When heat strikes: An analysis of Heat Health Action Plans in The Netherlands and France, and the role of the European Union

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List of Acronyms

ANBO	General Elderly Persons Association (Algemene Nederlandse Bond voor Ouderen)
ANSP	National Agency of Public Health (Agence Nationale de Santé Publique)
ARS	Regional Health Agency (Agence Régionale de Santé)
CBS	Statistics Netherlands (Centraal Bureau van Statistiek)
CIC	The Cellule Interminsterial Crisis Unit (Cellule Interministérielle de Crise)
CIRE	The Regional Intervention Units (Cellule d'Intervention en Région)
Climate-ADAPT	European Climate Adaptation Platform
CMVOA	Ministerial Cell for Operational Watch and Alert of the Ministry of the Environment, Energy, and the Sea (Cellule ministérielle de veille opérationnelle et d'alerte du ministère del'environnement, de l'énergie et de la mer)
COD	Departmental Operational Centre (Centre Opérationnel Départemental)
COGIC	Operational Centre for Interminsterial Crisis Management (Centre Opérationnel de Gestion Interministérielle des Crises)
CORRUSS	Operational Centre for Regulation and Response to Health and Social Emergencies (Centre Opérationnel de Régulation et de Réponse aux Urgences Sanitaires et Sociales)
CRAPS	Regional Health Support and Steering Unit (Cellule Régionale d'Appui et de Pilotage Sanitaire)
DGCS	General Directorate of Social Cohesion (Direction Générale de la Cohésion Sociale)
DGOS	Directorate General for the Offer of Care (Direction Générale de l'Offre de Soins)
DGS	Directorate General of Health (Direction Générale de la Santé)
DGSCGC	General Directorate for Civil Security and Crisis Management (Direction Générale de la Sécurité Civile et de la Gestion des Crises)
DUER	Single Risk Assessment Document (Document Unique d'Evaluation des Risques)
EC	European Commission
EEA	European Environmental Agency
EU	European Union
FAO	Food and Agriculture Organization
GGD	Municipal Health Services (Gemeentelijke Gezondheidsdiensten)
GDP	gross domestic product
GHOR	Regional Medical Assistance Organisations
GP	General Practitioner
HERA	European Health Emergency preparedness and Response Authority
HHAPs	heat-health action plans
HWHI	Heatwave hazard index
IBM	Biometeorological Indicators (Indicateur BioMétéorologique)

ISS	International Institute of Social Studies
KNMI	The Royal Netherlands Meteorological Institute (Koninklijk Nederlands Meteorologisch Instituut)
KNMP	Royal Society for the Advancement of Pharmacy (Koninklijke Nederlandse Maatschappij ter bevordering der Pharmacie)
LHV	National Association of General Practitioners (Landelijke Huisartsen Vereniging)
NGO	non-governmental organization
NHHAPs	National Heat-Health Action Plans
ORSEC	Departmental Civil Security Response Organisation (Organisation de la Réponse de Sécurité Civile)
PAU	Alert and Emergency Plan (Plan d'Alerte et d'Urgence)
PGCD	Departmental Heatwave Management Plan (Plan de Gestion d'une Canicule Départemental)
PNC	National Heatwave Plan (Plan National Canicule)
RIVM	The National Institute for Public Health and the Environment (Rijksinstituut voor Volksgezondheid en Milie)
SAAD	Home Assistance and Support Services (Service d'Aide et d'Accompagnement à Domicile)
SACS	Heatwave and Health Alert System (Système d'Alerte Canicule et Santé)
SORCH	Supportive Risk Awareness and Communication to Reduce the impact of the Cross-Border Heatwaves
SSIAD	Home Nursing Care Services (Service de Soins Infirmiers A Domicile)
TNT	digital terrestrial television (télévision numérique terrestre)
UNDP	United Nations Development Programme
WHO	World Health Organization

Abstract

In the summer of 2003, heatwaves were blamed for 70,000 deaths throughout Europe (Robine et al., 2008). Since the 1980s, heatwaves and cold waves have been blamed for over 90,000 fatalities across Europe (Feyen et al., 2020). In my research paper, I aim to analyse and compare the HHAPs (heat-health action plans) of France and the Netherlands. These two countries have some of the highest rates of heat-related deaths and are already seeing negative effects of heatwaves within their borders. Both countries have developed HHAPs which can be seen as a tool for risk communication, which is a tool for communicating and mitigating the risks of climate change, health, and similar risk-related disasters. My research is inspired by the Supportive Risk Awareness and Communication to Reduce the impact of the Cross-Border Heatwaves (SORCH) project (see Vanderplanken, 2021). The study concluded that further research is needed on this topic from the fifteen NHHAPs they studied. In this RP, I apply a theoretical framework on public policy instruments of carrots (economic incentives), sticks (laws), and sermons (information-based) and the theories decentralisation and political culture. The main research question is: 'To what extent do the Dutch and French National Heat Plans reflect dominant assumptions and best practices in public policy instrument mixes (sticks, carrots, and sermons)?'To answer the research question, I conducted a desk review of the HHAPs and several interviews with relevant civil servants.

Relevance to Development Studies

Climate change is a topic that has already affected everyday life in all countries around the world, and its effects will become more severe if adaptation measures are not quickly taken. Vulnerable populations such as the elderly, disabled, youth, ethnic and racial minorities, and the homeless are socio-economically disadvantaged. They often have less money, resources to cope with these effects, and have less of a voice in society to influence policy accordingly. This study seeks to analyse the national heat-health action plans (NHHAPs) of the Netherlands and France because these two countries have some of the highest rates of heat-related deaths in the European Union, and excess mortality is especially prevalent in vulnerable populations. The relevance for Development Studies lies in the lessons we can learn from the Global North for both developing countries and for analysing such NHHAPs.

Keywords

Climate change, disaster risk governance, European Union, France, heat risk communication, national heat health action plans, The Netherlands, vulnerable populations

Chapter 1
Introduction to Heatwaves and the Research Design

1.1 The negative effects of heatwaves

The number of days with extreme heat has doubled in Europe between 1960 and 2017 (García-León, D. et al., 2021). Heatwaves are one of the leading causes of death from climate change in Europe. Since 1980, heat and cold waves have caused nearly 90,000 fatalities in Europe, most from temperature extremes related to heatwaves (Feyen et al 2020: 23). The summer of 2003 was the deadliest year for heat related deaths during Europe's hottest summer in recent years. Over 70,000 deaths occurred across Europe due to heatwaves and extreme drought (Robine et al., 2008). As De Bono et al. (2004) says,

> "The extreme drought and heatwave that hit Europe in the summer of 2003 had enormous adverse social, economic and environmental effects, such as the death of thousands of vulnerable elderly people, the destruction of large areas of forests by fire, and effects on water ecosystems and glaciers. It caused power cuts, and transport restrictions and a decreased agricultural production. The losses are estimated to exceed 13 billion euros" (De Bono et al., 2004: 2).

The 2003 heatwave sent a sense of political urgency across Europe resulting in the creation of heat-health action plans (HHAPs). No national plans existed before the 2003 heatwaves, the only documented plan of heat prevention was in Marseille, France created in 1983 (Pascal et al., 2006). HHAPs were created using existing emergency response models and general principles of emergency response that were already in place in European Union (EU) countries (Matthies et al., 2008).

On the larger institutional level, the EU responded to the 2003 heatwaves. The first project was the EuroHEAT project which ran from 2005 to 2007, coordinated by WHO/Europe and co-funded by the European Commission's Directorate-General for Health and Consumers. The EuroHEAT project mapped the institutional knowledge, plans for heatwaves, and excessive heat response within the EU states. The project led to creating a framework and guidelines for member states to create their own HHAPs to deal with the increasing frequency and intensity of excessive heat or heatwaves (WHO Regional Office for Europe, n.d.).

Heatwaves continue to cause high rates of mortality. "The deadliest event in 2019 were the summer heatwaves that affected Europe, more specifically France, Belgium and the Netherlands with over 2500 deaths" (CRED, 2020: 3.). Heatwaves affect different population groups, those most vulnerable to the heatwaves include the elderly, people with chronic conditions, young children, pregnant women, and the disabled (World Health Organization, 2018). Vulnerable people also face reduced physiological and behavioural capacity for thermoregulation i.e., limited capacity to sweat. The poor have limited access to informational sources such as a cell phone, the news, radio, or social media (Feyen et al., 2020: 23).

Feyen et al. (2020: 7-11) notes that heatwaves are expected to happen more often and become more intense with climate change. The current death toll is at 2,700 deaths annually. As the temperature is expected to increase more people will be exposed and the annual death toll will increase. (See Table 1.1 below). In the scenario with unmitigated climate change (i.e., a plus 3°C increase in 2100), this figure is projected to rise to nearly 300 million/year, or more than half of the European population. Without climate mitigation and adaptation, the death-toll from extreme heat in the EU by the end of this century could reach 90,000, more

than 30 times more than at the present death toll of 2,750 deaths annually. (Feyen et al 2020: 7, 23).

Table 1.1
Estimates of people exposed annually to heatwaves by temperature increase

Temperature	People exposed annually	Annual death toll
Present[1]	9.6 million	2,750
1.5°C	100 million	30,000
2°C	176 million	50,000
3°C	300 million	90,000

Source: Author's own construction based on Feyen et al., (2020).

Heat will contribute to the intensity of other climate change related events and negatively affect sectors that contribute to countries economic growths. Heat reduces people's ability to work, decreases productivity, and delays the delivery of goods and services. Infrastructure needed to deliver goods and services will be negatively harmed by heat due to failure of transportation networks (OCED, 2018). Clear losses exist from gross domestic product (GDP) because of heat. As García-León, D. et al. (2021) notes, Europe has experienced GDP loss of 0.2% from 1981 to 2010 due to negative heat impacts. Additionally, years where the heat and heatwaves were more intense (specifically 2003, 2010, 2015, and 2018) GDP loss was between 0.3-0.5%. GDP loss is expected to grow consistently over the next 40 years resulting up to 1% GDP loss (García-León, D. et al. 2021).

Besides health and economic effects, heatwaves can have negative environmental impacts that affect energy supply, transportation, and water. In terms of energy, since heatwaves lead to an increase in energy consumption from use of cooling methods, blackouts are more likely to occur from increased demand of the power grid. Which in turn, leads to a higher omittance of greenhouse gases and an increase in tropospheric ozone levels in urban environments, resulting in negative health problems (Añel et al., 2017). Transportation systems are also negatively affected before, during, and after a heatwave. Increased temperatures cause pavement to soften and expand creating potholes and large surface dents. Similarly, Europe's rail system will be affected from increased frequent temperatures (Vajda et al., 2014). Prolonged heat will cause the rail tracks to buckle and expand, which could require more frequent track repairs and restrictions on speed to avoid trains derailing (Sanchis et al., 2020).

Alongside energy and transportation, water scarcity will continue to be affected by heatwaves. Prolonged heat leads to faster water evaporation contributing to water scarcity. Water scarcity effects irrigation, agriculture, and drinking water, which is especially alarming since heat will lead to less crops creating food scarcity that directly affects vulnerable communities (Costello et al., 2009).

The countries included in my study, i.e., France and The Netherlands, faced high mortality rates from the 2003 heatwave (see Table 1.2 below) , prompting the creation of the first heat-health action plans (HHAPs). Since then, the two countries have consistently been affected by heatwaves resulting in increased mortality. France created and implemented the first national heatwave plan in 2004. Other nations followed at various speeds.

[1] The base temperature referred in this table presently t is based on a 1°C increase from pre-industrial era levels.

Table 1.2
Mortality data from the 2003 European heatwaves

Country	Casualties
France	15,000
Germany	7,000
Spain	4,200
Italy	4,000
United Kingdom	2,045
Netherlands	1,400
Portugal	1,300
Belgium	150

Source: de Bono, A. et al. (2004) and Fouillet et al., (2006)

France has experienced a sizeable number of deaths from heatwaves, with 15,000 deaths in 2003 and 1,500 deaths in 2019(Fouillet et al., 2006; Brackett, 2019). The hottest occurred in the summer of 2019 which recorded a temperature of 45.9°C, breaking the earlier record of 42°C (Bador et al., 2016; Gerretsen and Yeung, 2019). Models show France could see temperatures of 50 °C or higher by the end of the 21st century (Bador et al., 2016).

France's heatwave plan was the first national heatwave plan called *Plan National Canicule*[2] or the National Heatwave Plan (PNC). It was ready for implementation by summer 2004 and first activated on 1 June 2004 (Pascal et al., 2006). The plan has been updated, most recently in 2017. Since France implemented their HHAP in 2004, the mortality rate has decreased by 90% (Hill et al., 2021). A study done in France on the 2006 heatwave estimated 6452 deaths should have occurred. With the preventative measures of the HHAP only 2065 deaths occurred, 4388 deaths less than expected (Fouillet et al., 2008) (See Table 1.3 below).

Table 1.3
France's mortality data from heatwaves from 2003-2020

Year	2003	2006	2013	2015	2016	2018	2019	2020
Number of deaths	15,000[3]	2,065[4]	N/A	3,275	700	600[5]	1,475[6]	1,924[7]

Source: Fouillet et al., (2006) and République Française (2017).

The Netherlands had 1,400 Between 1983 and 2015 France only had three official heatwaves. Since 2016 there have been multiple heatwaves a year deaths from the 2003 heatwaves, making it one of the highest death rates in Europe. The first heatwave plan was created by The Ministry of Health, Welfare, and Sport in 2006 and updated once in 2015. Additionally, in 2012 the National Institute for Public Health and the Environment (RIVM) created the "GGD guideline medical environmental science: Health risks of summer conditions" in 2012 (de Meer et al., 2012).

[2] I will now refer to the English name in the remainder of my RP.
[3] Fouillet et al., 2006
[4] République Française, 2017
[5] Fouillet et al., 2006
[6] Fouillet et al., 2006
[7] Fouillet et al., 2006

In 2020 the Netherlands recorded its first heatwave of more than five days where temperatures reached 35°C degrees or more, followed by another eight consecutive days of above 30°C degrees late that summer. Although the latter was not considered a heatwave according to the National Heatwave Plan, it still contributed to higher mortality rates. In 2020, Statistics Netherlands (CBS) recorded 3,206 people died in week 33 (10 to 16 August) and 2,850 people in week 34 (17 to 23 August) from heatwaves in addition to the normal expected death rate (so-called 'excess mortality') (CBS, 2021) (See Table 1.4 below). This statistic does not include COVID-19 deaths or deaths from other natural causes. During 2013, 2015, and 2016 the RIVM recorded heatwaves, but Statistics Netherlands (CBS) did not record excess mortality.

Table 1.4
The Netherlands mortality data from heatwaves from 2003-2020

Year	2003	2006	2013	2015	2016	2018	2019	2020
Number of deaths	1,400	1,000	N/A	N/A	N/A	1,000	400	400

Source: de Bono, A. et al. (2004) and Statistics Netherlands

1.2 Relevance and Justification

Considering occurrence and impacts of climate change related events, there is need to have good policies to prevent disastrous consequences of heatwaves. The most recent EU climate adaptation strategy adopted in February 2021 specifies there is a knowledge gap on the effects climate change on health. The plan calls for more research on the topic, attention to climate change adaptation policies and mitigation strategies to create a stronger climate-resilient EU (EU Commission, 2021). My research paper helps fill in these gaps by studying the heat health action plans (HHAPs) of these two countries finding their similarities and differences in terms of definitions of a heatwave, stakeholders involved, (communication) roles, and heat warning systems.

National health authorities must improve their ability and intervention measures when responding to heatwaves. Thus, there is a need to study how current heat health action plans and policies are formulated and implemented by different countries. Both France's and the Netherlands' HHAPs use policy instruments such as carrots, sticks and sermons to implement their HHAPs. France uses more sticks while the Netherlands has dominantly used sermons as a policy instrument. This research focuses on how these different policy instruments are formulated and to what extent they have been successful in preventing or at least reducing negative impact of heatwaves such as decreasing the strain on the health system and mortality.

This research is also prompt with the recent passing of the European Climate Law and creation of the EU Heat and Health Observatory which calls for more attention and data gathering on how heat impacts health.

France and the Netherlands were chosen based on their institutions, history of heatwaves, vulnerability to heatwaves, their institutional setup, and earlier studies done in these countries, as well as the availability of interviewees, time available and explain the significant differences that were found in these two HHAPs.

1.3 Research Objectives

The research I conducted aims to answer the questions below to give policy recommendations to improve heat-health action plans within the EU and globally. Throughout my research I found areas of similarities, differences, and areas where these HHAPs can be

improved to decrease mortality, improve accessibility to vulnerable populations, and offer ways of relief.

1.3.1 Research Questions

The main research question I aim to answer is: To what extent do the Netherlands and French National Heat Plans reflect dominant assumptions in public policy instrument mixes (sticks, carrots, and sermons), and how can the differences be explained?

In order to structure the data and analysis towards responding to the main research question, I will address the following sub-questions:

1. What type of policy instruments are used in the two plans and what kind of mix do we observe?

2. How can institutional history and setup, as well as political culture explain the choice of these mixes?

3. What lessons can be drawn from this analysis with regard to other European heat plans and EU heat health policy more generally?

1.4 Methodology

This research used qualitative and interpretive research methodology and tools. To study heat-health action plans (HHAPs) in France and the Netherlands and wider EU heat health policy this research has used two qualitative methods, i.e., content analysis and qualitative interviews. I first completed a desk review of three different policy documents, the French National Heatwave Plan and the Dutch National Heat Plan and the Environmental health guideline for *Municipal Public Health Services: Warm weather and health risks* from the Netherlands in English. The desk review helped me understand the purpose of the HHAPs, the institutional structure, key stakeholders, and how the HHAPs operated in France and the Netherlands. Upon completing the desk review, I used the data obtained from these HHAPs to help me formulate my main research question, sub-questions and interview questions for my study (see Appendix for interview guide).

Prior to analysing these documents, I completed a literature review on HHAPs and overall heat health policy. Some of the key literature I read to assist in formulating my desk review questions (see appendix) were the *Heat-health action plans: guidance*, which is the WHO guidelines for HHAPs published in 2008, WHO updated guidelines of HHAPs from 2021, *Heat and health in the WHO European Region: updated evidence for effective prevention* and, the *Governing heatwaves in Europe: comparing health policy and practices to better understand roles, responsibilities and collaboration*, a publication from the Supportive Risk Awareness and Communication to Reduce impact of Cross-Border Heatwaves (SCORCH) Project.

Content analysis is relevant to my research because it can be used to analyse collections of communications (Saraisky, 2015: 27). Content analysis seeks valid knowledge to uncover vital details about a topic (Krippendorff, 2019: 1). It is also a tool for analysing rich data, ranging from images, documents and policy papers. Specific information is analysed to understand what i.e., means to specific groups. In my research the collection of communications was the HHAPS (see Table 1.4 below). The HHAPs are communication plans structured to decide when a heatwave is occurring and how to inform the general population about it to help them mitigate its effects. The original documents were in the country's native languages of French and Dutch. I used the website DeepL to translate the documents to the English language. The desk review was primarily conducted during July-September 2021.

