. A possible approach is to incorporate courses on heatwave preparedness in curricula of medical programs and professions that come in contact with vulnerable groups (e.g. pharmacists, labour inspectors).

Several respondents (BE, FR, DE, CH, UK) mention that they are unsure whether all stakeholders are informed and to what extent they are able or willing to implement the information they receive. They believe that some stakeholders may discard the information, because they do not consider heat as a priority or because they do not have the resources to implement certain measures. This seems more likely when the national heatwave plan is a guideline rather than a nationally operated instrument. For instance, in Germany and Switzerland regional authorities can choose whether they develop and implement a regional heatwave plan. As a result, only a few regions have developed a heatwave plan.

*Okay, in 2003, of course, we had this first big heatwave and after that the Federal Office of Public Health decided we have to do something. Because until then there was nothing. So, what they did was that they developed an information campaign. [...] But then the cantons ... some of them used this material to do their own campaigns and some did nothing (public health agency, CH)*

Finally, in Belgium, respondents feel that stakeholders are really aware and implement the correct measures. Respondents from Spain and Portugal do not mention any specific issues in relation to the effectiveness of informing stakeholders, besides mentioning the need to assess whether the national plan is effective in this sense.

### ***b. Informing the general public***

Overall, respondents from Belgium, France, Germany, North Macedonia, Portugal, Spain, and Switzerland feel that awareness is increasing in the general public: they are more informed about heat-related health risks and implement protective measures. Furthermore, respondents feel that this awareness increases over the summer and during periods of prolonged heat. At the start of the season, many people are caught unprepared and unaware, but at the end of the summer people know better what to do to protect themselves from heat.

Despite this perception of increased awareness, however, most respondents (BE, FR, DE, PT, ES, CH) also recognize that part of the population remains unaware or does not change their behaviour.

*Of course, people generally know what to do. But whether they behave differently?  
(public health agency 2, BE)*

In order to increase awareness and to reach everyone, some respondents (BE, DE) specifically stress that repetition and continuation are key. In practice, this implies the repeated and simultaneous use of multiple communication tools and channels. For instance, the elderly may hear a warning on the television and not remember later. But if they are given a flyer, e.g. during a home visit, they have an additional, visual reminder about what measures to take.

*You have to try different communication media. Only an app or only a newsletter is not always effective. You might also have to write to people. You also have to activate neighbourhood care: "help your fellow people!", doctors, pharmacies, NGOs, protective associations [...] To get it into people's minds, you do not just have to do it once on television, you have to do it every year and repeat it. The learning effect must remain. It's very important because people think: "We made an app here and it has everything in it." That is not enough. (meteorological agency, DE)*

Other respondents (FR, MK, UK) suggest to join forces with schools and universities in order to offer continuous education to the public and professionals. According to them, this would enable a real state of preparedness, instead of merely reacting to a heatwave when it occurs.

With regard to the lack of behaviour change, one possible barrier seems to be individual freedom. People are free to choose what they do with information they receive, including not acting upon it. In order to convince this group to change their behaviour, respondents suggest to incorporate behavioural insights into the communication strategies (FR, PT), or to focus on self-responsibility (ES).

*We notice, for example, if the weatherman is standing there with a glass of water in his hand and drinks from it at the end of the weather forecast, that does have an effect on a part of the population. We can really feel that from the reactions. (public health agency 2, BE)*

[One way of using behavioural insights is to set the example (Thaler and Sunstein 2008), which is illustrated by this quote]

Despite the wide spread perception that the general public is informed and adapts its behaviour, few studies have been conducted on this topic. In the future, it might be recommended to implement these studies. These studies can also help to better understand why people do not follow recommendations and to design more suitable solutions.

*But in order... so, I think it's very important to look closely at what the motivation is for someone to not to follow the tips and there so to look for what kind of solution is available. Because only the news that you have to drink enough that's descended. People know that by now. (Red Cross, NL)*

Finally, a secondary outcome of informing the general public, is that they can also assist in protecting and helping vulnerable people. This is not limited to vulnerable people under their care (e.g. children, elderly), but also to people they meet in the streets (e.g. homeless). However, some respondents (DE, PT) feel that the general public is insufficiently aware of heat-related health risks for vulnerable populations. As a result, protective measures are not implemented (in time).

*Because, as I have already told you, the general population simply needs to be made more aware of this. We have also tried to say it a little through media, newspaper articles, to passers-by who walk across the street and see a homeless person, for example, in the blazing sun. Just wake him up and ask if he's all right or call an ambulance or whatever. That the general population is a bit sensitized about this. (social institution, DE)*

Another issue arises in Spain. Here, the respondents do feel that the public is aware of the health risks for vulnerable groups. However, they think the information may be too technical for them to understand, which may hinder them in the correct and timely implementation of protective measures. In the Netherlands, however, respondents believe that communication cannot be too patronizing.

*c. Informing vulnerable groups*

Similar to above, respondents (FR, MK, PT, ES, UK) perceive that vulnerable people – specifically the elderly – are generally aware of the health risks and recommendations, but they do not always implement protective measures. Sometimes, vulnerable people may not be able to implement measures, because of circumstances (e.g. at work) or because they lack the capacity to do so (e.g. immobility). In other cases, vulnerable people may not perceive themselves to be at risk.

*And we did a survey of the population with a large sample of seniors. And in fact, the elderly often say "yes, I know that the heat wave is a risk, I know the gestures of prevention". And when they are asked if they are at risk, they say no. There is very little difference between the under 65s and the over 65s. That is, there are not many more seniors who think themselves at risk. So now, we would like to see – there it is wishful thinking – how to make a prevention-based campaign based on these results. To make people aware of their risk and then to base the prevention on solidarity between generations, between neighbours, etc. (public health agency 2, FR)*

Moreover, vulnerable people may dismiss the information because they do not consider it to be relevant or reliable. One respondent (MK) believes that the elderly may be more likely to implement recommendations when these come from doctors.

Several respondents point out possible improvements to communication strategies to better reach vulnerable groups. These suggestions include customization of warnings to vulnerable groups and regions (NL), conveying the message in direct contact (PT), making the messages less technical (ES), and taking cultural factors into consideration when designing messages for minority groups (UK). Another important issue underlying this, is that vulnerable people can only be targeted and reached when they have been identified. We discuss this in more detail in chapter 3.5. Finally, similar to communication plans targeted at the general public, repetition is also key for informing vulnerable groups (ES).

#### 3.4.4. Assessing the effectiveness of communication plans

Similar to our approach in the literature review (D2.2), we interpret effectiveness of communication plans as the extent to which the communication succeeds to change behaviour and perceptions regarding heatwaves. Throughout the interviews, several strategies were mentioned for evaluating the effectiveness of the communication plans.

First, the morbidity and mortality data can provide insights into the extent to which protective measures are implemented by care providers. It can be assumed that when a communication campaign is effective, the number of people admitted with heat-related symptoms or death causes will decrease. This approach may present limitations depending on the methodology for collection and presentation of that aggregated data. For instance, a respondent from Portugal stated that, depending on the temporal resolution of the data, the true impact of heatwaves might not be evident. This happens because the most affected people are also part of the population that is likely to decrease in the same period.

Second, surveys can be implemented to assess the extent to which the general public is aware of the communication plan and implements protective measures. In France, for instance, yearly surveys have been organised since 2001 (implementation of the first vigilance card) to evaluate the familiarity of the public with the warning system. Since 2017, this evaluation also focuses on the public's understanding and perception of the plan. In Germany, respondents would be interested to know more about whether the information reaches the public and which communication tools are more suitable.

Third, some respondents mention that webpage analytics, download data, and number of likes and followers on social media can be used to evaluate the extent to which different communication tools reach stakeholders and the public. It is, however, impossible to know what these stakeholders and people do with the information once they have accessed it online. For some communication tools, such assessment is not possible unfortunately. For instance, respondents from Belgium point out that care providers can

subscribe to a newsletter that provides warnings, but they cannot see which organisations have or haven't registered. Another issue that respondents point out, is that it is difficult to determine the number of people that should be reached with a certain communication tool.

*The question is, when am I satisfied? Am I satisfied if I have one million in my newsletter or two million or only 10.000? If I have to reach every sick person in the hospital, I have to reach every old person in the nursing home, or is it enough to only reach the nurses and the management? (meteorological agency, DE)*

### 3.5. Care for vulnerable people

#### 3.5.1. Vulnerable groups

During the interviews, the respondents identify several vulnerable groups for which they discuss targeted services and actions (table 15). The types of vulnerable groups that were identified, largely depends on the focus on the organisations that were interviewed. For instance, a care facility for the elderly will only discuss the elderly (and co-morbidities such as isolation) as a vulnerable group.

Vulnerable groups that were identified by all countries, are the elderly and workers. Children and the homeless were mentioned as vulnerable groups by all countries, except for Switzerland.

Table 15 – Groups identified as vulnerable during the interviews

VULNERABLE GROUPS		COUNTRIES								
		BE	FR	DE	MK	NL	PT	ES	CH	UK
Age	Elderly									
	Babies and children									
Environmental	Urban regions									
	Polluted areas									
Medical	Chronically ill									
	Hospitalised or patient									
	Limited mobility									
	Mentally ill									
	Obese									
	Physical disability									
	Pre-existing disease									
	Pregnancy									
	Substance abuse									
	Use of medication									
Social	Ethnic background									
	Homelessness									
	Housing conditions									
	People at mass events									
	Physically active									
	Socio-economic status									
	Socially isolated									
	Tourist									
	Workers									
	Migrants									

Specific characteristics or vulnerabilities that were identified for each group, are described table 16. The respondents did not describe specific vulnerabilities for all the vulnerable groups they identified, so these groups were not included in this table.

Table 16 – Specific vulnerabilities attributed to vulnerable groups

VULNERABLE GROUPS		SPECIFIC VULNERABILITIES
Age	Elderly	Defined as +60 (MK), +65 (FR, CH), +75 (FR, NL, CH) Chronically ill (DE, ES) Cognitive impairment (ES) Difficulties in understanding (PT) Disabilities (FR) Do not always understand campaigns (BE) Do not feel the sensation of thirst (FR, PT, ES) Fragile (FR, PT, ES) Less sensitive to risks (ES) Living in remote areas (PT) Mentally ill (e.g. dementia) (ES) Pre-existing diseases (ES) Socially isolated, living alone at home (BE, FR, DE, MK, NL, PT, ES, CH)
	Babies and children	Defined as 0-4 (MK, ES), >18 (BE) Do not always follow recommendations (PT) Have fewer fluid reserves (FR)
Medical	Chronically ill	Diabetes (ES)
	Hospitalised or patient	Bedridden (PT) Less access to hydration (UK) Less control over their environment (UK)
	Limited mobility	Dependent on others (PT)
	Mentally ill	Dependent on others (ES) Difficulties in orienting in daily life (ES) Difficulties in understanding (ES) Limited autonomy (ES, UK) Memory disorders (ES)
	Physical disability	Dependent on others (BE) Limited mobility (MK)
	Pre-existing disease	Cardiovascular disease (FR, MK, PT, ES, UK) Pluri-pathologies (ES) Respiratory diseases (PT, ES, UK)
	Substance abuse	Addiction (PT) Alcohol consumption (ES) Drug use (ES)
	Use of medication	Accutane (UK) Diuretics (NL, ES) Medication that impact temperature control (NL) Neuroleptics (ES) Psychiatric drugs (e.g. for Parkinson's) (BE, NL, UK) Tranquilizers (ES)
Social	Ethnic background	Cultural barrier (UK) Language barrier (UK)
	Homelessness	Absence of air-conditioning (ES) Badly insulated houses (ES, UK)
	Physically active	Athletes (FR, NL) Amateurs who do not know their physical capacity (FR) Limited fluid intake to not have to use toilet during competition (NL) Participants in sports programs or events (FR)
	Socio-economic status	Less access to cooled spaces (PT) Poor housing conditions (PT)

VULNERABLE GROUPS		SPECIFIC VULNERABILITIES
Socially isolated	Less access to care (ES) Living in remote areas (PT) More difficult to reach (BE) No or smaller social safety net (BE, ES) Single, living alone (BE)	
Tourist	Exposure to heat (FR) Language barrier (FR)	
Workers	Physically active (FR) Work conditions such as building and hours (FR, DE, PT, UK) Working outside (BE, FR, MK, NL, ES, CH, UK)	
Migrants	Access to health insurance (DE) Language barrier (FR, NL, MK, UK)	

### 3.5.2. Identify and register vulnerable people

The identification and registration of vulnerable people are mentioned by respondents from France, Germany, Portugal, Spain and the United Kingdom. The respondents point out several ways to accomplish this. Overall, it is important that any register of vulnerable people is adapted regularly as the status of vulnerable people can change over time and sometimes very quickly.