Table 1.5
Policy documents used for this study

Country	Title (Original)	Title (Translated)	Responsible Authority	Original Version date	Latest Version date	Page totals
France	Plan National Canicule	National Heat-wave Plan	Ministry of Health	2004	2017	51
Netherlands	Nationaal Hitteplan	National Heat Plan	RIVM	2007	2015	22
Netherlands	GGD-richtlijn medische milieukunde Gezondheidsrisico's van zomerse omstandigheden	Environmental health guidelines for Municipal Public Health Services: Warm weather and health risks	RIVM and the Municipal Public Health Services (GGD)	2012	N/A	91

Once completing my desk review and content analysis on these documents, gaps still existed in my research. To bridge them, I used the qualitative interviewing method. Qualitative interviewing is knowledge-producing conversations (Brinkmann, 2013). The aim of the qualitative interviews was to understand what each of these documents mean to interviewees of this study. Qualitative interviews helped me understand what each HHAP means for different (policy, research) communities in my study and understand how the HHAPs work. I thus interviewed people with follow up questions I had from the desk reviews using semi-structured interviews to further understand the heat health action plans, institutional set up, political and social culture of France and the Netherlands. Six semi-structured interviews on the HHAPs of France and the Netherlands and overall heat health policy of the EU were conducted from September to November 2021 (see Table 1.5 below). All the interviews were conducted in English. Due to the COVID-19 pandemic the interviews were conducted remotely over Microsoft Teams and Zoom. Respondents were from the Government of France, Government of the Netherlands, European Union institutions, and researchers.

Table 1.6
Interview list for study

#	Role	Organization	Code/Name	Date of Interview
	Government			
1	National heat plan coordinator	RIVM, National Institute for Public Health and the Environment, The Netherlands	ECHO1	1 October 2021
2	Director of Environmental Health	Santé France	ECHO2	5 October 2021
	Researchers			
3	Expert- Environment, Health, and Wellbeing	European Environment Agency (EEA)	DELTA1	22 September 2021

4	Expert – Climate Change and Human Health	European Environment Agency (EEA), European Climate and Health Observatory (ECHO)	DELTA2	3 November 2021
5	Researcher and public health practitioner	SCORCH project and GGD Midden	DELTA3	27 October 2021
6	Senior research fellow	University of Leuven (at the time of the SORCH project)	DELTA4	3 November 2021

All countries have different institutions and definitions of these institutions' mandates that manage the NHHAPs. The interviews aimed to understand national policies and how they alert their citizens of quickly emerging climate disasters to potentially save lives with advanced awareness. The institutional mapping, policy analysis, and interviews allowed me to compare these policies and strategies France and the Netherlands, understand the risk communication practices in their national contexts, and formulate recommendations.

As an ethical obligation to the respondents, I informed respondents in detail about the research by email prior to conducting the interviews. I responded to any follow-up questions the respondents before the interviews. Before recording the interview, I received (oral) consent from the participant to record and use the data I collected from their interview. After the interviews were finished a transcript of the interviews were produced. To cut any potential biases, I tried to triangulate the information obtained from the desk review and interviews.

1.5 Challenges and Limitations

This study only covers two member states within the European Union, the Netherlands and France. It mainly analysed heat-health action plans for excessive heat, or heatwaves at the national level for France and the Netherlands. In the case of France, I also analysed the sub-national plans which France has needed in their HHAP. The Netherlands does not need sub-national plans. There was a special focus on the communication systems of the two countries. Other climate change-related disasters such as cold waves, wildfires, or floods are outside the scope of this paper.

Initially, I faced challenges in finding and reaching potential interviewees, since I could not travel to their offices and because they were busy. To overcome this challenge, I used my network and utilized the resources at ISS. Sandra Nijhof, the head of marketing and communications at ISS was helpful. My supervisor Dr. Sylvia Bergh helped by emailing people on my behalf. In the end, I was able to get the interviews I needed and overcome this challenge.

1.6 Organisation of the study

This paper is organised as follows: Chapter 1 supplied the background to the research topic and the research design. Chapter 2 focuses on key theoretical considerations and frameworks used for this research. Chapter 3 outlines France's and the Netherlands' heat-health action plans and applies the theoretical framework (sub-question 1). Chapter 4 discusses the

sub-questions on the institutional history, political culture, and the role of the European Union in heat health policy (sub-questions 2 and 3). The concluding chapter, chapter 5 gives policy recommendations and concluding thoughts.

Chapter 2
Conceptual Framework: Policy Instruments in Heat-Health Action Plans

2.1 Introduction

This chapter discusses the different theories and definitions used for this research paper. The main concept used is policy instruments, classified into carrot, sticks, and sermons. During the desk review and interviews it became clear that there are significant differences in the policy instruments used in these NHHAPs. This classification helped me articulate them. According to Howlett (1991: 1), "political scientists have studied policy instruments in order to better understand the linkages between policy formulation and policy implementation, and to gain insights into the public policy decision-making process"'. Furthermore, "public policy instruments are the set of techniques by which governmental authorities wield their power in attempting to ensure support and effect social change" (Bemelmans-Videc, Rist and Vedung, 1998: 3). The choices of public policy instruments in the formulation and implementation of heat-health action plans "reflect more general political or administrative strategies which are main lines of political and administrative action reflecting general aims and dominant means of action" (Bemelmans-Videc, Rist and Vedung, 1998: 4).

Governments began creating HHAPs after the 2003 summer heatwaves to address the high mortality. The HHAPs try to supply a system to make people understand the severity of heatwaves, to protect themselves and others from excessive heat which will result in decreased mortality. In France and the Netherlands there are two diverse ways policymakers responded to the heatwaves. "As for policy-instrument choice: the choice between two or more alternatives is the essence of decision making" (Bemelmans-Videc, Rist and Vedung, 1998: 4). During my analysis I found that France took more of a stick approach (by using more legal backing) to their heatwave plan, while the Netherlands took more of a sermon approach (more of communication plan, softer and decentralised approach).

The three policy instruments used are further explained to better evaluate the heatwave plans in this research. Regulations or laws are referred to as sticks, economic incentives are referred to as carrots, and information is referred to as sermons, following Bemelmans-Videc, Rist and Vedung (1998).

2.2 Sticks

Regulation theory says, rules created by governments to govern its society are called sticks (Pacheco-Vega, 2020) "Government creates rules to govern society member's behaviours (guiding or restraining). For regulation theory scholars, compliance is less of a moral duty and more of an issue with establishing directives for behaviour change that can be followed, monitored and enforced" (Pacheco-Vega, 2020: 7). Sticks are part of the setup of the heat-health action plans (HHAPs) in France and the Netherlands i.e., both France's and the Netherlands' meteorological agencies are required by law to report the weather to their health agencies (Hagens and Bruggen, 2014; République Française, 2017). Both countries have a heat warning system outlined in their HHAPs. Different agencies' roles and responsibilities are defined in the HHAPs during each level of the heat warning system.

As we will see later, France dominantly uses sticks as their main policy instrument to structure and implement their HHAP. France has incorporated laws passed prior to the 2003

heatwave centred around emergency response to health disasters. Additionally, after the 2003 heatwave France passed a series of laws creating the framework for implementing key parts of their HHAP. In contrast, the Netherlands does not dominantly use sticks in their HHAP, instead taking more of a sermon approach.

2.3 Sermons

Sermons are defined as "modern forms of intervention, with an emphasis on prevention of wrong or stimulation of the right conduct by offering insights into consequences of behaviour" (Bemelmans-Videc, Rist and Vedung, 1998: 11). They "are voluntary appeals by means of information or exhortation, characterized by the absence of obligation" (Thomann, 2018: 436). While sticks are hard instruments, sermons are considered soft instruments.

As we will see later, France and the Netherlands have sermons in the HHAPs. France's sermons complement the sticks i.e., certain news media are required by law to broadcast messages from the Ministry of Health (*le ministère chargé de la Santé),* while other media organisations are recommended to, but there will be no consequences if they do not broadcast the information. Another example of sermons in France's plan is family members and caregivers can voluntarily register vulnerable people at their local municipality. France's plan shows a clear mix of both sticks and sermons.

In contrast, information-based policy instruments (sermons) are the dominant instrument in the Netherlands HHAP. The communication-based plan involves the RIVM sending out a press release alerting the public of an excessive heat. General practitioners, news media, NGOs, and other stakeholders are expected to spread the information voluntarily. The use of sermons is very common within Dutch public policies. This makes sermons a relevant concept for my research.

2.4 Carrots

"Carrots are defined as financial means, supplying incentives. They may be positive (grants, subsidies) as well as negative (taxes, user charges) from a consumer's perspective" (Van Nispen tot Pannerden 2011:5). Both France and the Netherlands indirectly provide financial incentives in their HHAPs contributing to the economy i.e., France has contracts with private cell phone companies and pays the companies to send out heatwave warning text messages. The Netherlands provides economic incentives by encouraging citizens to consider environmentally and heat friendly home renovations i.e., replacing their roofs with heat proof material, installing improved ventilation and energy efficient cooling systems. This provides businesses and their employees with more work and earnings.

2.5 Contextual variables

Sticks, sermons, and carrots are used in a certain political context in which a policy is formulated and implemented. Every country's policy arena is different. Context variables are systemic and structural. For heat-health action plans there is not one blueprint because each country has its own systems and government structures. To understand the choices of certain policy instruments and their relative dominance, we need to consider certain contextual variables (see Table 2.1 below).

Table 2.1
An overview of the contextual variables

Context:	Examples:
General (systemic)	• History • Physical environment • Social (language, religion, regions i.e., provinces and municipalities) • Political • Economic • Cultural
Government arrangements (structure)	• Dynamics between governance actors and different sectors: policy networks • Dynamics among the relevant national, regional, or local government institutions involved in the choice, implementation and evaluation of policies and policy instruments.

Source: Adapted from Bemelmans-Videc, Rist and Vedung (1998: 12-17)

In the following, I will discuss two of these variables, political culture, and the multi-level governance arrangements (and decentralisation in particular). They proved to be most useful in the analysis.

2.5.1 Political Culture

Political culture is important to discuss in my paper as it heavily influences the choice of policy instruments. For this paper I use the following definition: Political culture is "the set of attitudes, beliefs, and sentiments which give order and meaning to a political process, and which provide the underlying assumptions and rules that govern behaviour in the political system" (Pye, 1972: 288).

The Netherlands' more recent political culture has been heavily marked by neoliberal policies where citizens are taught to fend for themselves. As a result, when the government tries to enforce policies with laws, it has limited success as citizens do not like being told what they can and cannot do. Citizens want minimal government interference in their personal lives. France's political culture is different, people will listen if they are told there is a public health issue. In chapter 4, I will develop this argument further.

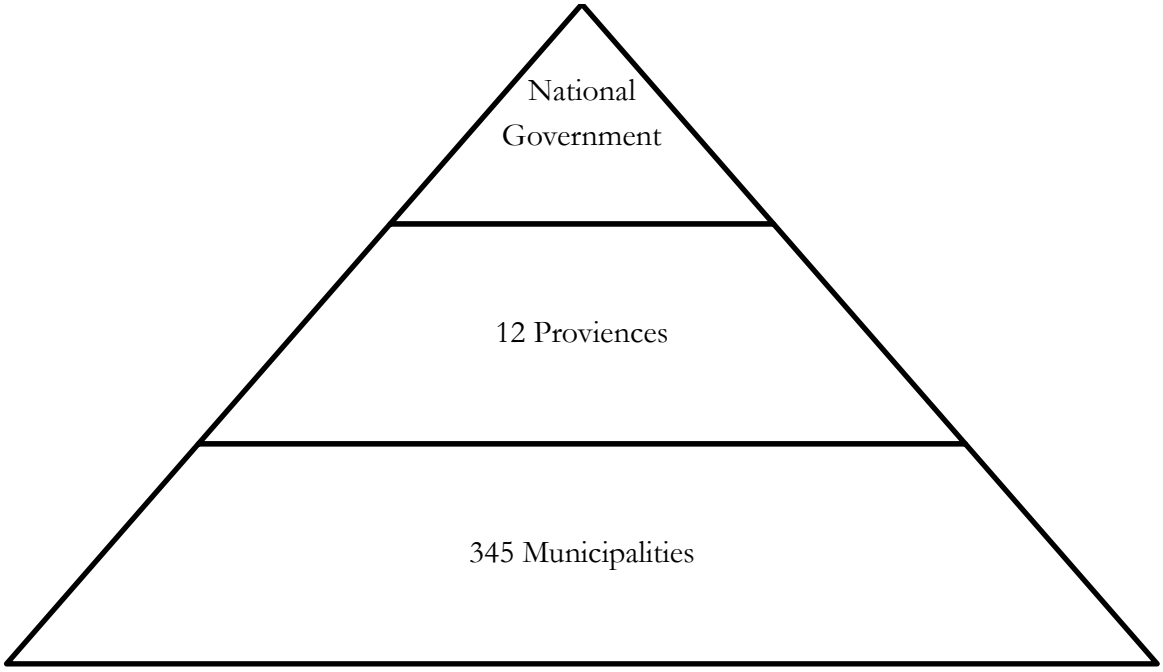
2.5.2 Decentralisation

In this paper I define decentralisation as:

> "[It is] the devolution by central government of authority over specific functions, with all of the administrative, political and economic attributes that these entail (e.g., tax-raising, expenditure, and decision-making powers), to democratic local governments that are independent of the centre within a legally delimited geographic and functional domain" (Faguet and Sánchez 2014: 228)

The Netherlands has been a decentralized unitary state since 1848. Within the government structure there is the national, regional (provincial), and local governments (see Figure 2.1 below). The central government unites the state and trusts the abilities of the local and regional governments to work and govern together. Decentralisation is encouraged by the Ministry of Interior Affairs, and the government is bound to this way of governing through article 117 of the Municipalities Act (de Graaff-Kamphof, n.d.).

Figure 2.1
Netherland's decentralized governance system



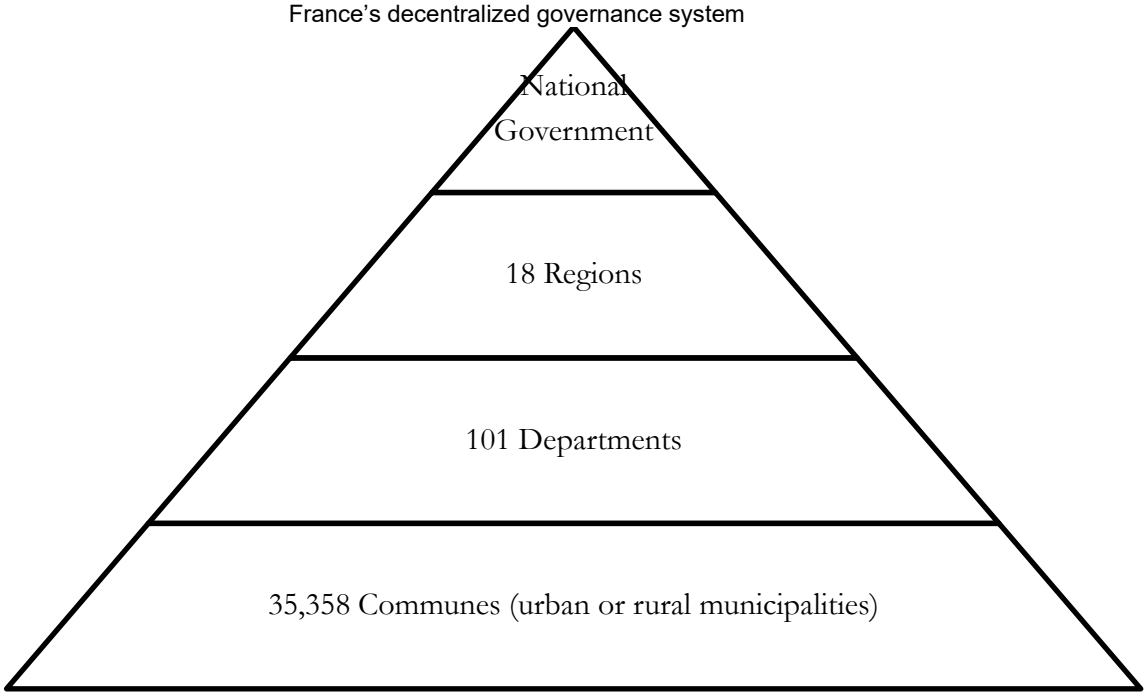
Source: Adapted from Government of the Netherlands (n.d.)

In 2015, a reform of the Netherlands Social Policy took effect. Municipalities were given new responsibilities, further decentralizing the state. They gained the responsibilities as the main provider of social services to the people living within their boundaries, including supplying youth care services, healthcare services for the elderly and chronically ill, and aiding job seekers. The number of local rules residents must follow was reduced and simplified to aid municipalities to take on a larger role (Government of the Netherlands, n.d.). This reform affected the HHAP because it defined the municipalities' role in public health and supporting vulnerable populations, it gave them a clearer responsibility that they oversaw protecting their citizens within their municipal boundaries during a heatwave.

The role of decentralisation is important in my analysis of the Netherlands' HHAP because municipalities decide if they want to have a local HHAP, respond to heatwaves, and assist vulnerable populations (i.e., elderly) in the event of prolonged heat (heatwave). Previously, the 2008 Public Health Law said, "municipalities are responsible for the well-being of their citizens" (de Meer, 2012: 50). The social reform of 2015 further emphasized the importance municipalities must ensure the health and wellbeing of their citizens especially focusing on children, disabled, elderly and people with chronic illnesses including general and preventative services (Vermeulen, 2015). The vulnerable groups mentioned in the social policy reform are listed as vulnerable populations in the HHAP and GGD guidelines. As of 1 January 2022, 345 municipalities exist in the Netherlands. However, very few municipalities have a local HHAP.

Turning now to France, it has a central government which manages creating and implementing policy. The three distinct levels of government below are the regions (régions), the departments (départements) and the municipalities (communes). Each sub-level oversees different services and sectors. The departments oversee the implementation of their local HHAP.

Figure 2.2
France's decentralized governance system



Source: Adapted from European Committee of the Regions (n.d.)

France's decentralization began at the beginning of the Fifth Republic in 1958 when it became a unitary state. The 1958 constitution started the process of decentralisation, yet reforms in France did not begin to take effect until the 1960s (Bezes and Parrado, 2013). The complex transition took decades to create a stabilized decentralised governance system. Reforms occurred between 1958 and today, strengthening the role of decentralisation. The transition of decentralisation accelerated with the Defferre Acts of 1982 and 1983 [8](European Committee of the Regions, n.d.). These reforms created new institutions and increased the power of the 96 department councils and larger communes. Local authorities were now legal fully autonomous entities. Regional and local actors were given more decision-making responsibilities in policy areas such as economic development, education, and social affairs. The central government preferred to work with the department governments over the region governments because of bigger budgets, more staff, and more responsibility on delivering services. The constitution was revised in March 2003 to formally create the current three sub-levels of governance which are the municipality, the department, and region below the central government (see Figure 2.2 below) (European Committee of the Regions, n.d.). To bridge communication between the central and sub-level governments, government representatives called prefects are appointed by the central government.

Prefects are "senior civil servants who mobilize complex, sophisticated administrative and policy knowledge to administer on the ground" (Tanguy, 2021: n.p.). Their role was created and defined in France's constitution during the Napoleonic era in the early 1800s before France decentralized (Bezes and Parrado, 2013). Today, a prefect is a government representative who ensures that central government policies are implemented at local governmental levels. Each of France's 101 departments has an appointed prefect surrounded by a prefectoral council. The department prefect is thus an important stakeholder when

[8] The Defferre Acts of 1982 and 1983 abolished France's national government supervision powers over local authorities' activities. Regions changed into territorial authorities governed by elected assemblies. Departmental and regional executive powers were given to the presidents of their respective councils.

implementing France's HHAPs as they oversee all health services, social services and communication.

This chapter discussed the theoretical policy framework of carrots, sticks, and sermons and theories on political culture and decentralisation. It also briefly applied the decentralisation concept to the Netherlands and France.