*The state of people is changing. So, there are people whose health is deteriorating rapidly. Even if they were not in the list of people at risk that existed in the month of June, we readjust. It is not a list that is fixed and rigid. No, we evolve (care provider, FR)*

First, vulnerable people can be identified through surveys that are sent out at the beginning of the vigilance period, usually May (FR). In France, surveys are conducted by care providers and local authorities, but care providers pass on the information to the authorities when necessary.

*We send a survey for heatwaves in which we collect the state of people. That is to say: are they alone in summer, are they going to leave or not, is their home well protected, is there air conditioning. So, we do this survey first, and through this service we find the isolated people. (care provider, FR)*

Second, care providers and their staff can identify vulnerable people when providing their services (FR, DE, UK). For instance, staff can be asked to regularly (e.g. monthly) list vulnerable people that receive their services. In case of a heatwave, the staff can then quickly mobilise and intervene to provide additional care to protect the most vulnerable.

*In case of a heatwave, we first try to see who has a greater risk among the patients who come here. A greater risk of having a heat stroke for example, or dehydration. To develop a bit of a triage system, so that patients can get in here. Also, because it's a bit cooler here. (social institution, DE)*

In addition to care providers, also other stakeholders can use existing databases to identify vulnerable people (PT, NL). For instance, in the Netherlands, demographic data available to municipalities are used to map vulnerable people geographically. Neighbourhood maps are created that indicated where elderly and socially isolated people live.

Finally, vulnerable people can apply to a register that is kept by, for instance, local authorities (FR, ES). They can either do this themselves, or their caretaker can register them. To reach as much vulnerable people as possible, the application can be made available online and on paper. The paper format can then be distributed by care providers and non-medical at-home services (e.g. cleaning company, meals at home), and registration forms can be sent to people who are known to be vulnerable (e.g. who already receive personalised care at home). Everyone that applies to this register, will receive adapted care during a heatwave. It is, however, perceived to be very difficult to get people to register to such a list.

*This file, is constituted every year from the registration of all elderly or disabled who feel fragile, and who wish to appear in this file to be called in case of a heatwave. There are registration forms available on the city's website, but also in paper formats in municipal services, pharmacies, doctors, etc. (social institution, FR)*

Two specific difficulties are pointed out by the respondents concerning identifying and registering vulnerable people. First, not all people are currently in a care system (UK). This means that they cannot be identified by care providers or other stakeholders. Second, some people refuse all assistance, for instance out of fear to be institutionalised (ES, UK).

### 3.5.3. Monitor vulnerable people and adapt care

To monitor the status of vulnerable people and to optimize care services targeted at these groups, several solutions are mentioned by the respondents. Ambulatory services are suggested most often, followed by tele-assistance and informal care. Also, adaptations to infrastructure are mentioned often. Table 17 provides an overview of the mentioned solutions per country, and they are described in more detail below.

Table 17 – possible ways to adapt care for vulnerable groups

TYPE OF ACTOR	COUNTRIES									
	BE	FR	DE	MK	NL	PT	ES	CH	UK	

Ambulant care									
Exceptional interventions									
Extra care by care providers									
Informal care									
Infrastructure									
Tele-assistance, phone calls									

### Ambulant care

Three different types of ambulant care are mentioned by the respondents: home visits (FR, PT), street teams (DE) and first aid posts at mass events (NL).

Care providers that provide home support throughout the year, are often tasked with additional monitoring of their patients during a heatwave (FR, PT, UK). In practice, this can imply that they visit their patients more regularly, or that they follow up their patients with daily phone calls.

*What will happen is that some community nurse who knows homecare, is going to be visiting these people. She will notify the home care organization who will send a little, usually a sort of text on their mobiles, to say “make sure you check such and such”.  
(public health agency, UK)*

Social services and NGOs such as Red Cross can also do welfare visits or go door-to-door to check on vulnerable people (UK, NL).

Street teams are a good way for reaching homeless people (FR, DE, ES). These teams can consist of social workers or medically trained personnel who visit locations where homeless people are known to reside. By visiting these locations, they can assess the health of these people, give advice on protective measures and hand out water. When necessary or available, they may offer to transport homeless people to shelters.

### Exceptional interventions

In some cases, the respondents (FR, PT) point out it may be necessary to implement exceptional measures, such as evacuating vulnerable people. Based on the interviews, this only seems to happen for vulnerable people who live in poor housing conditions and for those who are socially isolated and dependent on others (e.g. bedridden elderly).

### Extra care by care providers

For vulnerable people staying in care facilities, medical staff may want to make additional rounds and increase the frequency of evaluating vital signs (FR).

In addition, when people are leaving these facilities, it can be a good idea to reinforce advice on heatwaves since those people may still be vulnerable to heat (ES).

### Informal care

In addition to professional care, monitoring of vulnerable people within communities is considered an important resource (BE, DE, NL) and in some countries even promoted with campaigns. Informal care implies that family members and neighbours regularly check upon vulnerable people. This alleviates the

burden for care providers and ensures that especially isolated people are protected. It is, however, also important to inform those caretakers about the correct protective measures for vulnerable people.

This informal care can also be offered by organisations that provide home services, such as cleaning or meals at home (ES).

In France, the informal care is a bit more organized with a buddy system. This system organizes accompaniments of old, isolated and dependent people by volunteers. The volunteers can register themselves and receive information on people who would like to be accompanied. This system was created specifically for heatwaves, but serves a much broader purpose as well. In the United Kingdom, a campaign is organized that motivates people to do unrequested checks on their neighbours to make sure they are well.

## Infrastructure

Infrastructure is mentioned by many respondents (FR, PT, UK) as a way to improve the care for vulnerable people. Buildings need to be adapted to include protection from heat. Some examples:

- block-out curtains;
- fans and air conditioning;
- adapt building design;
- double-glazed windows.

To help those who do not have access to such infrastructure at home, temporary shelters are provided or access is given to air-conditioned rooms, for instance in hotels (FR, MK, PT, ES). In order to make sure that also those with limited mobility can have access to these locations, transport systems can be set up.

## Tele-assistance and phone calls

When a register of vulnerable people is available, local organisations (e.g. social institutions) may offer tele-assistance through phone calls (FR, ES, CH). During the creation of the register, vulnerable people can apply to be included in this service. If they are, they will be called daily during a heatwave.