Chapter 3 The policy instruments in France's and the Netherlands' heat-health action plans (HHAPs)

3.1 Introduction

In this chapter, I will discuss sub-question 1, i.e. 'What type of policy instruments are used in the two plans and what kind of mix do we observe?'. I begin with France and then move on to the Netherlands, discussing both sticks and sermons at the national and local levels in both countries.

3.2 National Sticks and Stakeholders in France's HHAP

The basic structure of France's heat-health action plan (HHAP), The National Heat-wave Plan (*Plan National Canicule, PNC*), constructed sticks (laws). The structure of the plan starts with the heat warning system, consisting of four distinct levels (see Table 3.1 below). "The PNC (heat warning system) also called the Heatwave and Health Alert System (*Système d'Alerte Canicule et Santé*, SACS) is active from June 1 to August 31 each year. "For any weather situation that warrants it, the PNC is (can be) activated outside of these periods" (République Française, 2017: 3).

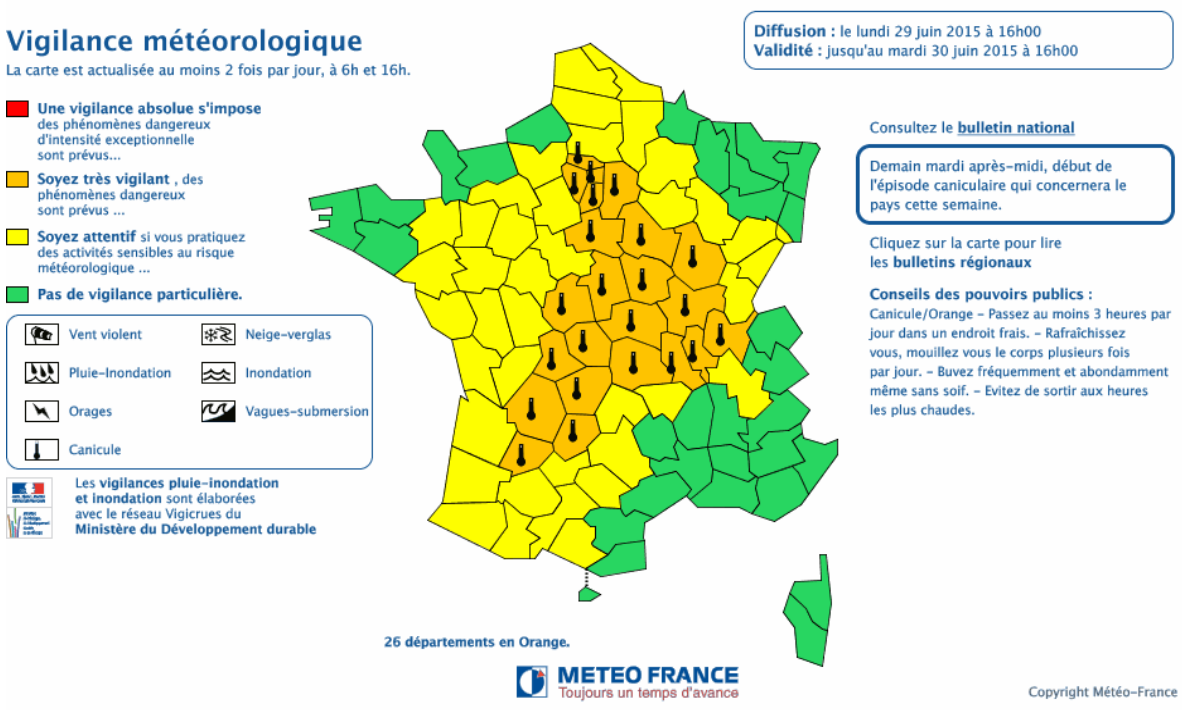
Table 3.1
Levels in France's heat warning system

Weather watch map	PNC Levels	Activation and removing the alert
Green	**Level 1 - seasonal watch.** A preventative information system is implemented during this level. The Ministry of Health sends out a press release informing the public it is the beginning of watch season for heatwaves.	Ministry of Health
Yellow	**Level 2 - heat warning** (1-2 days of prolonged heat). This signals the beginning of a heatwave and the introduction of measures.	Météo-France
Orange	**Level 3 - Heatwave alert** (3-4 days of prolonged heat). Actors involved in the PNC are mobilized. Measures targeted towards the care of people at risk begin to be implemented.	Departmental prefect
Red	**Level 4 - Maximum mobilization** (5+ days of prolonged heat with additional effects i.e., drought, water supply impacted, forest fires, power outages, and the need to stop or limit certain activities.) Extreme measures are used during this level because the crisis becomes intersectional. The Prime Minister becomes in charge of the PNC or designate another minister depending on the events that occur during the episode of a heatwave.	Departmental prefect or the Prime Minister depending on the severity of the situation

Source: Republique Francaise, 2017

The heatwave warning system is guided by the vigilance map provided by Météo-France, the national meteorological agency. These procedures (the stick) are embedded in Interminsterial law n°IOC/E/11/23223/C of September 28, 2011. This law "sets the framework for the procedures for placing a meteorological vigilance and alert on the metropolitan territory" (République Française, 2017: 16). Météo-France is required to provide daily meteorological information to each of the departmental prefectures, the Directorate General of Health (*Direction Générale de la Santé,* DGS), and Regional Health Agencies (*Agence Régionale de Santé, ARS*) at http://www.meteo.fr/extranets including the vigilance map, observed temperature curves by station, the Biometeorological Indicators (*Indicateur Biométéorologique, IBM*), and the forecasted temperatures for each department and region every day during level 1 (seasonal watch) from June 1st to August 31st even when there is no threat of a heatwave. The map of metropolitan France updates at minimum twice a day (6am and 4pm) on the Météo-France website[9] (République Française, 2017: 3, 19, 22). The map indicates whether a danger threatens one or more departments in the next twenty-four hours by showing the level of vigilance required, using four colors (green, yellow, orange, red). This allows the PNC to implement locally in one or more departments. (République Française, 2017: 16), see example below (Map 3.1.).

Map 3.1
An example of France's vigilance map showing a heatwave warning



Source: (République Française, 2017: 16).

Météo-France uses IBM to determine if the risk of a heatwave should increase from level 1 (seasonal watch) and changing the color on the alert/vigilance map by Météo-France. This is determined by the probability for reaching or exceeding the thresholds defined by the IBM minimum and IBM maximum. The IBM is the temperature average over three consecutive days creating the IBM minimum and the IBM maximum temperatures and is frequently updated. It does not depend on an updated PNC. (See Table 3.2 for example). The procedure to create the IBM thresholds for each department is data analyzed over thirty years of daily mortality and different meteorological indicators (République Française, 2017:16, 18). The

[9] http://vigilance.meteofrance.com

meteorological indicators include air humidity, length of earlier heatwaves, when the heat starts, air pollution, and feedbacks from the health services ANSP and ARS. (République Française, 2017: 18).

Table 3.2
An example of the Biometeorological Indicators (IBM)

Alsace																			
Department	City Threshold	Param	J-1		J		J+1		J+2		J+3		J+4		J+5	
LOWER RHINE	Strasbourg 19/34	IBMn/ IBMx	20.5	34.0	20.8	34.5	22.2	33.0	20.3	31.7	19.5	30.7	19.0	31.3	18.5	32.3

	Very high risk
	High risk
	Medium risk
	Low risk
	Almost no risk

Source: République Française (2017: 18).

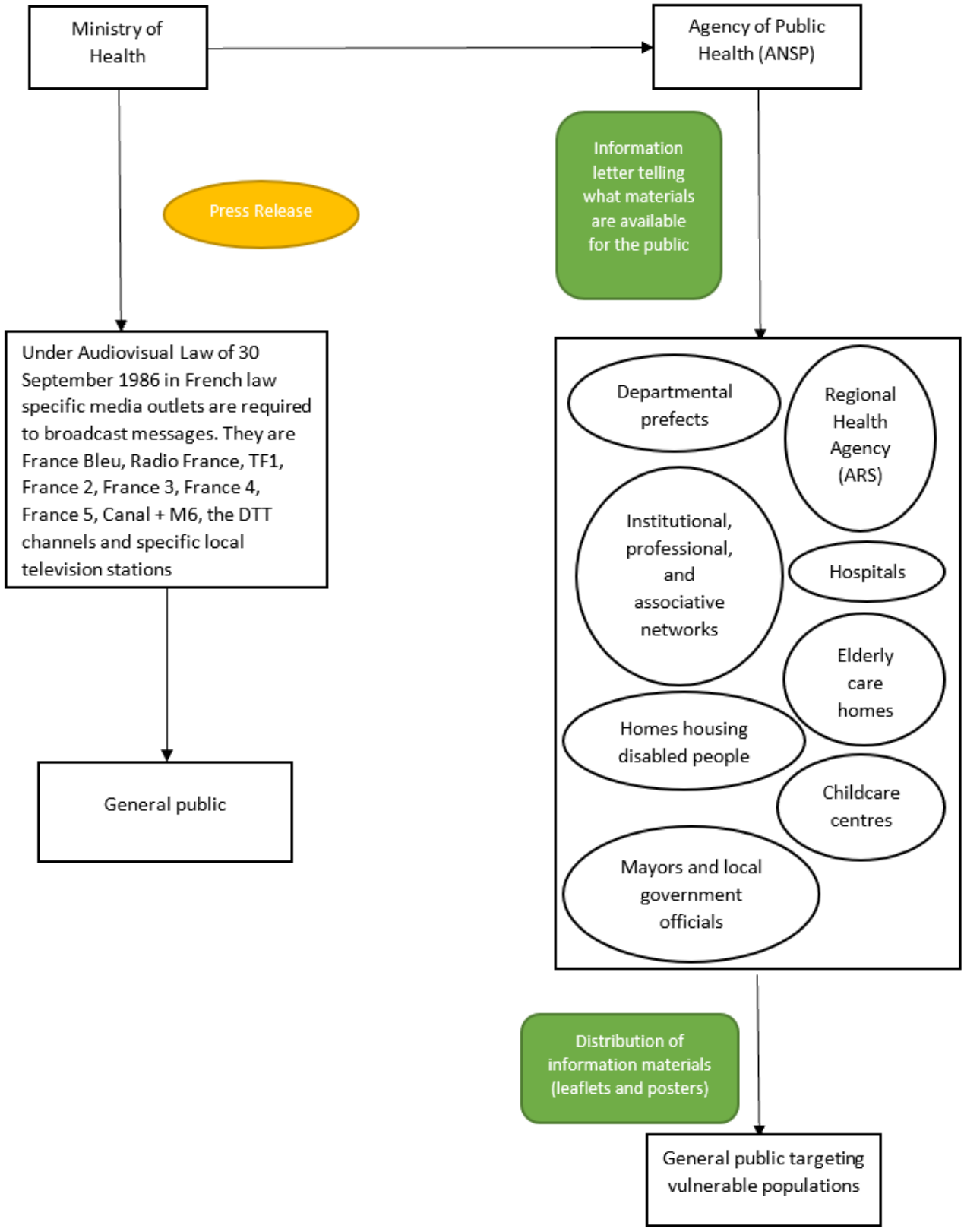
If the department turns red or orange on the map additional monitoring bulletins are posted providing in detail the time of the heatwave, intensity, and specific locations impacted. The bulletins are frequently updated and highlight the measures people should take to mitigate the heat effects (République Française, 2017: 17).

The Ministry of Health is another national actor that plays a key role in the PNC. The Ministry sends out a press release to the public signaling the beginning of the heatwave season (signaling level 1, seasonal watch), which highlights the various levels of the heat warning system and how to protect a person's health during a heatwave. The Ministry of Health can release further press releases during the summer, if necessary (République Française, 2017: 1).

The national telephone number (0 800 06 66 66) called heatwave information service (*canicule info service*) is set up by the ministry. This number broadcasts pre-recorded messages, answers callers' questions about heat, and gives recommendations about how to manage heat (République Française, 2017: 3).

The National Agency of Public Health (*Agence Nationale de Santé Publique*, ANSP) and the Regional Health Agencies (*Les Agences Régionales de Santé*, ARS) are responsible for monitoring the heat health indicators. Before the start of level 1 of the PNC the ANSP distributes an informational letter to the ARS, prefectural services, other partners, institutions, and professional networks (See Figure 3.2). The letter highlights all documents (leaflets and posters) available for the public, especially vulnerable populations. The free informational materials distributed in English and French focus on the risk prevention related to heat. Specific leaflets are also available for people with visual and hearing impairments (République Française, 2017: 1-2).

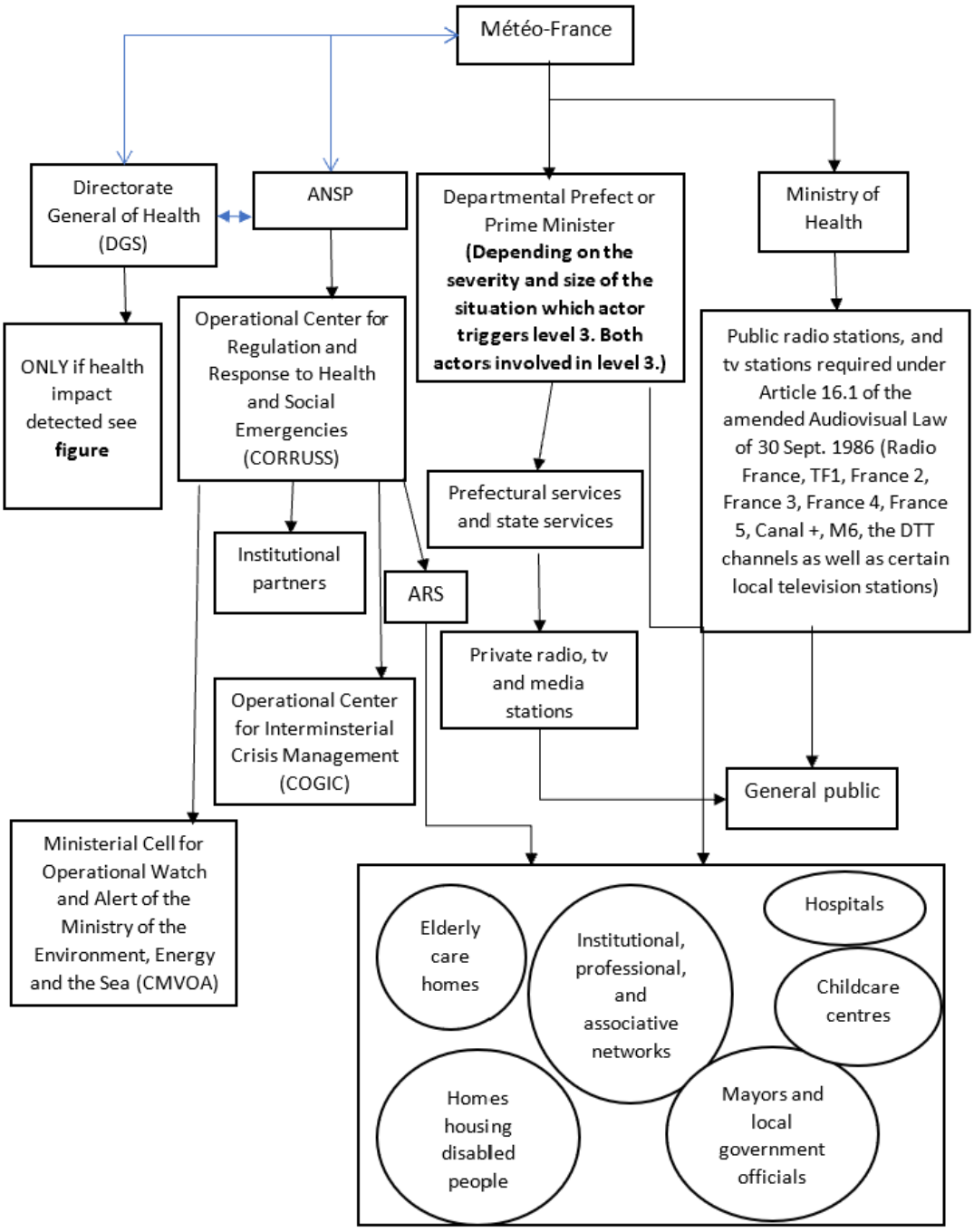
Figure 3.2
Pre-season, seasonal watch (level 1), and heat warning (level 2) actors



Source: Author's own construction based on République Française (2017).

ANSP is the first agency to collect, monitor, and estimate the impact of a heatwave event through health indicators on the local and national level. It decides on prevention measures to implement and when to lift the heat warning alert. The decree of July 24, 2013, defines the instructions and framework of the mandatory reporting (République Française, 2017: 3, 19). ANSP does this every working day if there is no significant impact on the health system and reports to DGS. Level 3 (heatwave alert) and level 4 (maximum mobilization), requires ANSP to monitor and send information every day by 2:30pm to DGS and Météo-France (République Française, 2017: 19). (See Figure 3.3 and Figure 3.4 below).

Figure 3.3
Level 3 – Heatwave alert actors



Source : Author's own construction based on République Française (2017).

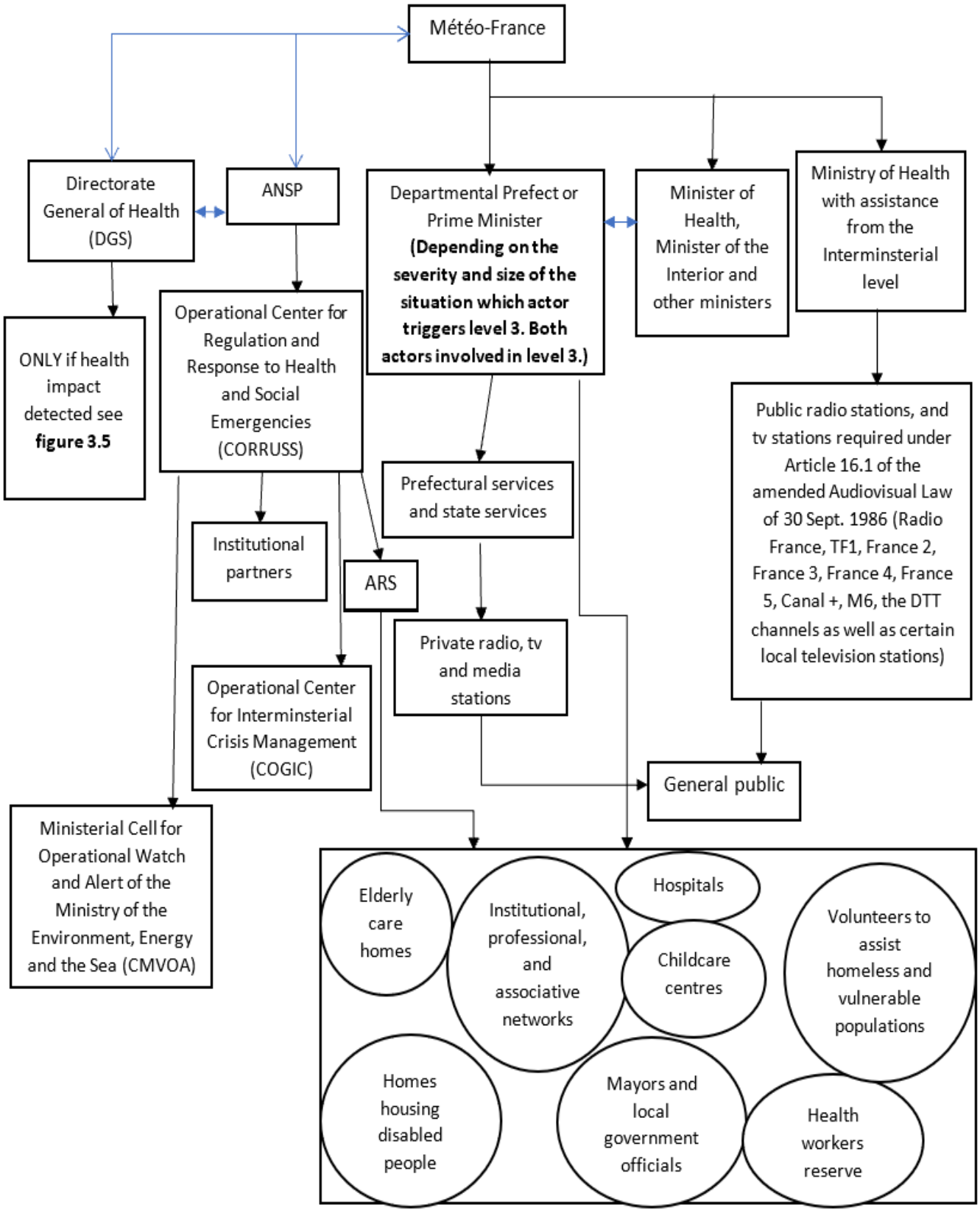
ARS communicates and works with the sub-level governments through the departmental prefects. It uses data collected on health at the national level. France's NHHAP states, "the permanence of care is a public service mission (L. 6112-1 of the public health code (République Française, 2017: 14). Under articles L. 1435-1, L. 1435-2 and R. 1435-1 et seq. of the Public Health Code the ARS supports the departmental prefects in implementing the PNC and provide its expertise in monitoring, collecting and analyzing information from and during a heatwave under the Regional Health Support Unit (*Cellule Régionale d'Appui et de Pilotage Sanitaire*, CRAPS) and Departmental Operational Centre (*Centre Opérationnel Départemental*, COD) (République Française, 2017: 28).

Other responsibilities include prevention health, and social care (République Française, 2017: 28). Under the Directors General of the ARS, ARS is required to send weekly information on the state of the supply of care in health establishments and identify low supply, such as hospital capacity, reporting departmental mobilization plans, health care facilities under pressure, activation of hospital white plans, and pre-hospital activity in each region and health territory (République Française, 2017: 14, 20). At level 2 ARS oversees expanding operations of the HHAP and prepare for level 3 and 4 alerts by collaborating with the departmental prefects. The local level communicates the effects of heat through flyers, leaflets, and increased interaction with the local media. (République Française, 2017: 4). Until level 3 (heatwave alert) is lifted the role of the ARS expands and starts to fill in a daily heatwave survey through the Health Information System for Alerts and Crises (SISAC)and monitors the strain of the health establishments (République Française, 2017: 3, 20, 31).

The Operational Center for Regulation and Response to Health and Social Emergencies (*Centre Opérationnel de Régulation et de Réponse aux Urgences Sanitaires et Sociales*, CORRUSS) is the bridge between the ANSP and the ARS. CORRUSS collects sends the regional health data and summaries from the ANSP to make a national health summary during level 3 and level 4 (maximum mobilization) of the PNC to the ARS (République Française, 2017: 21).

At level 4 (maximum mobilization) the Prime Minister lifts or maintains the measures Even when the temperature drops, level 4 can still be applicable if there are other ongoing indicators (i.e., impact of water supply or fires) (République Française, 2017: 33).

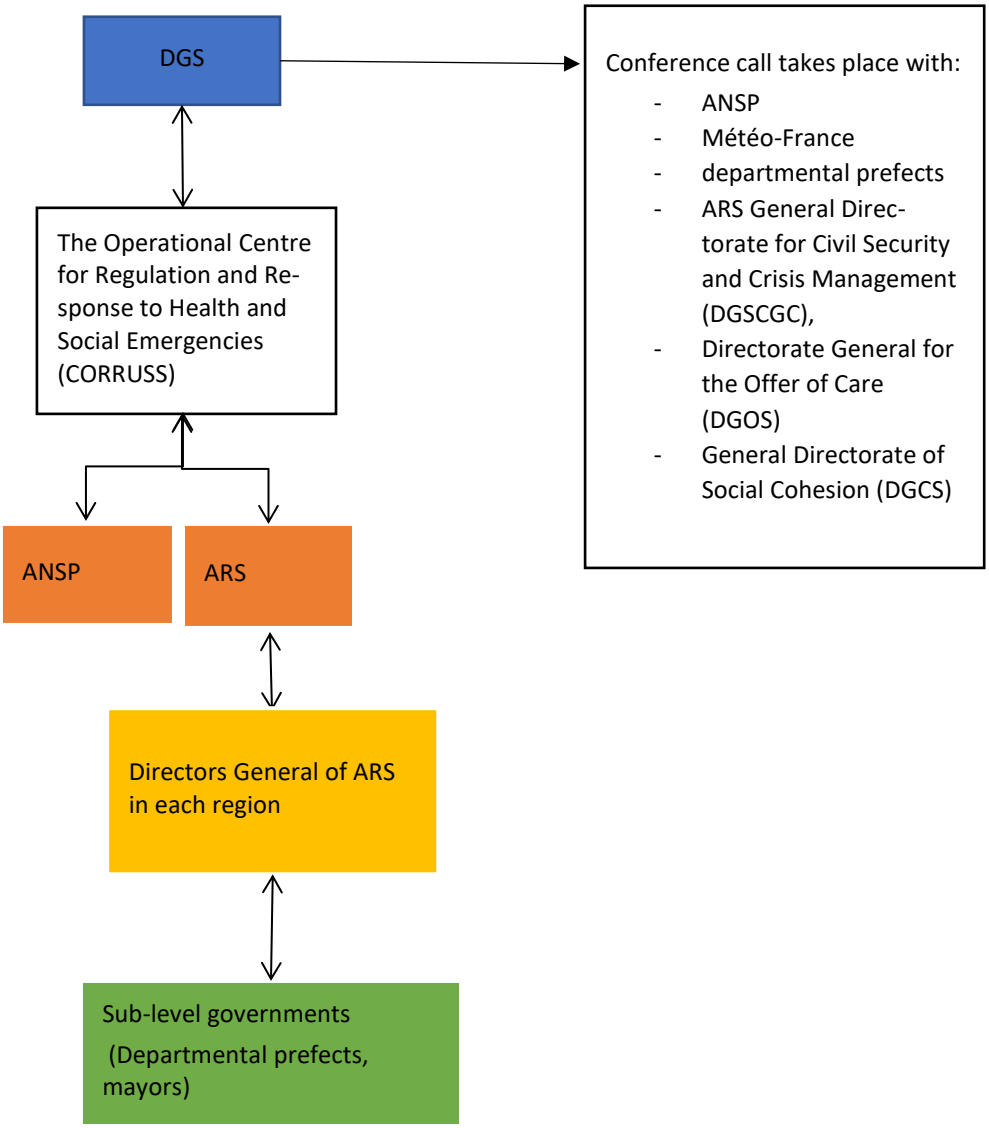
Figure 3.4
Level 4 – Maximum mobilization actors



Source : Author's own construction based on République Française (2017).

The General Health Directorate (DGS) another key actor nationally in the PNC, analyzes the health data sent by ANSP and ARS to create a national health summary on the health and social sector. If a noticeable impact on the health sector occurs, especially regarding the supply of health care available, DGS will a hold conference call with different actors concerned about the situation to analyze and propose more management measures, (see Figure 3.5 below). The calls can be as frequent depending on the severity.

Figure 3.5
System for monitoring health care system and response for overworked hospitals



Source : Author's own construction based on République Française (2017).

Institutions can apply additional sticks for vulnerable people Long term care facilities and facilities housing elderly are required to create and implement a "blue plan" (a monitoring and alert plan) activated in a crisis such as a health or meteorological crisis. According to decree n° 2005-768 of July 7, 2005, public, private, associative, and commercial institutions need this plan.

> "It defines the role and responsibilities of the management team, the procedures to be followed in the event of a crisis, the protocols for mobilizing staff, the level of equipment and stocks required to deal with a long-term crisis and the methods for raising staff awareness of good prevention practices" (République Française, 2017: 13).

A refreshed room is also part of the requirement of this blue plan. This law is a "priority measure of the PNC and provided for in Articles D. 312-160 and D. 312-161 of the Social Action and Family Code" (République Française, 2017: 13). The blue plan,

originally for the elderly, expanded on 14 June 2007 to include facilities with disabled people at the request of the Director General of Social Care (République Française, 2017: 14).

Hospitals must have a "white plan" (monitoring and alert plan) for heatwaves. Article 158 of Law No. 2016-41 of January 26, 2016, under Article L. 3131-8 of the Public Health Code (République Française, 2017: 20) requires the white plans. This plan includes procedures in the event the hospital is under stress, limited on staff, and the hospital operations in extraneous circumstances. White plans require indicators on bed management, amount of activity and implement other measures (République Française, 2017: 15).

The Ministry of Health manages the communication nationally when a level 3 (heatwave alert) is triggered. This guarantees smooth coordination of communication actions by different actors at local levels. Implementing a reinforced press relations system includes measures for active communication to the public about measures during a heatwave (nationally and locally). Starting at level 3, Article 16.1 of the amended Audiovisual Law of 30 September 1986 requires media outlets to broadcast messages by the Ministry of Health including alerts, press conferences, and press releases, etc. They are France Bleu, Radio France, TF1, France 2, France 3, France 4, France 5, Canal + M6, the digital terrestrial television (*télévision numérique terrestre, TNT*) channels and certain local television stations (République Française, 2017 : 4-5). An information and alert system begin on social media networks. Using partnerships there is specific communication towards vulnerable people through affiliated associations and networks (République Française, 2017: 5).

At level 4 (maximum mobilization) the same communication actions occur as level 3, yet at level 4 the Prime Minister becomes in charge of the PNC or appoint another minister. As the situation becomes a crisis, The Interministerial Crisis Unit (*Cellule Interministérielle de Crise, CIC*) activates. The only change from level 3 and 4 is that the Ministry of Health or at the Interminsterial level manages communication. (République Française, 2017: 30).

We can see two types of communication used in the heatwave plan, namely preventative communication, and emergency communication. Preventative communication at level 1 (seasonal watch) informs and reinforces information about heat. At level 2, Emergency communication begins which also occurs at level 3 and 4 through ARS, prefectures, or the municipalities.

3.3 National Sticks and Stakeholders in the Netherlands HHAP

The Netherlands' basic structure of the National heat-health action plan (HHAP) is defined by sticks and is essentially a communication plan. As explained earlier, two different documents together constitute the Netherland's national heatwave plan, i.e., the National Heat Plan (*National Hitteplan*[10]) and the Environmental health guideline for Municipal Public Health Services: Warm weather and health risks (*GGD-richtlijn medische milieukunde: Gezondheidsrisico's van zomerse omstandigheden*). These documents contribute two different key elements to mitigate heat. The NHHAP says, "the purpose of the National Heat Plan is to alert organisations in a timely manner that a period of sustained hot weather is expected" (Hagens and Bruggen, 2014: 3). The Municipal Health Services (*Gemeentelijke Gezondheidsdiensten, GGD*) guidelines' purpose is to, "provide information about the health risks of summer weather and measures to prevent them. The guideline also offers measures that can be taken prior to the summer in preparation for heat" (de Meer, 2014: 3) See the annex for the guidelines.

[10] I will now refer to the English name in the remainder of my RP.

The national heat warning system has three distinct levels (See Table 3.3). The vigilance phase of the heatwave plan effective from June 1st to September 1st, activates the Netherlands heatwave plan (Hagens and Bruggen, 2014: 15). The heat warning system is strictly for heat and the temperature determines the phases. If other factors were to occur such as forest fires, water supply, or power cuts, this would create a crisis which is more than defined in the NHHAP, turning the situation to other crisis and emergency structures and protocols (Hagens and Bruggen, 2014: 18).

Table 3.3
The Netherlands heatwave warning system

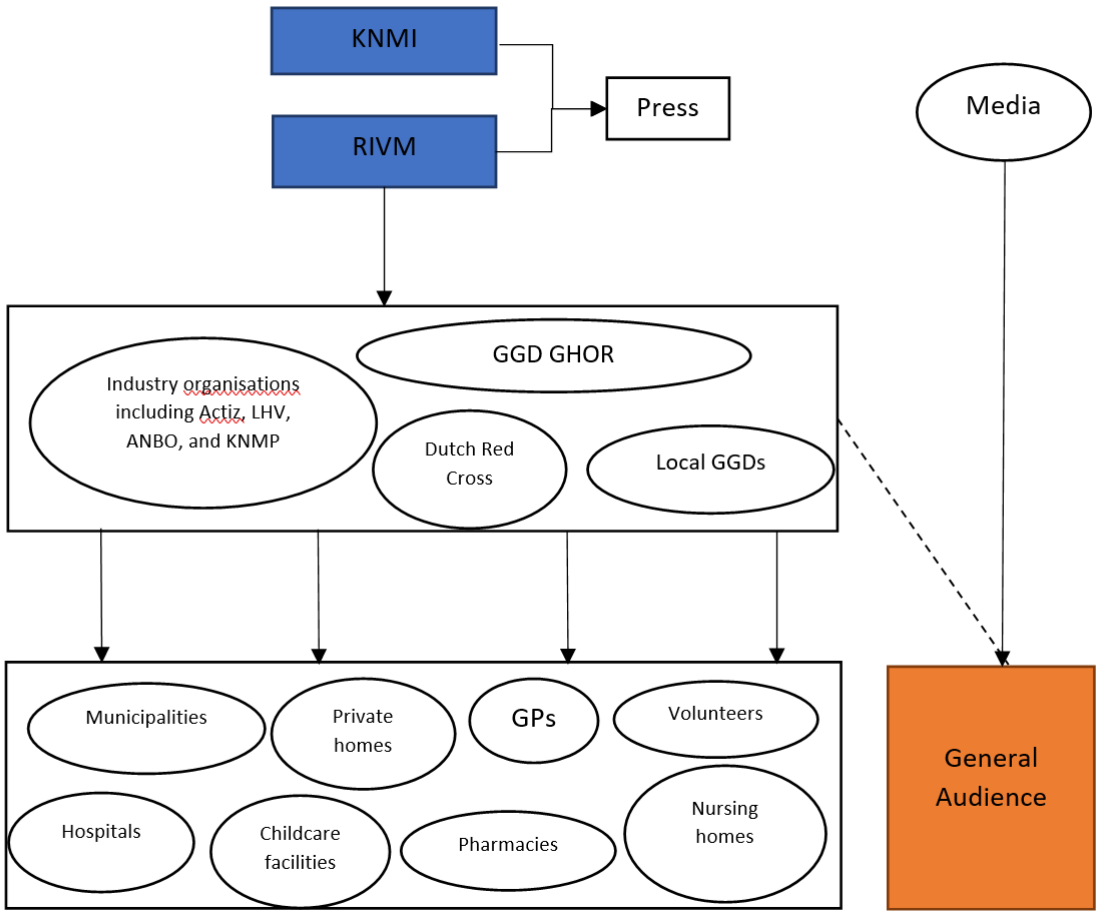
Weather watch level (phase)	Activation and removing the alert
Vigilance phase. There is no information sent out about this phase, it simply signals those institutions and organisation must get ready for periods of sustained heat.	KNMI and RIVM
Pre-warning phase. (Small probability that four or more days of prolonged heat above 27°C will occur). Decided more than 24 hours in advance.	KNMI and RIVM
Warning-phase. (High probability that four or more days of prolonged heat above 27°C will occur) The population receives their first notification about the likelihood of a period of prolonged heat. .	KNMI and RIVM

Source: Author's own construction based on Hagens and Bruggen (2014) and de Meer (2014).

The Royal Netherlands Meteorological Institute (*Koninklijk Nederlands Meteorologisch Instituut*) a main actor in the Netherlands HHAP, creates the weather forecast and calculates the probability that prolonged heat may occur. If the KNMI believes there will be four or more days of prolonged heat KNMI notifies the RIVM that there will be consecutive days of excessive heat. "Code yellow" (warning phase) is the KNMI weather warning for extreme heat and it can be issued regionally depending on the location (Hagens and Bruggen, 2014: 11, 16).

The National Institute for Public Health and the Environment (*Rijksinstituut voor Volksgezondheid en Milieu*) (RIVM) is another key actor in the heat plan. There are no responsibilities for the RIVM during the vigilance phase. During the warning or pre-warning phase, "together with the KNMI, makes the decision to send out a preliminary warning or a warning to all the notified recipients of the heat message (including GGDs, sector organisations and the Netherlands Red Cross. The RIVM manages the list of recipients" (Hagens and van Bruggen, 2014: 12). Recipients in turn share the message with members in their organisations, vulnerable populations, and the public. While not obligated, the media can pick up the press release sent out by the KNMI and RIVM. (See Figure 3.6 below for an illustration of this process).

Figure 3.6
Actors of the warning phase of the Netherlands HHAP



Source: (Hagens and van Bruggen, 2014: 17).

The NHHAP and communication on heat required the terms "sustained heat" or "prolonged heat." The NHHAP determines in advance when it will be consistently hot because forecasts with a high probability of the weather being above 27°C for four or more days is rare. Only after a period of sustained heat can the KNMI determine the occurrence of a heatwave (Hagens and Bruggen, 2014: 15).

The Public Health Act states, "municipalities are responsible for the well-being of their citizens" (de Meer, 2014: 12), meaning signalizing undesirable situations, advising the population about risks, answering questions from the population, and providing information is a statutory task (de Meer, 2014: 46).

The GGD guidelines says, "the main task of the GGD GHOR Nederland is to collectively represent the interests of the local and regional GGD and GHOR towards politics, (local) governments, insurers, cooperation partners, education, media, and public" (de Meer, 2014: 12). The GGD GHOR Netherlands is the national organization representing the 25 Municipal Health Services (GGDs) and Regional Medical Assistance Organizations (GHOR). The GGD advises municipalities on heat risks and how to communicate with them and tell citizens and other stakeholders in the public domain including schools, front-

line care providers, informal care, and childcare. (de Meer, 2014: 50; Haggens and Bruggen, 2014: 12).

GGD GHOR Nederland pays attention and advise on helping certain vulnerable groups and situations especially:

> "The elderly and very young children, people who are overweight or have a chronic disease (both physical and psychiatric), who use certain medications, alcohol or drugs and people who live in (inner) urban areas or social housing. Social risk groups are socially isolated persons, persons facing (imminent) eviction or disconnection of utilities, and the homeless. In addition, visitors of large-scale events are a risk group because of the limited possibility to organize their own adaptations during the warm period" (de Meer, 2014: 50).

These groups and people are most vulnerable because their bodies are less able to regulate their bodies' heat.

The GGD guidelines and NHHAP state stakeholders (organizations) participate in telling the public about heatwaves. The Dutch Red Cross, a private actor works with the government to share practical knowledge and instructions on protection from heat with volunteers and affiliated organizations. It can mobilize quickly and supply local help during a heatwave (Hagens and Bruggen, 2014: 13). Larger organizations specifically target certain industries and vulnerable populations including the General Elderly Persons Association (ANBO), the National Association of General Practitioners (LHV), the Royal Society for the Advancement of Pharmacy (KNMP) and Actiz (organization of health care entrepreneurs).

3.4 National Sermons in France HHAP

Sermons complement the sticks within the plan. Throughout France's plan communication is emphasized and resources are provided for prevention measures. "A special 'heatwave and extreme heat' file is available on the Ministry's (Ministry of Health) website including recommendations for distinct categories of the population to combat the impact of heat and a 'question and answer' section for the general public" (République Française, 2017: 1). Media stations that are not obligated to broadcast messages from the Ministry of Health are still encouraged to communicate information about heatwaves, especially starting at level 3.