The tele-assistance can be given by tele-operators who work with standardised questionnaires and can give advice over the phone. If they notice any worrying replies or if they cannot reach certain people, a care provider (e.g. social services) will be notified. To ensure everything is ok, the care provider will set up a home visit.

*We have a tele-assistance service [...] That means that you make proactive calls. I call her from my switchboard to remind her of a medical appointment or to congratulate her on her birthday, and I also call her to warn her that it's starting to get very hot. (local authority, ES)*

Further, also care providers can offer tele-assistance in addition to their usual services. For instance, day care centres can check on patients when they are unexpectedly absent from the centre, and provide advice on protective measures at home.

### 3.6. Evaluation

Respondents from Belgium, France, the Netherlands, Portugal, Spain and the United Kingdom report to conducting regular evaluations of their national heatwave plans. The national heatwave plan of North Macedonia has been evaluated at least once. In Germany and Switzerland, no real evaluation has taken place yet, according to the respondents. The evaluation is carried out at the national level, by one or more stakeholders such as public health agencies and the ministry of health.

The respondents say that evaluations usually take place at the end of the summer period and/or before the new summer period starts. These evaluations generally focus on what has occurred during the summer months, which actions were implemented, and whether there were any issues. Depending on the outcome, the plan may or may not be updated.

Targeted evaluations about the effectiveness of heatwave plans are less common. These evaluations make use, for instance, of surveys for stakeholders and the public. These surveys can inquire about several things: has the communication changed behaviour and awareness, risk perceptions, or understandability of the warning system and the recommendations.

*The information we have, is that we did a survey in 2016 in 6 cities, where we questioned all the actors of the heat wave plan at the local level. And so there they spoke to us, or we interrogated them, in a more general way: how they set up preventive actions, etc. And so actually we realized that they still use the public health leaflets, so we are still happy. (public health agency 2, FR)*

There are several possible ways to evaluate national heatwave plans. The following have already been used according to the respondents:

- analysing feedback from the public, such as questions and complaints (ES);
- meetings where stakeholders can provide feedback (BE, MK, ES);
- reduction in the mortality impact of heatwaves (BE, FR, DE, ES, CH, UK);
- survey for stakeholders (DE);
- survey for the public or specific target groups (FR, NL);
- reports by stakeholders about implemented actions, which can be evaluated by a central stakeholder (BE, MK, PT, UK).

Table 18 – Overview of specific elements of the national plan that are evaluated

ELEMENTS		STAKEHOLDERS INVOLVED
Actions	<ul style="list-style-type: none"> <li>Amount of printed material ordered (FR)</li> </ul>	Public health agency (FR)
	<ul style="list-style-type: none"> <li>Availability of printed material (BE)</li> </ul>	Public health agency (BE)
	<ul style="list-style-type: none"> <li>Daily evaluation of implemented measures and their use (FR)</li> </ul>	Local authority (FR) Municipal steering committee (FR)
	<ul style="list-style-type: none"> <li>Effectiveness of communication campaign (FR, DE)</li> </ul>	Public health agency (FR) Ministry of Environment (DE)
	<ul style="list-style-type: none"> <li>Geographic maps (PT)</li> </ul>	National agency (PT)
	<ul style="list-style-type: none"> <li>Number of times the plan was activated (ES, UK)</li> </ul>	Ministry of health (ES) Meteorological agency (UK)
Information and communication campaigns (PT)		Ministry of Health (PT)
Organisational scheme, collaborations and communication (FR, PT)		Public health agency (FR) Ministry of Health (PT)
Prevention and control (PT)		Ministry of Health (PT)
Surveillance system (UK)		Public health agency (UK)
Warning system	<ul style="list-style-type: none"> <li>Alarm phases (BE)</li> </ul>	Public health agency (BE) Cross-government agency (BE)
	<ul style="list-style-type: none"> <li>Overall functioning (NL)</li> </ul>	Meteorological agency (NL)
	<ul style="list-style-type: none"> <li>Parameter thresholds (BE, FR, ES)</li> </ul>	Public health agency (BE, FR) Cross-government agency (BE) Ministry of interior affairs (ES)
	<ul style="list-style-type: none"> <li>Parameters to monitor (PT)</li> </ul>	National agency (PT)

### 3.7. Resources

The successful implementation of a heatwave plan is dependent upon the availability of certain resources, such as data, human, financial and legal resources. Table 19 provides an overview of the resources discussed during the interviews, and if specified it also describes the stakeholders responsible for them and possible improvements. Data are not included in table 19, as they are already discussed under 3.2.2.

Table 19 – Resources discussed during interviews

RESOURCES		POSSIBLE IMPROVEMENTS	STAKEHOLDERS WHO PROVIDE RESOURCE
Human resources	Volunteers	Create framework to employ volunteers to alleviate care providers (FR)	Community groups (UK) Local authorities (CH) NGO (MK, UK)
	Mobile teams		Care providers (FR) Red Cross (MK) Social institutions (MK, ES)
	Additional staff	Additional (healthcare) staff to implement protective measures (FR, MK, PT, CH, UK)	Care providers (all countries) Ministry of Health (MK)
Financial resources	Funding heatwave plan		
	Financial support to implement (protective) measures	Increase financial support to implement protective measures for vulnerable groups (FR, CH, UK) More equipment to implement protective measures (MK, PT, UK)	Care providers (FR), Public health agency (FR) Local authority (MK) Ministry of Health (MK, NL)
	Financial support to monitor parameters	Budget increase to monitor all relevant parameters (BE, MK)	Regional authority (BE) Public health agency (BE)
	Financial support for communication tools	Budget increase to support novel communication tools to inform the general public and/or vulnerable groups (MK, NL, PT, ES, UK)	Ministry of Health (FR, MK, NL)
Legal resources	Laws governing workers' rights regarding heat-related health effects	Legal framework to implement protective measures for workers (DE)	Regional authority (DE) Ministry of Labour and Social Policy (MK)

Overall, human and financial resources are most often mentioned by respondents from France, North Macedonia, Portugal, Switzerland and the United Kingdom. Especially implementers (e.g. care providers) and monitors express a need for more budget and staff to implement the heatwave plan. Implementers usually receive financial resources from public health agencies or local agencies, whereas other stakeholders are more likely to receive financial support from ministries. Regarding human resources, it is usually not specified who is responsible for financing and providing additional staff.

### References

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## Annexes

### Annex 1 – Interview protocol

#### 1. Format

The interviews will be conducted **face-to-face**, and at a location that is convenient to the respondent (e.g. their place of work). When a face-to-face interview is not possible, the interview can be conducted via Skype or telephone instead.

For practical reasons, the interviews for a country that requires international travel should be scheduled over a period of a few days, to minimise travel expenses.

#### 2. Planning the interviews

- All interviews should be conducted, transcribed and translated in English by the end of October.
- Each partner is responsible for planning the interviews for the countries assigned to them.
- Planning the interviews:
  - A draft is provided of the e-mail that is to be sent to potential respondents. This draft is created in English and needs to be translated in the local language before sending, if possible.
  - When respondents have not replied to the e-mail after one week, contact them via phone.
  - Plan an appointment for a (maximum) duration of one hour.
  - Provide the respondent with your contact details (e.g. email, phone) and ensure you have their phone number and correct address.
  - Take travel times into account when scheduling the starting time of the interview, to prevent being late.
- The questions from the interview guide can be given in advance to the respondents

#### 3. Preparing for the interviews

- Before conducting the interviews in a certain country, the interviewer should make him/herself familiar with the national and/or regional heatwave plan(s) for that country
- An interview guide has been created to gain insights into the following questions:
  - Are stakeholders aware of the plan and what is their role in it?
  - Activities of the organisation when an alert is triggered;
  - Impact of the activities of the organisation;
  - Collaboration with other stakeholders;
  - Perception of plan.
- The interview guide is created in English, and needs to be translated by the partner in the language of the interview. If possible, the chosen language is the native language of the respondent.
- In order to record the interview, the interviewer should prepare a voice recorder (or mobile phone) and check its batteries and memory-capacity.

#### 4. Selection of the respondents

- For each of the selected countries, **between 7 and 9** interviews are conducted with stakeholders from the national level to the level of a selected city (i.e. the capital city or another city where heat is a bigger issue). This means that the interviewed respondents are (or should be) in the same information flow: the national level informs the regional level which informs the local level. Therefore, when interviewing actors from the regional level, select the region that applies to the selected city.

##### Partners and target countries

PARTNER	TARGET COUNTRIES	FOCUS ON CITY OF ...
Evaplan	Germany Spain Portugal	Berlin Madrid Lisbon
INCHES	Netherlands United Kingdom Belgium	Amsterdam London Brussels
UCLouvain	France North Macedonia Switzerland	Paris Skopje Bern

- For each of the selected countries, UCLouvain has prepared a list of stakeholders that are actively involved in the plan. For each country at least two stakeholders from every column should be included. The table below contains more details, and the stakeholders in black should be given priority. Some stakeholders have more than one role, which is indicated by the letter or letters behind the organisation name

## Possible stakeholders and their roles per country

COUNTRY	<u>A</u> UTHOR / <u>A</u> CTIVATOR / <u>C</u> OORDINATOR / <u>E</u> VALUATOR	<u>I</u> NFORMER / <u>M</u> ONITOR	<u>I</u> MPLEMENTER
DE	Umweltbundesamt (A) Länder authority (A C E) Municipal authority	DWD – met agency (Ac Im M) National/ regional public health agency	Care providers (hospital, elderly home, GP ...) (C I Im) Emergency services (C Im) Red cross
CH	Ministry of health (A) Public health agency (BAG and/or cantonal medical office) (Ac I M) Canton (A) Municipal authority (A)	Meteo Swiss – met agency (I M)	Care providers (Spitex, association of geriatric and nursing homes, cantonal pharmacy association) (Im) Emergency services (Im) Red cross
NL	VWS (A) KNMI – met agency (Ac I M) Municipal authority	RIVM (Ac I) GGD (I) GHOR (I) Red Cross (I)	Care organisations (ANBO, ActiZ, TNO, LHV, V&VN, KNMP) (A Im) Hospital, elderly home, GP ... (A Im)
UK	Met Office – met agency (Ac I M) DHSC (A E Im) Regional authority Municipal authority	NHS (E I Im M) PHE (E I Im M)	Hospitals, elderly home, GPs, ... (A I Im) Health and social care organisations (A I Im) Community health service providers (A I Im) LRF, LHRPs (A I Im) Red Cross
BE	FOD Volksgezondheid (A E I M) RAG (Ac E) Regional authority Municipal authority	KMI – met agency (I M) IRCEL (Ac I M)	Hospitals, elderly home, GPs, ... Red Cross
FR	Santé publique France (A C E I Im M) Prefect (Ac I Im) Municipal authorities (Ac I Im) Regional directorates of labour (Ac I Im)	Meteo France – met agency (I M) ANSP (I Im M) ARS (I Im M) InVS HCSP	SSIAD (Im) SADD (Im) medico-social teams (Im) occupational health services (Im) Social services, SAMU social (Im) CCAS (Im) CLIC (Im) Hospitals, elderly home, GPs, ... Red Cross
MK	UHMR – met agency (Ac I M) Ministry of health (A I Im)	MOH Commission (I M) Public health centres (Ac I Im M) Public health institute (Ac I Im M) Occupational health institute (I Im) Red Cross (I Im)	Health institutions (A E Im) Regional authority (Im) Municipal authority (Im) Educational and social institutions (A I Im) Centres for social care (A I Im)
ES	Autonomous communities (A I Im) Spanish federation of municipalities and provinces (A I Im) Ministry of health Municipal authority	AEMET – met agency ((Ac I Im) National health operational group (I)	National institute of epidemiology (Im) Educational and social institutions (Im) Municipal social services (Im) Day centres (Im) Hospitals, elderly home, GPs, ... Red Cross

PT	Ministry of health (A I) ARS (Ac I Im) National institute of health (Ac I Im) Regional authority Municipal authority	National health operational group (I Im) Public health units (I Im)	Red cross (Im) hospitals, elderly home, GPs, (Im) Emergency services (medical, fire, police) (Im) ULS (Im) ACES (Im)
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## 5. Conducting the interview

- Prior to the start of the interview, the interviewer gives a brief introduction and asks the respondent to sign a consent form (see attachment)
- After the consent form is signed, the voice recorder is turned on.
- The interview-guide is followed as much as possible, to ensure comparability and completeness.