3.5 National Sermons in the Netherlands HHAP

The Netherlands states in their heatwave plan, "the National Heat Plan is in fact a communication plan whereby the information must land on time and in full among risk groups and their immediate surroundings" (Hagens and Bruggen, 2014: 11). HHAP is sermons (information-based), with very few required sticks (laws). Communication comes from RIVM to different stakeholders. The RIVM sends out information about prolonged heat and posts about oncoming threats of heat on their website[11]. These resources can be used by the broader media, whereby "The media can disseminate information at their discretion (from the RIVM) about the occurrence of a period of sustained heat, the problems it may cause for certain groups, and the measures one can take to limit the negative health effects of the heat"

[11] https://www.rivm.nl/

(Hagens and Bruggen, 2014: 13). The basic protocol laid out by RIVM are "drink enough, take it easy, keep your house cool, think of each other, and since last year we've put more emphasis on heat and the use of medication. You shouldn't give too many tips, because how many tips can you handle at once?" (ECHO1).

3.6 Local Sticks in France HHAP

Locally there are measures that local governments execute through sticks under the leadership of the departmental prefect. Permanent circular: DGT circular no. 9 of July 4, 2013, on the implementation of the national heatwave plan requires departmental prefects implement the plan locally in the form of a Departmental Heatwave Management Plan (PGCD). Local service links the PGCD to the Departmental Civil Security Response Organisation (ORSEC). They also activate level 3 or 4 depending on the situation. (République Française, 2017: 4, 11, 29, 33). The departmental prefect maintain and update the PGCD. The PGCD describes the entire PNC at the departmental level based on the plan's activation levels including the actors and their roles. PGCD links to the departmental ORSEC plan (République Française, 2017: 34). The departmental prefect must analyze the situation with the information available from ARS, Météo-France and other local actors while coordinating with ARS (République Française, 2017: 29).

If a heatwave escalates, the departmental prefect has additional responsibilities. The prefect must provide a local number in each department to answer questions from the public (République Française, 2017: 2). The departmental prefect must work with concerned associations and institutional partners to quickly mobilize and guarantee shelters, cooling spaces, accommodation, and day care places, as well as the mobilization of mobile teams or any other social surveillance system, as mentioned in article L. 345-2 of the Social Action and Family Code. Another law, decree n°2015-1446 of November 6, 2015, states the above and groups of volunteers must mobilize to identify homeless people and other people needing to access these shelters and encourage them to use these shelters or assist them with any medical help (République Française, 2017: 9). The departmental prefect uses the ORSEC system for local needs i.e., activating the COD, using the alert system for actors, and activating the public information unit. The COD brings together representatives from the different actors within the department concerned by the heatwave to coordinate actions need to mitigate heat (République Française, 2017: 30).

A signature piece of France's heatwave plan requires each municipality to have and maintain a list of people who are vulnerable, where they live and their contact information, which was created as a law after the 2003 heatwave that states, "In accordance with the provisions of this law of June 30, 2004 and articles R. 121-2 to R. 121-12 of the code of social action and families, the municipalities have set up a nominative register intended to register elderly people and people with disabilities who request it" (République Française, 2017: 7). This create guidelines on how mayors manage confidential information since this is sensitive information. "Decree no. 2004-926 of September 2004 set out the procedures for collecting, transmitting, and using this personal data" It gives mayors the power to inform people the register has been created, collect applications, maintain the list and the confidentiality of the people on the list, communicate the register to the prefect in case the PAU is activated (République Française, 2017: 7). Municipalities call and check on vulnerable individuals once or twice a day based on the list of vulnerable people (ECHO2).

Different local agencies also further assist national agencies. The Regional Intervention Units (*Cellule d'Intervention en Région*, *CIRE*) analyses the health indicators to estimate the impact of heat as ARS does nationally and sends the data to DRS (République Française, 2017: 19).

3.6.1 Local Sticks in the Netherlands HHAP

Municipalities or local organizations have no stick requirements. As stated above the HHAP is a communication plan. Most of the measures are only recommendations. A few actors of the plan have required roles that are sticks but sticks only occur at the national level.

3.7 Local Sermons in France HHAP

Each municipality maintains a list of vulnerable populations which is a stick, registering on that list is voluntary meaning and achieved through sermons. People must gain consent from the vulnerable person to add them to the list. People that can register people on this list include relatives of the vulnerable people, nurses, social workers, or neighbors (République Française, 2017: 7). To register people on the list the PNC encourages the prefect to collaborate with local authorities and different associations such as the Home Nursing Care Services (SSIAD) and the Home Assistance and Support Services (SAAD) and social services to inform people and encourage them to register these vulnerable people to the list. National networks have a framework agreement to mobilize their networks locally to help local governments with vulnerable populations if needed in an event of a heatwave. Prefects encouraged by the national government raise awareness with local mayors, create local partnerships with associations affiliated with vulnerable populations to be involved in actions and response to these populations in the event of a heatwave. This helps for a more efficient response to heat (République Française, 2017: 7).

Another 'sermon' policy tool used by the Regional Directorates for the Economy, Competition and Consumption, Labour, and Employment (Direccte) as encourages companies to adapt their work organization in anticipation of hot weather" (République Française, 2017: 13). This framework is based on the 2016-2020 occupational health plan (PST3) (République Française, 2017: 11). "Within this framework, they can: mobilize the occupational health services, through the occupational health inspectors, so that the occupational physicians advise the employers (R. 4623-1) on the precautions to be taken with regard to the employees, especially those who are the most exposed to the risks related to the heatwave, and inform their employees correctly; provide for increased vigilance on the part of the labour inspectorate in the sectors of activity most concerned by the risks associated with heatwaves and thermal environments, in particular construction and public works, but also other sectors (in particular: restaurants, bakeries, dry cleaners). Driving vehicles, seasonal outdoor jobs (e.g., beaches....), etc., are also likely to require vigilance. In this context, the labour inspectorate encourages employers to declare each work accident" (République Française, 2017: 12).

Once the level 3 (heat warning) of HHAP is activated, state services in each region inform the public, through local media of the measures the prefect took in response. State services redistribute media material (leaflets and posters). State services open a local information number, which is different from the Ministry of Health's national number (République Française, 2017: 4).

Additionally, at level 3 local radio and television stations are encouraged to broadcast heatwave alerts. Prefectures keep track of the stations broadcasting these messages. The Ministry of Health maintains a list of radio stations broadcasting the messages for the public to access on the Ministry of Health website (République Française, 2017: 4-5).

3.8 Local Sermons in the Netherlands HHAP

On the local level municipalities, health care institutions, and care providers have flexibility on how they manage and mitigate the effects of heat. It is optional to subscribe to the RIVM email list that sends information about heat, mitigation information and when the KNMI and RIVM declare a heat warning. After RIVM sends out emails, "it is up to these recipients to use the messages and pass them on to their own clients/members (Hagens and van Bruggen, 2014: 16). There are government organizations and NGOs that can advise these organizations and municipalities on the topic of heat. The Dutch Red Cross and the "GGDs can inform the public, (healthcare) institutions and care providers about the risks of prolonged heat. They give practical advice on how to limit the heat-related nuisance" (Hagens and van Bruggen, 2014: 12). "The role of local GGDs in the National Heat Plan is primary to advise municipalities about the health risks and how to communicate about them" (Hagens and Bruggen, 2014: 12). The GGD guidelines further state:

> "Advice to municipalities can be preventative (outside a warm period) or reactive (during a warm period). Reactive advice to municipalities focuses mainly on events and social reception. Prior to a warm period, agreements can be made about measures to be taken during a warm period. The GGD can support the municipality in developing a scenario for municipalities and social care organizations. In addition, the Municipal Health Service can provide preventive advice to the municipality with regard to the design of the residential and living environment in terms of spatial planning, building materials and cooling elements" (de Meer, 2014: 62).

The municipalities can choose if they want to have their own local Heat Plan/HHAP (ECHO1). The local GGD decides on their own structure and roles in their local HHAP (13). They decide how they communicate to the public, information they provide and what channels they go through during the event of a heatwave.

Healthcare institutions decide how they prepare for periods of sustained heat, spread the message to residents and implementing the measures they have pre-decided (Hagens and Bruggen, 2014: 13). Local governments do not monitor which institution has a heat plan. The GGD and the Red Cross can advise organizations that collaborate with vulnerable people on how plan for an event of a heatwave. The dominant use of sermons gives organizations, government agencies, and local government flexibility on how to manage at heatwave but lacks organization among stakeholders in the Netherlands compared to France's use of sermons.

3.9 Conclusion: What type of policy instruments are used in the two plans and what kind of mix do we observe?

3.9.1 France's policy mix

From the analysis in this chapter, we can see that sticks dominate the French HHAP because of the trauma existing from the 2003 heatwave. France developed their heatwave plan at the national level and implements their plan nationally and locally yet has passed specific laws for implementing the HHAP locally.

A key law featured in France's HHAP is the Social Action and Family Code, articles R. 121-2 to R. 121-12[12] on June 30, 2004. This law is the signature pieces of France's HHAP (see HERE and here above). The sermon feature of the list allow voluntary for people who are vulnerable to be registered, It is perhaps the only plan in Europe that has a law requiring the government to check in on people during a heatwave. DELTA4 who was a researcher part of the SCORCH project and analysed 15 different HHAPs says:

> "The plan of France is one of the only plans that I found in Europe where they take a lot of effort in making a register for vulnerable people. In particular, the elderly, they can sign up for this register, it is documented, all their names are listed there. And when a heatwave occurs, they check everyone included in this register on a regular basis, if they are still okay. I found, […], the plan of France was the only one that managed to actually implement this system […] it was one of the only plants that actually succeeded in making it work for these vulnerable people and for involving them and offering care for these vulnerable people. I think different things, the alert system is very complete the way that they approach the vulnerable people. It's very unique, and I think very successful in their case, with of course room for improvement" (DELTA4).

As we can read in this quote, it is still voluntary (sermons) for vulnerable people to register themselves or family, care workers, or neighbours to register them with their consent.

In addition to sermons, the plan consists of a series of laws (sticks) that sectors, municipalities, and prefectures need to follow before a heatwave, starting with implementation of the plan through a series of laws, regulations, and decrees. Without repeating all the sticks shown in the earlier sections, suffice it to mention a few:

Article L. 116-3 of the Social Action and Family code which requires mayors to find air condition locations for at-risk people living at home, ability to contact and check in on elderly and disabled people living at home with respect to privacy laws, provide water distribution points, and extend municipal swimming pool hours (République Française, 2017: 35).

The amended Audiovisual Law of 30 September 1986 requires certain radio stations and television channels to broadcast health alerts when instructed to do so by the Ministry of Health (République Française, 2017: 5). Other laws in the heatwave plan require agencies to cooperate and supply support during the heatwave, such as between the ARS and the CRAPS and COD. Locally ANSP, ARS and the departmental prefects must work together to distribute information to partners, prefectural services, professional networks, and institutions who help distribute leaflets and posters to the public while targeting vulnerable populations (République Française, 2017: 1-2).

There are laws to check local and national health indicators that check the status and the amount of the supply of care. In addition, depending on the level of the heat warning system

[12]https://www.legifrance.gouv.fr/codes/section_lc/LEGITEXT000006074069/LEGISCTA000006145434/#LEGISCTA000006145434

ARS has specific roles relating to the capacity of hospitals, activities, which hospitals have activated their required white plans, and checking the strain of health care establishments. A key role ARS plays is expanding the operations of the heatwave plan and preparing for the possibility of level 3 and 4 at the local level (République Française, 2017: 14, 20, 28). This data is then taken from ANSP and ARS to create a national health summary by the DGS who sends the report to partners.

The mortality rate decreased 90% from the 2003 heatwave to implementing the HHAP (Hill et al., 2021). This decrease in mortality can arguably be attributed to the policy mix and the incentives that government officials must implement the plan. Job security is constantly on the line for the prefect with the president of France allowed to release a prefect without notice if the prefect does not implementation policies or perform up to the national government's standards (Cole 2011; The Connexion, 2010).

The plan is well structured enough where it can function without the use of sermons because the sticks feature the communication plan, the implantation of the plan locally, tracking health indicators, how to take care of vulnerable populations, and the heat warning system. The sermons that are featured in France's plan complement the strong use of sticks throughout the plan. Sermons complementing the sticks include media not under the Audiovisual Law of 30 September 1986. While France's plan is dominantly sticks, the Netherlands features a different policy mix and less incentive from government officials to implement the plan

3.9.2 Netherlands policy mix

The dominant policy instrument in the Dutch HHAP (including the 93-page document of the GGD guideline medical environmental science) are sermons. The Dutch plan is very decentralized. The Public Health Act of 2008 states municipalities manage the well-being of their citizens (de Meer et al., 2012). The KNMI and the RIVM send out the message to the public health authorities (GGDs) warning them of multiple days of excessive heat ahead, and this essentially activates the HHAP. There is thus a strong reliance that the GGDs send out the messages to the public and care institutions, but there are no binding mechanisms to make sure this happens. All the KNMI and the RIVM can do is hope that the local structures will send out the messages and take all the required measures. There is often not a backup plan and as a result the message might not be communicated to the vulnerable populations, contributing toa lack of a system of dissemination within organizations that have vulnerable people such as nursing homes, hospitals, and companies with workers who work outside. The government and relevant agencies thus believe that people are going to read the newspaper and self-inform themselves that a heatwave is coming (DELTA3). However, this disregards the fact that people who are vulnerable often do not consider themselves as vulnerable, thus are not likely to take the warnings seriously (Martinez, 2019). Care and other relevant organizations are also often not willing to take responsibility to inform or look after these groups. This lack of organization is not only clear in the cities but also in rural areas.

Based on the interview with DELTA3, we can thus see that in the Netherlands a lack of ownership in who will take responsibility for enforcing the heatwave plan. No minister or ministry wants to take responsibility for the heatwave plan, a conclusion that came out of working groups on heat in the Netherlands. Part of the problem is that relevant stakeholders disagree on whether there should be one national heatwave plan or more than on local heat plans. Cities have taken different approaches too. Currently the Hague, Tilburg, and Groningen have local heat plans, and Rotterdam is creating one. Another reason for the lack of a strong national and local organisation around heat plans could lie in the fact that relevant authorities are only focused on the four years of their term as elected officials, and not beyond (DELTA3).

There also appears to be a lack of incentive to implement the plan because there are no consequences or job security at risk if the plan is not successfully implemented. No mandatory reporting is needed from the local to the national level. The laws put in place such as the Public Health Act of 2008 that says that municipalities manage the well-being of their citizens, but not required to have a local heatwave plan. Therefore, it is unclear in this policy mix how municipalities are supposed to help their citizens especially vulnerable populations during a heatwave. Regulations would help the Netherlands HHAP more structure and make the roles of all the actors involved clearer.

Chapter 4 The effect of institutional history and political culture on the creation of the HHAPs, and the role of the EU

4.1 How can institutional history and setup, as well as political culture explain the choice of these mixes?

Between France and the Netherlands, France had significantly more deaths than Netherlands. Both countries reacted differently. This can be explained by the mortality rate, political culture, institutional set up, and social culture in France and the Netherlands

4.1.1 France's institutional history

The trigger for creating France's HHAP was the deadly heatwave in the summer of 2003. The death toll was excessive especially to elderly and isolated individuals. A respondent, a former researcher at the SORCH Project described the aftermath as traumatizing for the government and people in healthcare in the quote below.

> "They told me that during the 2003 Heatwave, a lot of elderly people died alone in their homes because they were living at top floor apartments in France , or in Par-is, at least, these top apartments they used to be 100 or 200 years ago, the rooms for the maids of the rich people living in the large house, they have been converted into apartments, but their entry is separate from the main entry way. […] It is common that people living in these apartments don't meet their neighbours for a long time because they have a separate entryway. […] A lot of people died in those top (floor) apartments, […] because […], it's very hot there. They're under the roof. It's badly isolated, little ventilation. It's often old people that were living there because it was cheaper in rents. […] I think especially the measures for vulnerable people, and especially the isolated people are really a reflection from their experiences in an effort to prevent a reoccurrence of that situation" (DELTA4).

As mentioned, the laws created from the high death toll in the elderly population. Many of France's buildings were built during a time when heatwaves were not an issue and occupants had live-in servants. Since live-in staff are no longer common, the purpose for these living units has changed making them more conducive to isolating the individual. It is costly to change the configuration or access for these former house cleaners' quarters. Any new development or reconstruction should consider heatwaves and the risk of people being isolated.

Additionally, the creation of the plan was also triggered from the average mean temperatures in summer 2003, which were roughly the same throughout two-thirds of France. The media first reported emergency services were experiencing higher-than-normal demand and funeral parlours were overwhelmed with more than normal number of bodies, with elderly people especially dying at higher-than-normal rates. Doctors and emergency personnel went to the media, at once blaming the Directorate General of Public Health. The media spread the news that the government of France was more focused on managing the energy supply and mitigating the economic effects of the heat than protecting the public.

Marseille was the only city in France that did not have excess mortality during the 2003 heatwave due to a local heat warning system.

> "The heatwave was not really exactly defined with thresholds, but when it's very hot, they decided to inform the population about the risk and how to prevent the risk

and, we suppose, it is the reason why in 2003 it was the only city with no excess mortality during the heatwave" (ECHO2)

Due to the 2003 heatwave, there was a sense of desperation from the government to find people to help create a mitigation plan for heatwaves to be in place by the following year. Despite a lack of any institutional history on national HHAPs, the policymakers were able to create the first national HHAP in the EU, thereby becoming a model for other countries.

The 2003 heatwave has been engrained into a collective memory and the trauma of the events that occur still affect individuals and different sectors today. To elaborate on what happened in 2003, the Director of Public Health resigned on August 18th after being blamed by the health minister at the time for putting France is this catastrophe. Citizens of France started demanding reform of the social and health care of older people to avoid another disaster. In Paris alone 57 corpses were never reclaimed by their families. A private nursing home director was charged with responsibility for the death of an older women. These incidents showed that facilities were not accurately equipped to manage a period of prolonged heat.

In 2000, France's healthcare system was named the best in the world by the World Health Organization (WHO) overall. In contrast, a report presented to the National Assembly on what went wrong in the 2003 heatwave episode highlighted that the health care system was the weakest sector. The report said, "among other consequences of this painful episode, it became clear that the French hospital system, although reputed to be among the best in the developed world, was barely capable of overcoming the circumstances of disaster medicine during the summer" (Evin and Aubert, 2004: 112). Hospitals were understaffed due to staff taking their summer holidays and lacked supplies and space, which further intensified the situation and decreased the quality of care. Hospitals lacked communication between other hospitals, departmental prefects, and the Ministry of Health. The lack of preparedness was also clear at the policy level.

The 2003 heatwaves proved to be a political disaster for Prime Minister Jean-Pierre Raffarin, whose approval rating decreasing from 45% to 29% and 69% expressed no confidence in him (Vacas, 2019). President Jacques Chirac was on a three-week vacation for August during the 2003 heatwaves which angered French citizens. Creating the heatwave plan was necessary from a social and political view. French citizens blamed the national government for not protecting their public safety forcing the government to respond to rebuild the public's trust. Countries such as France will have to see a shift in cultural norms such as moving its peak holiday season due to the intensity and longevity of heat. The peak heatwave season is a time when Europeans take their summer holidays. The climate models show as the planet continues to warm more workforce and resources will be needed during the summer holidays, and it will become too hot for the key workers to take a holiday during these months. Further laws could be added to France's heatwave plan i.e., limiting when emergency workers can go on holidays and people being required to limit resources such as limiting energy to prevent rolling blackouts or water rations to have enough resources for vulnerable populations and emergency services.