## 6. Processing the data

- After the interview, the audio-file is stored on a shared drive. Please use the following format to name the file: *audio\_country\_stakeholder*.
- The interview is transcribed literally in the language in which it is performed:
  - All spoken words by the respondent and the interviewer are transcribed;
  - All words are typed out in the order as they were mentioned;
  - The distinction between interviewer (I) and respondent (R) is indicated as follows:

**I: Are you familiar with the content of the national heatwave plan of your country?**

R: Yes, I am.
  - To improve legibility, the transcript is allowed to be written in “written language” instead of phonetic “spoken language”:
    - small changes to a word due to dialect do not have to be typed out literally, e.g. “changin” can be written correctly as “changing”
    - meaningless repetitions of words such as “uhm, oh, ah” are left out and the word is written down only once
  - When the respondent hesitates or thinks between words/sentences, this is marked as [...]
  - Emotions are indicated between square brackets (e.g. [angry]). When someone is laughing it is indicated as [laughing] instead of “hahaha”
  - Sounds from the environment (dog barking, traffic) do not have to be included
  - Time indications should be included in the text when words are unclear
- After the interview is transcribed, it needs to be translated to English by the partner as literal as possible.
- The transcription and translation are also stored on the shared drive, using the following formats to name the file: *transcript\_country\_stakeholder* and *EN\_country\_stakeholder*
- Scan the consent form and save on the shared drive. Please use the following format to name the file: *consent\_country\_stakeholder*



## Annex 2 – Interview guide

### A. National heatwave plan

First, I'd like to ask a few questions about the national heatwave plan.

1. Are you familiar with the national heatwave plan of YOUR COUNTRY and the content of the plan?
2. What role does your organisation play within the heatwave plan?

#### **ACTIVATOR:**

- Is your organisation involved in the activation of the national warning or increasing the alert level? What exactly does this entail?
- For which alert levels is your organisation involved in the activation?
- Does your organisation decide on the activation alone or together with others? In case of the latter, with whom, and how does this communication go in practice?

#### **AUTHOR – EVALUATOR:**

- Was your organisation involved in the development of the plan? If yes, how was your organisation involved, and for which topics (e.g. heat, ozone, UV)?
- Is your organisation involved in the evaluation of the plan? How does the evaluation process work? For which topics is your organisation involved in the evaluation?

#### **COORDINATOR**

- Which actions and/or stakeholders is your organisation responsible for coordinating, and which stakeholders are the target group?
- On which policy level is your organisation responsible (e.g. national, provincial, local)?
- For which alert levels is your organisation responsible as a coordinator?

#### **MONITOR:**

- Which parameters does your organisation monitor (e.g. mortality, morbidity, weather, air pollution, indoor temperature)?
- How does your organisation monitor these parameters and what is the frequency by which they are monitored?
- Does your organisation receive information on parameters from other organisations? If yes, from who?

#### **INFORMER:**

- Who does your organisation inform, when does your organisation inform them and what information is given?
- From whom does your organisation receive the information that you use to inform others?
- Which medium does your organisation use to inform others, and how often are they informed?

#### **IMPLEMENTER:**

- Which measures does your organisation implement with respect to heatwaves (e.g. awareness campaign, ensure cool spaces, mobilise additional personnel)?
3. With respect to the role of your organisation in the national plan, do you primarily focus on prevention, preparedness, response, aftercare or a combination of these?

4. Do you feel that the responsibilities of your organisation are clearly described in the plan?
5. Do you feel that your organisation is well prepared to perform its role in the plan? Why do you feel that this is, or is not the case?
6. Which (financial) resources did your organisation require to set up the heatwave plan? Which (financial) resources does it require to implement, maintain and update the heatwave plan?
7. Are there circumstances under which your organisation deviates from its role or from the processes described in the heatwave plan? When and why does this happen?

## B. Heatwave plan of your organisation

8. Does your organisation have its own heatwave plan? (if yes, ask for document)
9. In what aspects does this plan differ from the national plan?
10. Which parameters does your organisation monitor with respect to heatwaves, as described in the organisational heatwave plan (e.g. mortality, morbidity, weather, air pollution, indoor temperature)?
11. Does the heatwave plan of your organisation primarily focus on prevention, preparedness, response, aftercare or a combination of these?
12. Which measures does your organisation take by itself with respect to heatwaves (e.g. awareness campaign, ensure cool spaces, mobilise additional personnel)?

## C. In case of a heatwave

13. Does your organisation monitor heat-related information when a heatwave occurs (e.g. weather forecasts)?
14. How do you / your organisation prioritize exposure to heat as a public health threat (scale of 1-10)? Can you explain why you give this grade?
15. Is your organisation directly involved in warning the public or a population at risk for adverse effects due to heat? Does this follow the same procedure as described in the national plan, or are there differences?
  - i. When is the warning system in your organisation activated? On which parameters does this depend?
  - ii. Which medium / media does your organisation use to communicate the warning?
  - iii. Which message does your organisation send out? Does your organisation only inform on the occurrence of a heatwave, or does it also provide additional information?
  - iv. What are your target audiences?
  - v. Do you feel that you are normally able to reach a large proportion of these groups? If yes, how does this happen? If not, why not?
  - vi. Do you feel the national heatwave plan offers enough options to reach these populations? Which existing methods do you consider to be useful, and which ones not?
  - vii. Do you feel another way of reaching the target groups could be more effective?
  - viii. Do you feel the messages and recommendations that the National Heatwave plan presents are sufficiently clear for the population at risk and their caretakers?

- ix. To what extent do you think the population at risk changes their behaviour based on the recommendations and the actions of your organisation (e.g. on a scale of 1-10)? Can you explain why you give this grade?

#### D. Other stakeholders

16. Do you collaborate with other stakeholders on the topic of heat or heatwaves?
- If yes, with which stakeholders?
  - Is this collaboration described in the national heatwave plan?
  - If yes, does the collaboration happen as it is described?
17. How has your organisation experienced these collaborations in the past: mostly positive, mostly negative, and why is this the case?
- Do you consider the number of collaborations to be sufficient/too much/not enough?
  - Which collaborations would you add/leave out?
18. Which additional collaborations would be necessary in the future...
- ...to improve the effectiveness of the plan?
  - ...considering a changing climate and an expected increase in heatwaves?

#### E. Evaluation

19. How did your organisation experience the activation of the heatwave plan in previous years?
- What do you consider strong aspects of the national heatwave plan?
  - What do you consider weak aspects of the national heatwave plan?
  - Do you have recommendations for changes?
20. Has the national plan or the plan of your organisation been evaluated? If yes, can you tell us what the main results are? (ask for report)

#### F. Concluding questions

21. Do you have any other remarks that we have not addressed until now, and that you feel could be important for our study?
22. Do you know other stakeholders in your country who you recommend us to interview within the framework of this project?