4.1.2 France's political culture

In addition to institutional history, it is useful to consider France's political culture as an explanatory factor in how its HHAP was designed. The French revolution transformed political culture when it broke away from the ancient regime. The French broke completely from their national past, values, and installed a new government with completely new values. It transformed political thinking lasting through the 18th century (Hunt, 1989). New thinkers appeared that continue to influence France in the 21st century. New enlightenment social

ideas of people sharing common interests, liberty, and granting equal rights and freedoms to all people regardless of social status or group within the national framework and increased active participation in politics (Stromberg, 1988). People became more involved and opiniated about politics in France that has continued into the 21st century.

The 1980s was another major shift in France's political culture. Laws were passed to make the state more decentralized. More power was given to the mayors at the local level when decentralization laws were passed in 1982. Prefects were given more power also while state departments also became more decentralized. Another significant shift in France also occurred in 1982 when the state monopoly of audio-visual communication and an independent regulating authority was introduced. Even though there was decentralization, the government still controls the independent regulating authority as seen in the HHAP.

Unlike the Netherlands, heatwaves have become embedded in France's political culture. As a result of the lack of preparedness and response by politicians the 2003 heatwaves have long-term consequences in terms of distrust in politicians in France. Citizens saw the heatwaves as a failure to inform and protect citizens (Poumadère et al., 2005: 1492). Government performance was measured by the number of deaths that occurred especially from the elderly. Even before the 2003 heatwaves political trust in the democratic government in France has been declining. Between 1981 and 2001 France saw an 8 percent decline from 47 percent to 39 percent (Catterberg and Moreno, 2005).

French people believe the government handles protecting citizens from health risks. Before the 2003 heatwaves the culture of the French government was to take a more administrative approach and be less firsthand. French people had different expectations. "When there is a really serious health problem, the public health officials will take care of it. Until they alert me about a specific problem, I don't really have to worry" (Poumadère, 2005: 1490). They will listen if there is a public health crisis (i.e., heatwave). Due to the 2003 heatwaves France has taken on a social security role to protect its citizens when it comes to health and social issues with the HHAP being dominated by sticks passed after 2003 (Stephenson, 2009). The laws passed were part of an attempt by the government to regain the trust of. Since the plan was implemented in 2004, France has cut its death toll from heat by 90%, based off decrease in mortality (Ford, 2019).

4.1.3 Netherland's political culture

The foundation of the current political structure and culture of the Netherlands stems from the late 18th century. The Netherlands went through its own revolution called the Patriots Revolt from 1787-1813 causing a change in political culture that sparked a notion of sovereignty for the people. This value of freedom and independence continues to be evidenced in Dutch culture today. It was a turning point of the Netherlands into a modern liberal representative democracy (Poell, 2007). There was also a clear separation between the church and state which the National Assembly in charge of creating the first constitution set up in 1796. This followed in the footsteps of France and the United States of America. There were trying between 1796-1848 to incorporate religion into the government of the Netherlands during another brief period when the monarchy was heavily involved in the government before the current democracy was created in 1848 (Rooy, 2015).

The Dutch revolutionists were strongly affected and inspired by the French revolutionists. After the Patriot Revolt failed more Dutch revolutionists supported the unitary democratic state model after seeing the success of the French revolutionists. The Dutch revolutionists were especially inspired by the French concept of freedom, the idea to include everyone. The early concept of Dutch freedom post-revolution was freedom was connected

to local governments and independence from higher state institutions and still applies today in the current government (Poell, 2007).

Decentralization appeared in Dutch political culture as early as the 1700s. The Revolution of 1795 tried to centralize the Dutch government with creating a new constitution in 1798 to create a modern unitary democratic state, but there was mass resistance when local and provincial autonomy was eliminated. The new constitution only lasted until 1801 when the government fell apart due to a weak central government. The political authority returned to being partly decentralized causing a reversal of centralization and democratization. The Netherlands became more authoritarian until 1840 with the revival of democratization. Attempts have continually been made to democratize and centralize throughout the late 18th century and 19th century, but ultimately were eventually reversed (Poell, 2007).

The failed Patriot Revolt did start the basic foundations for the current Dutch political system today. As early as 1798 clubs and neighbourhood assemblies formed coalitions. Political opponents and democratic institutions could be overruled with these coalitions. Political parties would be introduced into the Netherlands in 1869 (de Rooy, 2015). Following the failed revolution, the first municipal governments were set up beginning with the Amsterdam municipality in October 1801 (Poell, 2007: 126).

1848 was a turning point for the Netherlands with the current constitution creating a parliamentary democracy system. The monarchy therefore had less of a role in the government and the king had limited powers.

Further aspects of the 1848 constitution shaped Dutch political culture to be what it is today. Liberal policy is defined as an emphasis on individual freedom that is important in the new constitution. The individual is more important than the state is, and people should say how the policies are created. The polder model, most used in economic and social policy in the Netherlands is also connected with this, meaning consensus decision making and everyone having a voice in the policy if it affects them. This makes stakeholders feel more like they have ownership in a policy leading to less resistance to the policy and the government, but it can also significantly slow the policy making progress (Hendriks, 2017). It could be argued that the Netherlands HHAP reflects this liberal policy and the polder model. When the HHAP was created different actors including the government, the Dutch Red Cross, organizations connected with vulnerable populations, and government agencies had a say in creating the HHAP. The HHAP as a communication plan still allows groups individual freedom on how they prepare and mitigate the effects of a heatwave.

Dutch political culture also explains why people do not want to listen to the government. The government has instilled neoliberal policies and educating its citizens to be self-reliant and independent. If you are poor and you fail it is your fault. Neoliberal policies have backfired on the government because, as a respondent said, "I think in the Netherlands we are too much of a wild bunch and don't want to listen if somebody really tells us what to do. We always look how far we can go with not doing it. So that is a cultural difference. I think that is why it is always difficult here to use sticks with regulations" (DELTA3). COVID is an example where the Netherlands experienced the worst violence in every major city in four decades in January 2021 due to the COVID-19 lockdown measures. The government wanted to suddenly restrict individual freedom and enforced new laws such as curfew, wearing masks and force businesses to close because they felt they had to do this to ease the pressure on hospitals. These protests showed the same theme of Dutch citizens being fearful of the government having too much power and influence over its citizens

The heavy reliance on sermons in the HHAP can arguably also be explained, partly by referring to the Dutch policy development context of pillarization and decentralization. Pillarisation (from the Dutch: *verzuiling*), is defined as politico-denominational segregation of a society, or the separation of a society into groups (or pillars) by religion and associated

political beliefs. Each pillar historically had their own social institutions and organizations such as newspapers, broadcasting organisations, political parties, trade unions, farmers' associations, banks, stores, schools, hospitals, universities, scouting organisations and sports clubs (Çelik, 2013; Hellemans, 2020).

De-pillarisation of Dutch society has been ongoing for the last 60 years or so, "the result has been a confusion of local, regional, and national institutions, some administered directly by government and others farmed out to interest groups with a specific basis or purpose" (Toonen 2000: 170). This trend started in the 1950s (Rooy, 2015). This trend is aggravated with shifting decentralisation and re-centralisation dynamics with municipal powers and can explain why there is no strongly shared institutional ownership of the HHAP. The people would prefer to decide on their own how to protect themselves from heat instead of the government telling them how to.

To conclude this section, the HHAPs are created based off institutional history, political culture and social culture which decides the policy instruments used in France and the Netherlands HHAPs. Both countries have decentralized governments, but each country takes a different approach. France's uses sticks due to the high death toll from the 2003 heatwaves. French citizens blamed the government for the disaster. To restore the citizens' trust in it, the government created the first national HHAP in attempts mitigate a high death toll and protect vulnerable populations requiring cooperation from the national and local governments. A government actor not cooperating with their role in the HHAP could result in the loss of their job. In contrast, the Netherlands' HHAP is dominated by sermons giving citizens the freedom of how to protect themselves from heat.

4.2 What lessons can be drawn from this analysis with regard to other European heat plans and EU heat health policy more generally?

Turning now to the third sub-question, progress with heat health action plans (HHAPs) and wider heat health policies stay complex within the EU because they are under different policy arenas including health, social policy, and climate adaptation. The EU has worked closely with the World Health Organization (WHO) on HHAPs beginning with EuroHeat which found eight core elements of HHAPs. They are

> "Agreement on a lead body, accurate and timely alert systems, a heat-related health information plan, a reduction in indoor heat exposure, particular care for vulnerable population groups, preparedness of the health and social care system, long-term urban planning, and real-time surveillance and evaluation" (Matthies et al., 2008).

The EU has adopted the framework of the WHO. EU institutions and organisations have categorized HHAPs under health including the European Commission and European Environmental Agency.

Categorizing HHAPs under health and wider heat health policy within the EU make it challenging as health falls under national sovereignty. Therefore, the role the EU can have in overseeing the plans is limited. Under the EU mandates HHAPs cannot be a regulation based on article 129(1) of the Maastricht Treaty (European Union Treaty) which states in the EU "the Community shall contribute towards ensuring a high level of human health protection by encouraging cooperation between the Member States and, if necessary, lending sup-port to their action" (European Commission, 1992: 24). Article 129(4) further says the European Union is allowed to spend money on Euro-pean Union level health projects but is not allowed to harmonize public health measures in member states (European Commission, 1992). The Amsterdam Treaty further strengthened the power member states have on their public

health laws. Article 129 (1) was revised to say that in the EU, "a high level of human health protection shall be ensured in the definition and implementation of all Community [union] policies and activities" (Office for Official Publications of the European Communities, 1997: 40). In the most recent update to the EU mandates the Lisbon Treaty article 152(7) states,

> "Union action shall respect the responsibilities of the Member States for the definition of their health policy and for the organisation and delivery of health services and medical care. The responsibilities of the Member States shall include the management of health services and medical care and the allocation of the resources assigned to them" (European Commission, 2007: 84).

The EU has responded within the limits of its mandates by funding different research projects on heat and health to provide member states with relevant knowledge to integrate into their own policies. The European Environmental Agency (EEA) has set up a database for knowledge and research through the European Climate Adaptation Platform (Climate-ADAPT) and the recently set up European Climate and Health Observatory through the EU Climate law. These platforms are available to member states, local governments and the general public.

The EU has also funded projects outside of the EEA to produce knowledge on heat and health. The first project was a response to the 2003 heatwaves called EuroHeat which was co-funded funded by the European Commission (EC) Directorate-General for Health and Consumers. The project "quantified the health effects of heat in European cities and identified options for improving health systems' preparedness for and response to the effects of heatwaves" and coordinating with the WHO European Region created the first framework for HHAPs (World Health Organization Regional Office for Europe, n.d.: n.p.). Two other projects, HEAT-SHIELD[13] and SCORCH Project are EU funded research projects on heat and health. HEAT-SHIELD "addresses the negative impacts of workplace heat stress on the health and productivity of the EU workforce" (HEAT SHIELD, n.d.: n.p.). The Supportive Risk Awareness and Communication to Reduce impact of Cross-Border Heatwaves (SCORCH) aims "to reduce the health impact of heatwaves on vulnerable, urban populations through improved risk communication strategies" (University Hospital Heidelberg, n.d.: n.p.).

The WHO has had an influential role since the 2003 heatwaves beginning with the EU funded EuroHeat project. Article 129(3) of the Amsterdam Treaty says that "the Community and the Member States shall foster cooperation with third countries and the competent international organisations in the sphere of public health" (European Commission, 1997: 40). There was no institution within the European Union working on climate adaption strategies prior to 2003, when the first EU climate adaptation strategy was developed. The EU did not have the ability to create the framework and gather the knowledge on the health effects of heatwaves while the WHO did at the time. The WHO essentially functioned as a consultant ensuring that the EU does not go beyond its boundaries the mandate defines when getting involved in member states public health systems. Working with the WHO has also been an opportunity for the EU to spread its influence through funding to other non-EU nations. Other nations have received help from the WHO framework and created their own HHAPs, including North Macedonia and Switzerland.

However, from interviews it appears that a network of researchers, experts, and policy-makers working on HHAPs, and heat health policy has not yet been set up among the EU member states. As a result, there is not enough critical mass to create enough power to bring more attention to HHAPs and the effects of heat on health as a major issue. A lack of

[13] https://www.heat-shield.eu/

network prevents further progress and advancement on these plans at the local, national levels and private sector.

Climate adaptation strategies in general do not have a "one size fits all solution". There are distinct factors to consider such as governance structures, political and societal cultures. Different countries also prioritize heat and health at distinct levels. France has prioritized it higher than other countries due to the high death toll it has experienced. Other nations have not established HHAPs because they have yet to experience a disaster as France has.

The EU will face challenges with health and climate change with the current restrictions of the EU mandates. The mandates were written before climate change was a prominent issue. Research has proven health and climate change such as heat are correlated with each other, but until EU mandates are revised there are no regulations that can be enforced to protect EU citizens when it comes to climate change and health. The strongest role the EU can take is to continue to fund, produce and encourage research on heat and health so that the member states will see this as enough of an issue to create policies such as HHAPs. The EU can also supply and offer states disaster aid if they request it. Recently, the EU has been developing new projects to respond to health crises such as heatwaves and floods.

4.2.1 Additional Institutions and developments within the EU

Other EU institutions work on heat and health under broader terms of climate change, environmental issues, or environmental threats. Recent developments have happened bringing further attention to climate and health. The COVID-19 pandemic has brought new attention on health relating to climate change. In 2020 the European Commission launched the European Health Union in response to fighting future pandemics. The goal of the European Health Union is that "all EU countries prepare and respond together to health crises, medical supplies are available, affordable and innovative, and countries work together to improve prevention, treatment and aftercare for diseases such as cancer" (European Commission, n.d.). While climate change health is not mentioned at once, one of the key incentives of the health Union announced in 2021 and which will be operational in 2022 is the European Health Emergency Preparedness and Response Authority (HERA). Under task 1, HERA's tasks include threat assessments and intelligence gathering with the aim of trying to detect biological and other health threats quickly after they appear, evaluate their impacts and identify potential counter measures. Climate change is mentioned as one of the threats, but it is not specified what climate change effects HERA would be involved in or how in-depth (European Commission, 2021).

Chapter 5 Conclusions and Policy Recommendations

5.1 Policy Recommendations

Going forward, the EU could take a more active role in coordinating national efforts to develop HHAPs. For example, I found that there is a lack of communication between the national policymakers who work on heatwaves across the EU, and a desire for more networking, interactions and exchanges on best practices. Respondents who have worked on heat-health action plans also have found the same gap.

> "The […] thing that I would say needs improvement is knowledge exchange, because I feel and I saw also in the SCORCH project, there's a lot to learn in Europe or outside Europe as well, from the heatwaves plans. that already exists. […] Everyone is creating their own heatwave plan, almost from a new or based on also the WHO guidelines. But there's very little exchange between the main stakeholders involved in each country's plan. They don't get together yearly or even I don't know, biannually or they don't get together at all. And I feel there, they could learn a lot from talking to each other from exchanging knowledge and exchanging lessons learned and best practices" (DELTA4).

Another respondent asked me to share my contacts for other policy makers working on HHAPs in other EU countries.

As mentioned above the EU does not currently have a role in monitoring, evaluation, or requiring the member states to have national plans. One action that the EU can begin to take to have more of a role is to add climate change mortality to the Eurostat database. Heat mortality is difficult to track. However, EU states have been able to track and record deaths from heat also after the 2003 heatwaves. The EU can begin to take the data from the member states along with other climate change related deaths and add it to the Eurostat database. Once they have the statistics about heat mortality, they will be able to develop better policy interventions about heat and other climate change casualties.

The COVID-19 pandemic has brought new developments in health establishments within the EU which will positively affect the response on heatwaves. In 2021 the new EU Heat and Health Observatory has been set up under the 2021 EU Adaption Strategy. Outside of heat health policy there has been the establishment of HERA, but the language of HERA still is vague on how this emergency response authority will be involved in heatwaves. The European Health Union was set up this year in 2021 and oversees HERA.

The European Health Union is another prime opportunity for the EU to get more involved in heat health and wider climate change related health. However, there appears to be a focus by the new health union on preventing future pandemics, but not enough attention on climate change related health and events that occur each year even when there is not a pandemic. One way to do this would be to expand the aims the European Health Union and include EU institutions that work on climate change and health besides the brief mention of environmental threats to health in HERA.

In addition, there appears to be a lack of involvement with the private sector while plans have supplied recommendations on how cities should approach urban planning and buildings to prevent further heat islands. Respondents acknowledged that there is an opportunity for the private sector to get involved on this issue as well. The private sector specifically construction can work with local governments when constructing new buildings to use more heat resistant materials. Malls, schools, and community centres can be used as cooling spaces

for people to escape the heat who do not have the proper facilities at home to keep cool. Countries offer subsides for heat resistant materials and energy efficient appliances and systems. Two of the key benefits of the EU green deal are upgraded, energy efficient buildings and cleaner energy with new innovative technology. While HHAPs do not have as strong connection to the EU green deal right now especially since HHAPs have not been made a regulation under the EU Climate Law there is an opportunity to connect the HHAPs and more involvement from the private sector while also supplying a strong case for the EU to influence member states to create more heat resistant cities.

5.2 Conclusion

Heatwaves have caused the highest number of climate change related deaths in the European Union but have lacked attention from the EU and member states (Watts et al., 2021). The 2003 heatwaves resulted in the creation of heat-health action plans (HHAPs) with France being the first to implement a national plan. Other EU member states including the Netherlands and non-EU countries have followed.

The first sub-question asked what type of policy instruments (carrots, sticks and sermons) are used and what mixes we can see. France's HHAP is dominated by sticks and complimented by sermons due to lessons learned from the deadly 2003 heatwave. The sticks in place are designed to prevent high mortality, causing strain on the health care system, and to guarantee that communication is channelled down from the Ministry of Health to the local governments, institutions, partners, and media. Each (territorial) department led by a departmental prefect must have a local HHAP. The incentive to conduct the HHAP by government officials in France is job security especially for the prefect. The use of sticks supplies structure and explains the roles each actor has in executing the HHAP.

In contrast, the Netherlands plan is dominated by sermons as it is essentially a communication plan. Only the KNMI and RIVM have roles that are sticks. There are no local sticks and municipalities do not have to have local heat plans. The media does not have any obligation to report the heatwave alerts sent out by the RIVM. This makes the plan unstructured and unreliable because actors lack the incentive to conduct their roles and responsibilities in the plan. The mixes can be understood from political culture, institutional history, and decentralization which was the focus of the second sub-question.

France's institutional history is dominated by the trauma from the 2003 heatwave resulting in citizens blaming the government for the disaster. The government officials were incentivized to act and created the first HHAP that was ready to be implemented by the following summer to regain French citizens' trust. The Netherlands policy mix stems from a history of neoliberal policies leading the government to take a hands-off approach with their HHAP. Dutch citizens are taught to be self-reliant and independent, but when the government tries to enforce rules, Dutch citizens are resistant to policies that limit their freedom, as we saw with the protests to the curfew during the COVID-19 pandemic. Due to the political culture, sermons are the most suitable and possible policy instrument is sermons. The different policy mixes show how each HHAP is crafted reflecting the countries health care systems, governance system, and political culture.

To answer my third sub-question of lessons that can be drawn and learned from the analysis about other European heat plans and EU heat policy generally there is not a one size fits all solution due to member states have different definitions and roles. The EU's role stays limited due to the boundaries set by the EU mandates because while HHAPs are classified as climate adaptation plans but they are also classified as health plans, thus limiting the intervention the EU can have on member states. The EU's mandate does not allow it to be involved in a member states public health system. As a result, the WHO has played a key role

in creating the framework of HHAPs for the EU. So far, EU's largest role is to invest in research, encourage the production of knowledge and keep databases of case studies and research on how climate change impacts health i.e., by setting up the European Climate and Health Observatory. The EU can also supply help when member states request help if a heatwave by calling on HERA. The COVID-19 pandemic has brought new demand for the EU to supply more support for member states in events related to health. The EU's response to heatwaves should receive help from this.

Finally, this study contributes to the most recent EU climate adaptation strategy by studying a knowledge gap the EU has found of how climate change effects health. It also points to the need for the EU's increased for heatwaves as heatwaves are expected to worsen as the temperatures increase. The economic, social, and health effects from heatwaves will have severe consequences if member states within the EU do not take steps towards creating policies to mitigate the effects of heatwaves.

Appendix

Appendix 1
GGD Guidelines Recommendations

- Below is the table adapted on what these info measures are that those who are communicating information about heatwaves should encourage citizens to take when sending out information measures during the vigilance phase (before and after summer) from 53-56:
  1. A cool and fresh home

     Cooling inside
  - Blinds work correctly, it is preferred there is a drop-down screen.
  - Buy and use an air conditioner that pays attention to heat production and energy consumption. The filter needs to be cleaned regularly to prevent mould growth.
  - Consider a fan.
  - Consider buying a thermal storage unit

    Location bedroom
  - Bedroom faces north.

    Ventilating and airing
  - Have continuous ventilation, 24 hours a day, by keeping ventilation system open, leaving windows open, or using a mechanical ventilation system.
  - Clean ventilation grills and ducts regularly.
  - Do not turn off mechanical ventilation.

    Housing
  - Roof should be insulated.
  - Consider a 'green' roof or a thatched roof. Know before installing the roof if the fire insurance policy needs to be amended.
  - Paint a flat roof white.
  - Use natural building materials.

    Planting in garden or balcony
  - Limit the exposure of direct sunlight in your home by planting plants outside.
  - When planting on the balcony or gallery, consider how much weight the structure can manage.
  2. Cool place outside the house

     At the house
  - Create cool, shady spots with plants and/or water on the balcony or in the garden.
  - Use sunscreen

  In the area
  - Know where the cool spots are in the neighbourhood with plants or water features, swimming pool, or nature reserve.
  - Know cool living areas such as an activity centre or library.
  3. Personal care

     Fluid intake
  - 'Ensure good moisture status prior to a warm period" (54).

Physical conditions

- Be in good physical condition.
- Increase adaptability through physical exercise before a period of extended heat.

4. Medical risks

Chronic Disease

- Supply proper treatment.
- Make sure there is a social network by taking part in activities and keep in contact with family, friends, and neighbours.
- Have a list of contacts for emergencies

- Info measures are that the municipalities should encourage citizens to take when sending out information measures during the warning phase (during a warm spell):

1. A cool and fresh home

Cooling

- Use blinds from sunrise to sunset, even before the sun rises
- Use a fan or air conditioner while still considering the heat and energy consumption
- If you have a flat roof, consider using a water sprinkler

Location bedroom

- Sleep in a bedroom that faces the north
- Sleep in another area if the bedroom is too hot.

Ventilating and airing

- Have continuous ventilation, 24 hours a day by keeping ventilation grilles open, leave windows slightly open or use mechanical ventilation.
- Air the house by opening the windows and doors when it is cooler outside than inside (early morning). Make sure burglar alarms are functioning when doing this.
- Keep mechanical ventilation on turn it to the highest setting if it cooler inside than outside.
- Have airflow through the house with the windows and doors facing each other.

Electrical devices

- Minimize the use of lamps and heat-generating devices. Completely unplug electrical devices when possible.

2. Cool place outside the house

At the house

- In the shade outside or near water can be cooler than inside
- Use an umbrella.

In the area

- Find a cool place in shade of trees or near water such as a lake, pond, or swimming pool.
- If the home cannot be properly cooled and ideally you should stay inside, find a cooled public building such as a mall, activity centre, grocery store, or library.

3. Personal care

Fluid intake

- Fluid intake based on how much urine you produce and the colour or the frequency of toilet visits.
- Limit use of alcohol.

- Caffeinated drinks are okay for use, there is no evidence that there are negative effects of it against heat (57). It is recommended to take no more than 400 mg (58).
- Drink enough water, (at least 2 litres per a day, but it also depends on the person) athletes should also increase salt intake (56). For athletes it is recommended of 500 ml of fluid per an hour with 0.25 g of salt when exercising in hot weather (58).

Physical condition

- Exercise in the morning when it is cooler, before 6am or in the evening after 6pm.

Clothing

- Wear loose, light breathable clothing
- Wear a hat, ideally white with ventilation

Cooling

- Take a lukewarm shower or wash self only with lukewarm water.

4. Medical risks

Chronic diseases

- Get advice from your doctors about symptoms of the condition that need medical attention in hot weather.
- Have a cell phone with data and a fully charged battery with an up-to-date list of important contacts
- Keep in contact with neighbours, family, and/or friends for help.

Medication use

- Keep medication at the prescribed temperature in a locked cabinet at room temperature or the refrigerator. Contact the pharmacy if you have any questions on shelf life.
- Discuss with your doctor about adjusting your medication.

- Additionally, there is other individual advice for at risk groups including elderly (75+), young children (0-2 years), residents (inner) urban areas, residents social housing, social risk groups: social isolation, out-of-home placement, homeless, and visitors of events (61).
- "Intermediary organisations and individuals can be used to supply advice and information. […] The use of intermediary organisations and persons who have regular contact with persons from risk groups has the advantage of repetition, updating and tailor-made advice. In addition, there is an opportunity for the person in question to ask questions and receive feedback" (51).
- "The communication medium depends on the intermediary: brochures, posters, or pamphlets are suitable for public locations such as a shop, school or library. The use pf social media offers a range of possibilities for communication. Among older people, the use of social media is more limited than among young people" (53).
- "In general, personally transmitted information sticks better than anonymous, written information such as a website or brochure. The effectiveness pf press releases depend on the range and the medium used. Radio or television coverage will be more effective than newspaper coverage but reaches a smaller audience. In the newspaper the position is important: on the front page will be more effective than in the municipal reports" (53).
- "Cooling measures can be taken in advance of the summer period, both in the home and in the urban environment" (3).

- Homes should include proper shade, roof insulation, thermal storage, fans, and air conditioners (3)
- Urban planning suggestions to prevent heat islands for municipalities include:
    - Planting trees, shrubbery, water features, and creating ponds (5)
    - "A street plan that allows the wind to spread freely throughout the city" (3)
    - Making sure enough water is available for residents to drink and cool off with (5).
    - Tall buildings have a negative impact on heatwaves as by building them close together contribute to the creation of heat islands (26)
    - "In urban planning, the street plan and natural elements can contribute to limiting urban heat islands" (26).
    - "Natural vegetation and surface water within the city contribute to cooling by shading and evaporation respectively" (26).
    - "Roofs and pavements contribute to the formation of heat islands through the degree of heat absorption and sunlight reflection of the material used. The common building materials (bitumen, concrete, wood, stone, asphalt, glass) absorb approximately 90 percent of heat. The large surface area of such material allows cities to store up to twice as much heat compared to non-urban areas (26 citing Chirsten and Vogt, 2004).
    - Architectural features and people who live in the home contribute to the amount of heat indoors because indoor temperature can exceed outdoor temperature. (27).
    - Important to limit solar radiation. This can be done by insolation with larger window area and south facing windows (27).
    - Shade from surrounding buildings, vegetation or sun blinds can limit solar radiation (27).
    - "Residents can take heat stress into account when designing their homes. Sleeping rooms under inadequately insulated roofs lead to increased heat load at night" (27).
    - Recommends use of fans or air conditioning to reduce heat loads (27).
    - Using blinds starting before the sun is up can help the rooms stay cool throughout the day (27).
    - Limit the use of electronics, lamps, electrical appliances, and gas stoves because they can contribute to the heat (27).
    - "Many institutional buildings were not built with warm weather in mind. Cooling often inadequate and air conditioning is also not a standard use. This can chase temperatures to rise inside and pose a health risk, particularly to the vulnerable groups of residents" (45)
- For citizens
    - Drink enough water on warm days (3)
    - Good ventilation in the home and awareness to where cooling facilities can be accessed (3)
    - Ensure enough cooling by ventilating well and using cooling measures adequately (5).
- "Persistent heat can lead to inconvenience and (mild and severe) health effects" (12).
- "Hot weather can have health effects even without extremely hot temperatures, particularly among the elderly and people with chronic conditions" (12).

- "Heat-related health effects can be limited by reducing exposure to heat, by actions which limit the consequences of exposure, and by recognising possible health effects at an early stage and thereby preventing aggravation" (12)
- The report includes a section on climate scenarios that show citizens how the average amount of tropical and summery days affects the Netherlands from 1981-2010 (20)
- Risk groups (vulnerable populations) are labelled and defined more in depth (GGD guidelines) than the National Heat Plan. See figure here for the comparison
- "Advice on measures for people living in or staying at care institutions (nursing homes, prisons, hospitals, etc.) is the responsibility of the institutions concerned, which are advised on this by their own umbrella organisation" (50).
- "The Public Health Service can opt for close cooperation with intermediary organisations such as health care institutions. To do so, the GGD will need to have an idea of the effectiveness of such an approach in its own region" (50).

Appendix 2
Desk Review Questions

1. How do the NHHAPs define a heatwave?

2. What are the criteria to activate the NHHAP?

3. What institution is responsible for determining the HHAP needs to be activated?

4. What are the roles and responsibilities of each actor mentioned in the HHAP?

5. What groups are considered vulnerable populations?

6. What are the different response systems put in place?

7. What strategies are recommended for indoor heat exposure to reduce indoor heat stress?

8. What are the strategies recommended for outdoor heat exposure?

9. Who was the institution responsible for approving the current plan?

10. What is communicated, to whom and when?

11. What are the different languages that the communication is done in?

12. What is the preparation done each year before the summer?

13. To what extent does the implementation differ from the NHHAPs?

14. How many times has the HHAP been updated? When?

15. What were the original factors that led to the creation of their original HHAP?

16. Are there any WHO or EU regulations that prompted the creation of the NHHAPs?

Appendix 3
Interview Guide

Interview questions for ECHO2 Sante France

What are the different languages that information about heat exposure is communicated in?

What were the original factors that led to the creation of the national heat-health action plan?

Was there any political context, organizational learning, or public pressure for the government to act and create climate adaptation strategies such as the heat-health action plan?

How is the information about a possible prolonged heat exposure or heatwaves communicated to people especially vulnerable people who have limited access to technology? What about hard of hearing or people with limited to no vision?

At this time what do you think is the biggest weakness or what part of the HHAP do you think needs to be improved?

In all the NHHAP I examined, I noticed people with disabilities were not labeled as vulnerable populations or it is not as clear as it should be if it is mentioned, can you tell me the reason for this? Can the heat warning system be activated at anytime during the year or only during a certain time period? Is there a pre-warning stage such as a time period where the involved institutions prepare for possible heatwaves before the summer starts?

What templates or guidelines were used when creating the heat-health action plans?

Why was it decided that the Ministry of Health would be responsible for deciding if the National Heatwave Plan would be need to be activated?

What has been improved from the heatwave plan from the evaluations that have occurred after each heatwave?

The heatwave plan has a very extensive and detail strategy to communicate heatwaves to the general public. How effective has this communication strategy been?

Why was it decided to add people with disabilities to vulnerable populations?

What extra assistance do vulnerable populations receive during times of excessive heat?

Interview questions for DELTA1 European Environmental Agency (EEA)

Was the WHO framework on heat-health action plans or any other policy framework from the European Commission or other institutions within the European Union used to craft the current NHHAP?

If no, where did ideas come from?

And how did you decide on the institutional setup/responsibilities?

What was the reasoning to add disabilities to the list of vulnerable people?

How is the information about a possible prolonged heat exposure or heatwaves communicated to people especially vulnerable people who have limited access to technology? What about hard of hearing or people with limited to no vision?

What are the different languages that information about heat exposure is communicated in?

Questions on effectiveness of the heatplan:

I read in a news article the mortality rate in France has decreased by 600% since the 2003 heatwave. What do you believe is the reason for this? [then if she doesn't mention it herself, prompt by saying 'How has preventative communication helped France fight heatwaves?']

Then deepen this question by asking:

How has the cooperation of the media helped decreases France's mortality rate?

Is it required for the media to send out material provided by your organization? (this is the same as this one: In general, is the media required to cooperate as part of the Heatwave plan?, so I would not use the second one).

Then you could deepen the answer by asking:

What effect does the press release have when it is sent out at the start of the seasonal watch?

Then turn to another actor:

What is the role of municipalities in the National Heatwave Plan?

Are they involved in any of the communication at the national level?

Are they required to have a local heatwave plan?

What long-term planning such as urban planning or infrastructure if any [i.e. disregarding of whether there are heat plans or not] has been done to mitigate or lessen the negative effects of heatwaves?

Finally:

At this time what do you think is the biggest weakness or what part of the HHAP do you think needs to be improved?

Interview questions for DELTA2 European Observatory Climate and Health (EOCH)

1. What was the reason to create the new Health and Climate Observatory?

2. What is the difference between the Health and Climate Observatory and Climate-ADAPT?

3. What regulations are there currently for climate adaption that EU states are required to follow?

4. What about regulations regarding heat-health action plans?

5. Does the observatory 'only' collect data and resources and or /to what extent do they have any influence on the governance of heat adaptation, if any?

6. What is the role of the EU institutions more broadly when it comes to heatwaves? Why has it not been more involved in the framework of HHAPs? Why has the WHO played a more important role even though the EU institutions have the capacity to do so? Or don't they have the capacity?

7. Is the private sector involved in climate adaptation plans or how can they be more involved?

8. In a previous interview, they said funding has been recently cut for climate change due to financial restructuring within the EU? How does that impact heat health policy?

9. Why do you think heat plans are not more localized? Is there a lack of willingness to take ownership at the local level? Is there a lack of knowledge about the consequences of heatwaves?

10. What have you seen done within the EU to educate the vulnerable populations that they are vulnerable? Is there more that can be done?

11. What new research questions would you have for us on the governance aspects?

Interview questions for DELTA3 SCORCH Project and GGD Midden

1. What inspired the SCORCH project? What was the motivation to do this qualitative analysis of HHAPs? Why was it necessary?

2. What policy instruments used did you see throughout the HHAPs? [need to explain the main types briefly first]

3. What plans stood out to you during the analysis of the HHAPs? [I think this is too vague – stood out in what sense? Maybe better to remove?]

4. What key components of the Netherlands heatwave plan stood out?

5. What key components of France's heatwave plan stood out?

6. How can institutional history and setup, as well as political culture explain the choice of these mixes? (focus only on NL and France for now)

7. Are the plans mostly communication-based plans? [as opposed to? Otherwise remove]

8. How is the private sector involved in the HHAPs or is there a lack of involvement? [in their article, they also mean by 'private' the civil society sector I think, but also trade unions]

9. Are the plans localized? Could they be more localized to include those stakeholders?

Or perhaps replace this with: Are local heat plans needed in all countries to effectively implement the national heat plans, or would a stronger national heat plan also be sufficient?

10. What do you think can be improved overall from the HHAPs? [I think this is said quite well in their article, so no need to repeat it here?, or we could cite from their article and ask if he wants to add anything or which of the recommendations is the most important; some stakeholders are missing (schools, trade unions, sports clubs) local stakeholders not aware of their roles in the NHHAP, not enough detailed roles, no legal enforcement, lack of coordination at the local level]

Some questions on the Working Group on Health in Climate Change (HIC) of the Environment and Health Process (EHP) in Europe:

11. This is set up by the WHO, correct? Why and when? (2012?)

12. To what extent is the EU involved here?

13. Is the cross-country learning happening here that you mentioned in the article?

Questions on EU regulation/role

14. Are there any EU policies that address the heat-health issue, next to the HHAPs?

15. Question about EU Regulation 2021/1119 of the European Parliament and of the Council dated 30 June 2021, establishing the framework for achieving climate neutrality ('European Climate Law'). Its fifth preamble emphasizes the need to address the growing climate-related risks to health, including more frequent and intense heatwaves.

Is this also going to include the NHHAPs?

16. And why is it not possible to have stronger EU-wide regulation? Or would it not be desirable anyway as the contexts are so different?

17. And what is the role of the new European climate and health observatory launched by the Commission under the European Climate Adaptation Platform Climate-ADAPT?

18. More broadly, what is the role of EU institutions in coordinating national efforts in the EU member states on the HHAPs?

As a senior researcher at The Hague University of Applied Sciences, I'm also looking for new research questions to be addressed in future grant applications and looking for potential partners.

19. I appreciated your RQs for future research in the article – role of power and authority, relations/collaborations change over time, drivers/barriers of collaboration. And which resources are necessary.

20. Question around municipal level not considered in NHHAPs? And top-down manner of assigning roles.

21. Mitigation, preparedness and evaluation under addressed as focus in HHAPs is on response.

22. You say that there is a debate among scholars and policy-makers about the best approach to NHHAPs – what are the key issues here? Is this about the EuroHEAT project framework or another one?

23. Questions around Cross-country structural collaboration?

Interview questions for DELTA4 University of Leuven (at the time SCORCH project)

1. What heatwave plans were you involved analyzing or interviewing during SCORCH project?

2. Which heatwave plan was your favorite? Why?

Now shifting to France:

3. What key components of France's heatwave plan stood out?

4. Are local heat plans needed in France to effectively implement the national heat plans, or would a stronger national heat plan also be sufficient?

5. Are the regions in support of the heatwave plan? Have you seen any resistance towards the plan from local governments or citizens?

6. Are regions willing to take responsibility to implement the plan?

7. Does France have fines or sanctions in place if people don't follow the rules? What about the regions? They are required by law to have their own heatwave plans.

8. What policy instruments used did you see in France's heatwave plan? [need to explain the main types briefly first]

9. How can institutional history and setup, as well as political culture explain the choice of these mixes for France?

10. What effects do you think the 2003 heatwave has had on France? Would you say the citizens are more cautious, aware or educated on heatwaves because of 2003?

11. How is the private sector involved in the HHAPs (then prompt if needed: or is there a lack of involvement?) [in their article, they also mean by 'private' the civil society sector I think, but also trade unions]

12. How does France look out for the people who are vulnerable during a heatwave? Are municipalities required to contact them?

13. Why does France discourage the use of air conditioning during a heatwave? I am aware they have been trying to use more public areas for cooling places, but there have been some obstacles.

14. What do you think can be improved overall from the HHAPs? [I think this is said quite well in their article, so no need to repeat it here?, or we could cite from their article and ask if he wants to add anything or which of the recommendations is the most important; some stakeholders are missing (schools, trade unions, sports clubs) local

stakeholders not aware of their roles in the NHHAP, not enough detailed roles, no legal enforcement, lack of coordination at the local level]

References

About Climate-ADAPT. Available at: https://climate-adapt.eea.europa.eu/about [Accessed 11 November 2021].

Allen, M.R., Dube, O.P., Solecki, W., Aragón-Durand, F. et al., 2018. Framing and Context. In: Anonymous Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable de-velopment, and efforts to eradicate poverty. The Intergovernmental Panel on Climate Change (IPCC). pp.49-91.