## Annex 3 – Consent form

### Title of the study

SCORCH - Supportive Risk Awareness and Communication to Reduce Impact of Cross-Border Heatwaves

### Research organisations

Université catholique de Louvain, Centre for Research on the Epidemiology of Disasters

Evaplan GmbH am Universitätsklinikum Heidelberg

INCHES

### Local investigator

Name: \_\_\_\_\_

e-mail: \_\_\_\_\_

### Background

We invite you kindly to participate in a study on improving preparedness to heatwaves. The study assesses existing national heatwave plans and their effectiveness. Understanding challenges and opportunities for the implementation of national heatwave plans is a major step in mitigating the health impact of heatwaves and in developing new heatwave plans. It is therefore important to view this through a qualitative approach based on interviews.

### What do we expect from you?

You will be asked to answer open-ended questions about the national heatwave plan from the perspective of your organisation. We will ask about how your organization implements the plan.

This interview will take approximately one hour. Please know that your participation is entirely voluntary and your refusal to participate will not result in any loss of benefits. Also, you have the right to withdraw your consent or discontinue the discussion at any time without penalty. You can ask to skip any question that you do not wish to answer.

### What will we do with the information from the interview?

The information we collect from these discussions will be used in a report. We will also use the information in scientific articles. While we cannot guarantee anonymity as the name of your organization will be mentioned in the report, we will protect your privacy and the confidentiality of the information you provide.

We would like to record this interview on a digital recorder to make sure that we accurately capture all the information you provide. We will transcribe the recorded discussions and they will only be used by the research team to analyse the data. The recordings themselves will not be shared with anyone outside the research team and will be deleted after transcription is complete.

### Consent

If you have read the consent form and you are sure about wanting to participate, you can indicate this at the bottom of this document. If you have any questions about the study, you are free to ask them now. You can also stop us at any time during the interview if you have any questions. If you have questions, concerns or complaints about this research study later, you may contact me on the email address provided in this document.

Are you interested in participating in this study?  Yes  No

Do you consent to the interview being recorded?  Yes  No

Do you allow me to quote from the interview without using your name?  Yes  No

Interviewer

date, name and signature

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Interviewee

date, name and signature

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## Annex 4 – Impact and effectiveness communication plan

COUNTRY	STAKEHOLDERS	GENERAL PUBLIC	VULNERABLE GROUPS
BE	<ul style="list-style-type: none"> <li>It is unclear if care home physicians are aware of heat-related health risks for patients who use certain medications (public health agency)</li> <li>There is a need to raise awareness among educational institutes (public health agency)</li> <li>Local authorities are increasingly focusing on reaching vulnerable groups (public health agency)</li> <li>Care providers are aware of the national plan (public health agency)</li> </ul>	<ul style="list-style-type: none"> <li>People are aware of the protective measures, but do not implement (all of) them (public health agency)</li> <li>People are developing better habits to protect themselves from the heat (meteorological agency)</li> </ul>	<ul style="list-style-type: none"> <li>Elderly living in care homes are more likely to follow recommendations, than elderly living at home (public health agency)</li> <li>The elderly do not always understand the recommendations (public health agency)</li> </ul>
FR	<ul style="list-style-type: none"> <li>Communication does not reach all stakeholders (public health agency)</li> <li>Not all professionals understand the message well (public health agency)</li> <li>Local authorities are well aware that heatwaves are a risk (local authority)</li> <li>It is unclear which stakeholders use the available material (ministry)</li> </ul>	<ul style="list-style-type: none"> <li>Communication does not reach everyone (public health agency)</li> <li>Not everyone seeks the same information: some want to know about the level of risk, some about the protective measures (meteorological agency)</li> <li>People know the protective measures, but do not implement (all of) them (public health agency)</li> <li>There is need for prevention based on behavioural advice (public health agency)</li> </ul>	<ul style="list-style-type: none"> <li>People are aware of heat-health risks, but do not consider themselves to be at risk (meteorological agency)</li> <li>People are aware of the health risks for vulnerable people (social institution)</li> <li>People living in hotter regions are usually better aware of appropriate measures (public health agency)</li> </ul>
DE	<ul style="list-style-type: none"> <li>It is unclear whether all medical staff is well informed about the health risks and protective measures (ministry, DE)</li> <li>It is unclear whether the health sector considers heat a health risk (ministry, DE)</li> <li>It is unclear how many stakeholders receive the information (meteorological agency)</li> <li>Not all care providers have adequate infrastructure to protect patients from heat (ministry)</li> <li>Some event organisers seem to be unaware of the health risks of heat or do not recognise the importance (ministry)</li> </ul>	<ul style="list-style-type: none"> <li>It is unclear how current communication impacts the public (ministry, meteorological agency)</li> <li>Early heatwaves have a bigger impact because people are not prepared (meteorological agency)</li> <li>People adapt their behaviour during a heatwave when they are informed through the media (meteorological agency)</li> <li>People learn through repetition (meteorological agency)</li> <li>Everyone is informed and knows protective measures (care provider)</li> </ul>	<ul style="list-style-type: none"> <li>Effectiveness of information will increase when prevention focuses on health benefits of following recommendations (public health agency)</li> <li>Homeless people have become more resistant to outside weather conditions (social institution)</li> </ul>