Ambler, J. 1975. Trust in Political and Nonpolitical Authorities in France. *Comparative Politics,* 8(1), pp.31-58. 10.2307/421452 Available at: https://www.jstor.org/stable/421452 .

Añel, J., Fernández-González, M., Labandeira, X., López-Otero, X. et al., 2017. Impact of Cold Waves and Heat Waves on the Energy Production Sector. *Atmosphere,* 8(12), pp.209. 10.3390/atmos8110209 Available at: https://explore.openaire.eu/search/publication?articleId=dedup_wf_001::cd6a089057dfd6cad3fbdf371cc690c8 .

Bador, M., Terray, L., Boé, J., Somot, S. et al., 2016. Future summer mega-heatwave and record-breaking temperatures in a warmer France climate. *Environmental Research Letters,* 12(7), pp.74025. 10.1088/1748-9326/aa751c Available at: https://iopscience.iop.org/article/10.1088/1748-9326/aa751c .

Bemelmans-Videc, M., Rist, R.C. and Vedung, E.O., 1998. Carrots, sticks & sermons. New Brunswick [u.a.]: Transactions Publ. 10.4324/9781315081748 Available at: http://bvbr.bib-bvb.de:8991/F?func=service&doc_library=BVB01&local_base=BVB01&doc_number=008120861&sequence=000001&line_number=0001&func_code=DB_RECORDS&service_type=MEDIA .

Bezes, P. and Parrado, S., 2013a. Trajectories of Administrative Reform: Institutions, Timing and Choices in France and Spain. *West European Politics,* 3610.1080/01402382.2013.742735 .

Bezes, P. and Parrado, S., 2013b. Trajectories of Administrative Reform: Institutions, Timing and Choices in France and Spain. *Null,* 36(1), pp.22-50. 10.1080/01402382.2013.742735 Available at: https://doi.org/10.1080/01402382.2013.742735 .

Brackett, R. 2019. Summer Heat Waves Kill 1,500 People in France. The Weather Channel : the Improbable Rise of a Media Phenomenon, Available at: https://weather.com/news/news/2019-09-08-summer-heat-waves-kill-1500-people-in-france [Accessed 16 July 2021].

Brinkmann, S. 2013. Qualitative interviewing. Oxford University Press. 10.1093/acprof:osobl/9780199861392.001.0001 Available at: https://oxford.universitypressscholarship.com/view/10.1093/acprof:osobl/9780199861392.001.0001/acprof-9780199861392 .

Caisse nationale des Allocations familiales, (CNAF). Caisses d'Allocations Familiales. Available at: http://www.caf.fr/ [Accessed 18 November 2021].

Catterberg, G. and Moreno, A., 2005. The Individual Bases of Political Trust: Trends in New and Established Democracies. *International Journal of Public Opinion Research,* 18(1), pp.31-48. 10.1093/ijpor/edh081 Available at: https://doi.org/10.1093/ijpor/edh081 [Accessed 3 March 2022].

CBS. 2021. Deaths registered weekly, by sex and age. Available at: https://www.cbs.nl/en-gb/figures/detail/70895eng [Accessed 30 December].

Çelik, G. 2013. Breakpoint or Binder: Religious Engagement in Dutch Civil Society. *Journal of Civil Society,* 9(3), pp.248-267. 10.1080/17448689.2013.813733 Available at: https://www.tandfonline.com/doi/abs/10.1080/17448689.2013.813733 .

Cole, A. 2011. Prefects in Search of a Role in a Europeanised France. *Journal of Public Policy,* 31(3), pp.385-407. 10.1017/S0143814X11000122 Available at: https://dx.doi.org/10.1017/S0143814X11000122 .

Cole, A., Fox, S., Pasquier, R. and Stafford, I., 2018. Political trust in France's multi-level government. *Journal of Trust Research,* 8(1), pp.45-67. 10.1080/21515581.2018.1457534 Available at: https://www.tandfonline.com/doi/abs/10.1080/21515581.2018.1457534 .

Commission, E., Joint, R.C., Feyen, L., Gosling, S. et al., 2020. Climate change impacts and adaptation in Europe : JRC PESETA IV final report. Publications Office. /10.2760/171121 .

Costello, A., Abbas, M., Allen, A., Ball, S. et al., 2009. Managing the health effects of climate change: lancet and University College London Institute for Global Health Commission. *The Lancet,* 373(9676), pp.1693-1733.

CRED. 2020. . Natural Disasters 2019. Available at: https://emdat.be/ sites/default/files/adsr_2019.pdf .

de Bono, A., Peduzzi, P., Kluser, S. and Giuliani, G., 2004. Impacts of Summer 2003 Heat Wave in Europe. United Nations Environment Programme. Available at: https://explore.openaire.eu/search/publication?articleId=od_____1400::1eaefef927cc44206574065dcd5bab49 [Accessed 24 September 2021].

de Graaff-Kamphof, I. The Netherland's experience with decentralisation. Department of Governance and Finance Ministry of Interior affairs and Kingdom Relations. Available at: https://www.oecd.org/regional/regional-policy/Netherlands-experience.pdf [Accessed 27 February 2022].

de Meer, G., Aarts, F., van den Broek, I., van Bruggen, M. et al., 2012. Environmental health guidelines for Municipal Public Health Services:
Warm weather and health risks . 'Rijksinstituut voor Volksgezondheid en Milieu (RIVM). [Accessed 1 December 2021].

EU Commission. 2021. Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change', COMMUNICATION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:82:FIN .

European Commission. Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community, (2007/C 306/01). Official Journal of the European Union. Available at: https://www.refworld.org/docid/476258d32.html

European Commission. Treaty of Amsterdam amending the Treaty on European Union, the Treaties establishing the European Communities and certain related acts. Luxembourg: Office for Official Publications of the European Communities. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:11997D/TXT&from=EN .

European Commission. Treaty on European Union. Luxembourg: Office for Official Publications of the European Communities.

European Committee of the Regions. France . Available at: https://portal.cor.europa.eu/divisionpowers/Pages/France-Introduction.aspx [Accessed 1 December 2021].

European Environment and Health Task Force. Available at: https://www.euro.who.int/en/health-topics/environment-and-health/pages/european-environment-and-health-process-ehp/governance/european-environment-and-health-task-force [Accessed 11 November 2021].

Evin, C.M. and Aubert, M.F., 2004. Rapport de la Commission d'Enquête de l'Assemblée Nationale sur les
conséquences sanitaires et sociales de la canicule. Le drame de la canicule: une gestion déficiente
révélatrice d'une crise structurelle.

Faguet, J. and Sanchez, F., 2014. Decentralization and access to social services in Colombia. *Public Choice,* 160(1/2), pp.227-249. 10.1007/s11127-013-0077-7 Available at: https://www.jstor.org/stable/24507645 .

Feyen, L., Formetta, G., Ibarreta, D., Forzieri, G. et al., 2020. Global warming and human impacts of heat and cold extremes in the EU. 29959Available at: https://op.europa.eu/publication/manifestation_identifier/PUB_KJNA29959ENN .

Ford, P. 2019. Heat waves: How France has cut death toll 90% since 2003. The Christian Science monitor, Available at: https://www.csmonitor.com/World/Europe/2019/1104/Heat-waves-How-France-has-cut-death-toll-90-since-2003 [Accessed Nov 30, 2021].

Fouillet, A., Rey, G., Laurent, F., Pavillon, G. et al., 2006. Excess mortality related to the August 2003 heat wave in France. *International Archives of Occupational and Environmental*

Health, 80(1), pp.16-24. 10.1007/s00420-006-0089-4 Available at: https://www.ncbi.nlm.nih.gov/pubmed/16523319 .

Fouillet, A., Rey, G., Wagner, V., Laaidi, K. et al., 2008. Has the impact of heat waves on mortality changed in France since the European heat wave of summer 2003? A study of the 2006 heat wave. *International Journal of Epidemiology,* 37(2), pp.309-317. 10.1093/ije/dym253 Available at: https://api.istex.fr/ark:/67375/HXZ-67NZ8V5N-T/fulltext.pdf .

García-León, D., Casanueva, A., Standardi, G., Burgstall, A. et al., 2021. Current and projected regional economic impacts of heatwaves in Europe. *Nature Communications,* 12(1), pp.5807. 10.1038/s41467-021-26050-z Available at: https://search.proquest.com/docview/2578915484 .

Gerretsen, I. and Yeung, J., 2019. Europe's heat wave is shattering temperature records and cities are struggling to cope. Cable News Network, Available at: https://www.cnn.com/2019/07/25/europe/europe-heat-wave-records-intl/index.html [Accessed 26 December 2021].

Government of the Netherlands. 2021. Applying for rent benefit - Housing - Government.nl. Available at: https://www.government.nl/topics/housing/rented-housing/applying-for-rent-benefit [Accessed 18 November 2021].

Government of the Netherlands. 2017. Central government promotes energy savings - Renewable energy - Government.nl. Available at: https://www.government.nl/topics/renewable-energy/central-government-promotes-energy-savings [Accessed 29 November 2021].

Government of the Netherlands. Decentralisation of government tasks. [Accessed 1 December].

Hagens, W.I. and van Burggen, M., 2014. National Heat Plan. 'Rijksinstituut voor Volksgezondheid en Milieu (RIVM). [Accessed 1 June 2021].

Hellemans, S. 2020. Pillarization ('Verzuiling'). On Organized 'Self-Contained Worlds' in the Modern World. *The American Sociologist,* 51(2), pp.124-147. 10.1007/s12108-020-09449-x Available at: https://link.springer.com/article/10.1007/s12108-020-09449-x [Accessed 30 December 2021].

Hendriks, F. 2017. Polder Politics : the Re-Invention of Consensus Democracy in the Netherlands. Milton: Taylor and Francis.

Hill, A.C., Babin, M. and Baumgartner, S., 2021. A World Overheating. Available at: https://www.cfr.org/article/climate-change-world-overheating-how-countries-adapt-extreme-temperature .

Howlett, M. 1991. Policy Instruments, Policy Styles, and Policy Implementation: National Approaches to Theories of Instrument Choice. *Policy Studies Journal,* 19(2), pp.1-21. 10.1111/j.1541-0072.1991.tb01878.x Available at: https://search.proquest.com/docview/1300125590 .

Hunt, L. 1989. The Language of Politics and Political Culture in France, England, the USA, and the Dutch Republic. *Bijdragen En Mededelingen Betreffende De Geschiedenis Der Nederlanden,* 104(4), pp.610-622. Available at: https://search.proquest.com/docview/1309256877 .

Hunt, L. 1989. The language of politics and political culture in France, England, the USA, and the Dutch Republic. *Bijdragen En Mededelingen Betreffende De Geschiedenis Der Nederlanden,* 104(4), pp.610-621. 10.18352/bmgn-lchr.3171 Available at: https://doaj.org/article/2ca1c445a90f43c5894a7349c377d4b2 .

Intergovernmental Panel on Climate Change. 2018. Global warming of 1.5°C : An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. Intergovernmental Panel on Climate Change. Available at: https://search.informit.org/documentSummary;res=APO;dn=195966 .

Krippendorff, K. 2019. Content analysis. Los Angeles: SAGE. Available at: http://bvbr.bib-bvb.de:8991/F?func=service&doc_library=BVB01&local_base=BVB01&doc_number=030520825&sequence=000002&line_number=0001&func_code=DB_RECORDS&service_type=MEDIA .

Marin, C., Hales, S., Matthies, F. and Graham, B., 2008. Heat-Health Action Plans. Geneva: WHO Regional Office for Europe. Available at: https://www.euro.who.int/en/publications/abstracts/heathealth-action-plans .

Martinez, G.S., Linares, C., Ayuso, A., Kendrovski, V. et al., 2019. Heat-health action plans in Europe: Challenges ahead and how to tackle them. *Environmental Research,* 176pp.108548. 10.1016/j.envres.2019.108548 Available at: https://dx.doi.org/10.1016/j.envres.2019.108548 .

Matthies, F., Bickler, G., Cardeñosa Marin, N., Hales, S. et al., 2008. Heat-health action plans: guidance. Denmark: WHO Regional Office for Europe. Available at: https://www.who.int/publications/i/item/9789289071918 [Accessed 23 September 2021].

OECD. 2018. Climate-resilient infrastructure. https://doi.org/https://doi.org/10.1787/4fdf9eaf-en Available at: https://www.oecd-ilibrary.org/content/paper/4fdf9eaf-en .

Ogg, J. Heatwave: implications of the 2003 French heat wave for the social care of older people. Available at: https://youngfoundation.org/wp-content/uploads/2013/04/Heatwave-October-2005.pdf .

Pacheco-Vega, R. 2020. Environmental regulation, governance, and policy instruments, 20 years after the stick, carrot, and sermon typology. *Journal of Environmental Policy & Planning,* 22(5), pp.620-635. 10.1080/1523908X.2020.1792862 Available at: https://www.tandfonline.com/doi/abs/10.1080/1523908X.2020.1792862 .

Pascal, M., Laaidi, K., Ledrans, M., Baffert, E. et al., 2006. France's heat health watch warning system. *International Journal of Biometeorology,* 50(3), pp.144-153. 10.1007/s00484-005-0003-x Available at: https://www.ncbi.nlm.nih.gov/pubmed/16328399 .

Poell, T. 2007. The Democratic Paradox. Dutch Revolutionary Struggles over Democratisation and Centralisation (1780-1813). Utrecht University. Available at: https://www.narcis.nl/publication/RecordID/oai:dspace.library.uu.nl:1874%2F22668 .

Poumadère, M., Mays, C., Le Mer, S. and Blong, R., 2005. The 2003 Heat Wave in France: Dangerous Climate Change Here and Now. *Risk Analysis,* 25(6), pp.1483-1494. 10.1111/j.1539-6924.2005.00694.x .

Pye, L.W. 1972. Culture and political science. *Social Science Quarterly,* 53(2), pp.285-296. Available at: http://www.econis.eu/PPNSET?PPN=482391960 .

République Française. 2017. National Heatwave Plan. Available at: https://solidarites-sante.gouv.fr/IMG/pdf/pnc_actualise_2017.pdf .

Robine, J., Cheung, S.L.K., Le Roy, S., Van Oyen, H. et al., 2008. Death toll exceeded 70,000 in Europe during the summer of 2003. *Comptes Rendus. Biologies,* 331(2), pp.171-178. 10.1016/j.crvi.2007.12.001 Available at: https://dx.doi.org/10.1016/j.crvi.2007.12.001 .

Rooy, P.d. 2015. A tiny spot on the earth: the political culture of the Netherlands in the Nineteenth and Twentieth Century. Amsterdam University Press. 10.18352/bmgn-lchr.10235 Available at: http://portal.igpublish.com/iglibrary/search/AUPB0001200.html .

Salkind Neil, J. 2010. Encyclopedia of research design. Thousand Oaks, Calif.: Sage.

Sanchis, I.V., Franco, R.I., Zuriaga, P.S. and Fernández, P.M., 2020. Risk of increasing temperature due to climate change on operation of the Spanish rail network. *Transportation Research Procedia,* 45pp.5-12. https://doi.org/10.1016/j.trpro.2020.02.056 Available at: https://www.sciencedirect.com/science/article/pii/S235214652030106X .

Saraisky, N.G. 2015. Analyzing Public Discourse: Using Media Content Analysis to Understand the Policy Process. *Current Issues in Comparative Education,* 17(1), pp.26-41. Available at: https://www.tc.columbia.edu/cice/pdf/03_Green-Saraisky-CICE-18.pdf .

Stephenson, P. 2009. Hot Under the Collar: Lessons from the 2003 Heatwave in France and the Security Implications for Coping with Environmental Threats in the EU. *Journal of Contemporary European Research,* 5(2), pp.293-311. Available at: https://www.narcis.nl/publication/RecordID/oai:cris.maastrichtuniversity.nl:publications%2F12e70205-bbb5-4b73-ab8a-61eabc615351 .

Stromberg, R.N. 1988. The Philosophes and the French Revolution: Reflections on Some Recent Research. *The History Teacher (Long Beach, Calif.),* 21(3), pp.321-339. 10.2307/492999 Available at: https://www.jstor.org/stable/492999 .

Tanguy, G. 2020. French Prefects: Genesis and Institutionalization of a State 'Grand Corps' (Nineteenth–Twenty-First Centuries). Cham: Springer International Publishing. 10.1007/978-3-030-59396-4_2 Available at: http://link.springer.com/10.1007/978-3-030-59396-4_2 .

The Connexion. 2010. What exactly does a préfet do? English Language Media, Available at: https://www.connexionfrance.com/article/Archive/What-exactly-does-a-prefet-do [Accessed 28 March 2022].

The EuroHEAT project. Available at: https://www.euro.who.int/en/health-topics/environment-and-health/Climate-change/archive/the-euroheat-project [Accessed Oct 28].

Thomann, E. 2018. "Donate your organs, donate life!" Explicitness in policy instruments. *Policy Sciences,* 51(4), pp.433-456. 10.1007/s11077-018-9324-6 Available at: https://link.springer.com/article/10.1007/s11077-018-9324-6 .

Toonen, T.A.J. 2000. Governing a consensus democracy: The interplay of Pillarisation and administration. *West European Politics,* 23(3), pp.165-178. 10.1080/01402380008425389 Available at: https://www.tandfonline.com/doi/abs/10.1080/01402380008425389 .

Vajda, A., Tuomenvirta, H., Juga, I., Nurmi, P. et al., 2014. Severe weather affecting European transport systems: the identification, classification and frequencies of events. *Natural Hazards,* 72(1), pp.169-188.

van Nispen tot Pannerden, Frans K. M. 2011. Policy Instruments.

Van Nispen, F. 2011. Policy Instruments. *New England Journal of Medicine - N ENGL J MED,* .

Vanderplanken, K., Hazel, P.v.d., Marx, M., Shams, A.Z. et al., 2021. Governing heatwaves in Europe: comparing health policy and practices to better understand roles, responsibilities and collaboration. *Health Research Policy and Systems,* 19(1), pp.20. 10.1186/s12961-020-00645-2 Available at: https://doi.org/10.1186/s12961-020-00645-2 .

Vermeulen, W. 2015. Decentralization of social policy in the Netherlands. The Hague, Netherlands: CPB Netherlands Bureau for Economic Policy Analysis. Available at: https://www.cpb.nl/sites/default/files/publicaties/download/cpb-background-document-decentralization-social-policy-netherlands.pdf [Accessed 1 December 2021].

Walsh, D. 2021. 'Angry citizens who hate the system': Why the riots in the Netherlands go beyond a COVID curfew. Euronews, Available at: https://www.euronews.com/2021/01/27/angry-citizens-who-hate-the-system-why-the-riots-in-the-netherlands-go-beyond-a-covid-curf [Accessed Nov 11, 2021].

Watts, N., Amann, M., Arnell, N., Ayeb-Karlsson, S. et al., 2021. The 2020 report of The Lancet Countdown on health and climate change: responding to converging crises. *The Lancet (British Edition),* 397(10269), 10.1016/S0140-6736(20)32290-X Available at: https://dx.doi.org/10.1016/S0140-6736(20)32290-X .

WHO Regional Office for Europe. Climate Change: Data and statistics. Available at: https://www.euro.who.int/en/health-topics/environment-and-health/Climate-change/data-and-statistics [Accessed 27 May].

World Health Organization. 2018. Heat and Health. Available at: https://www.who.int/news-room/fact-sheets/detail/climate-change-heat-and-health [Accessed 30 December 2021].