	<ul style="list-style-type: none"> <li>There is a need to educate care providers (ministry)</li> </ul>	<ul style="list-style-type: none"> <li>Not all parents are aware of the health risks for their children and implement protective measures (care provider)</li> <li>There is a large group who doesn't understand the risk (care provider, meteorological agency)</li> <li>People may know, but they do not necessarily behave that way (ministry)</li> <li>The public should be more aware of vulnerable groups and intervene when they see risky behaviour (social institution)</li> <li></li> </ul>	
MK	<ul style="list-style-type: none"> <li>There is a need to educate GPs (public health agency)</li> </ul>	<ul style="list-style-type: none"> <li>People have adapted their behaviour to the changing climate (public health agency)</li> <li>Public awareness is high, also thanks to the available apps (public health agency)</li> </ul>	<ul style="list-style-type: none"> <li>Workers are often still outside during the hottest moment despite recommendations to employers (public health agency)</li> <li>Elderly are more likely to believe and follow recommendations coming from doctors than from others (emergency services)</li> </ul>
NL	<ul style="list-style-type: none"> <li>There is a need to educate care providers (Red Cross, ministry)</li> <li>There is little awareness about heat-related health risks for people who use certain medication (ministry)</li> <li>Awareness is increasing among stakeholders in infrastructure (public health agency)</li> <li>Care providers take the recommendations seriously and implement protective measures (meteorological agency)</li> </ul>	<ul style="list-style-type: none"> <li>It is unclear how current communication impacts the public (environmental sector, ministry)</li> <li>The warning can become easier, but also less patronizing (ministry)</li> <li>If the plan is activated too often, people will follow the recommendations less strictly (public health agency)</li> </ul>	<ul style="list-style-type: none"> <li>Warnings can be more customized to vulnerable groups and regions (ministry)</li> <li>Warnings were more customized to vulnerable groups after evaluation (NGO)</li> <li>The elderly are aware of the recommendation, but do not implement (all of) them successfully (NGO)</li> <li>The elderly take the recommendations more serious than younger people (meteorological agency)</li> <li>Changing the behaviour of the elderly depends on how the recommendations are presented (NGO)</li> <li>Athletes are not following the recommendations due to inadequate sanitary facilities along the track and fear of finishing late (NGO)</li> </ul>
PT	<ul style="list-style-type: none"> <li>Local organisations are able to reach immigrants (public health agency)</li> <li>Care providers implement protective measures (local agency)</li> </ul>	<ul style="list-style-type: none"> <li>Awareness is gradually increasing over time (meteorological agency, ministry)</li> <li>People may know, but they do not necessarily behave that way (meteorological agency)</li> <li>People can choose how they use information and whether or not they adapt their behaviour (meteorological agency, ministry)</li> </ul>	<ul style="list-style-type: none"> <li>The elderly are more careful than younger people (meteorological agency)</li> <li>Sometimes elderly do not take recommendations seriously (care provider)</li> <li>Elderly do not always succeed in implementing recommendations (local agency)</li> </ul>

		<ul style="list-style-type: none"> <li>• Not everyone takes protection of vulnerable groups seriously (care provider)</li> <li>• There is always a group that will not change their behaviour (meteorological agency, ministry)</li> <li>• People are more aware of and implement recommendations (ministry, local agency, care provider, social institution, public health agency)</li> <li>• There is need for prevention based on behavioural advice (ministry)</li> </ul>	<ul style="list-style-type: none"> <li>• Direct contact is the best way to reach target groups (public health agency)</li> <li>• Some vulnerable groups cannot be reached because they are not yet identified (local agency)</li> </ul>
ES	<ul style="list-style-type: none"> <li>• (not mentioned)</li> </ul>	<ul style="list-style-type: none"> <li>• Not everyone understands the health risks of heat and do not follow the recommendations (meteorological agency, local authority)</li> <li>• After a long period of heat, people are more accustomed and take better care (meteorological agency)</li> <li>• People are familiar with the weather warnings (meteorological agency)</li> <li>• People are more aware of heat-related health risks, symptoms and protective measures (ministry, local agency, social institution, regional authority)</li> <li>• Awareness is increasing, but there is always unconsciousness (ministry, local agency)</li> <li>• People can choose how they use information (ministry, regional authority)</li> <li>• Effectiveness of information will increase when prevention is based on self-responsibility (local authority)</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• People are aware of heat-health risks, but do not consider themselves to be at risk (local agency)</li> <li>• Perception of elderly and their caretakers has changed a lot resulting in slowly improving behaviour (care provider)</li> <li>• Recommendations are effective for the elderly, but less so for younger people (local authority)</li> <li>• Young parents and the elderly are aware (local authority)</li> <li>• Homeless people will follow recommendations and protect themselves, unless they are using alcohol or drugs (social institution)</li> <li>• Elderly are aware of the recommendations (care provider)</li> <li>• The warning may be too technical for vulnerable groups and their caretakers to understand (meteorological agency)</li> <li>• Information may not reach the elderly, but it does reach their caretakers (local authority)</li> </ul>
CH	<ul style="list-style-type: none"> <li>• The plan has become more routine to local stakeholders (regional authority)</li> <li>• There is a need to improve the diffusion of information among some stakeholders (regional authority)</li> <li>• Not all local authorities perceive heat as a public health treat (public health agency)</li> <li>• It is unclear how regional authorities diffuse information in their region (public health agency)</li> </ul>	<ul style="list-style-type: none"> <li>• People are more aware of the issue (regional authority)</li> <li>• People are informed through different (media) channels but they do not automatically implement the protective measures (regional authority)</li> <li>• People are very interested in weather warnings (meteorological agency)</li> </ul>	<ul style="list-style-type: none"> <li>• Vulnerable people are more difficult to reach (regional authority)</li> <li>• Not all elderly people use care adapted to heat (e.g. buddy system) out of fear that they will be institutionalized (regional authority)</li> </ul>

	<ul style="list-style-type: none"> <li>• Some care providers in elderly homes are unaware of the heat-related health risks (public health agency)</li> <li>• Care providers are not always aware which recommendations are implemented by their staff (care provider)</li> </ul>		
UK	<ul style="list-style-type: none"> <li>• Local organisations are good at informing their staff (community group)</li> <li>• There is a need to educate social care providers (community group)</li> <li>• The awareness among local stakeholders is increasing (community group)</li> <li>• Stakeholders do not have the capacity to contact and mobilise everyone (public health agency)</li> <li>• Medical staff cannot always implement recommendations for themselves (public health agency)</li> </ul>	<ul style="list-style-type: none"> <li>• It is unclear how current communication affects the general public's behaviour and awareness (community group, Red Cross, local partnership, public health agency)</li> <li>• The public is not aware of the plan (Red Cross)</li> <li>• The current communication does not reach everyone (public health agency)</li> <li>• It is unclear whether everyone understands the weather warnings (emergency services)</li> </ul>	<ul style="list-style-type: none"> <li>• It is unclear how current communication affects vulnerable people's behaviour and awareness (public health agency)</li> <li>• Vulnerable people do not consider themselves to be vulnerable (local partnership, public health agency)</li> <li>• The information is not received by minority different minority groups (local partnership)</li> <li>• The interpretation of the warning system varies between different minority groups (local partnership)</li> <li>• The elderly are aware of the recommendations but do not necessarily implement them (public health agency)</li> </ul>