THE EUROPEAN HEALTH MAP

A COMPARATIVE LITERATURE AND POLICY ANALYSIS ON THE DEFINITION OF HEALTH IN EUROPE TO REALIZE HEALTHY AND SUSTAINABLE DIETS

BILLY VAN ZOOMEREN

1047986

Wageningen University & Research (WUR)
Division of Human Nutrition and Health

Systems Approach for Sustainable and Healthy Diets (MNH-2020-SP-E)

March – December 2022

MSc *Nutrition and Health*

Supervisors: prof.dr.ir. P. (Pieter) van 't Veer
dr.ir. A. (Anneleen) Kuijsten

Chair group: Global Nutrition

PREFACE

Combining the two master programs *Nutrition and Health* (Wageningen University and Research) and *Philosophy: Bioethics & Health* (Vrije Universiteit Amsterdam), the concept of 'health' is a central theme in my academic career. It is even already present in both program titles, and although everybody knows what is generally meant with this concept, we all have a slightly different definition of it. To use the word 'healthy' is a common and persuasive linguistic construct to promote certain products, activities, choices, or policies, on both individual as well as the public and planetary levels. Even though there are sufficient and sound criticisms and alternatives in academic literature on the definition of health, it seems to me that we have become deaf to these criticism about what is *actually* meant with 'health'. The decennia-old definition stays in use, and its power is only reinforced in new policies and projects. During the writing processes of philosophical essays and nutrition-related papers and reports, I was taught to set boundaries to my research by relying on existing frameworks and definitions, that fit to the contextual time and place of the research question. This made me realize the importance of complete, and context-fitting definitions for drawing up effective policies on the global and national level. In light of our rapidly changing perspectives on planetary and human sustainability prospects, I want to investigate what definitions of health are steering the public and planetary health policies, how they relate to specific contexts and scientific domains, and moreover, to evaluate their effectiveness to the current needs and availabilities. As I started my academic career with the interdisciplinary bachelor program *Bèta-Gamma* (Universiteit van Amsterdam), and combined both alpha and beta programs in my masters, my skills and interests will come full circle with the interdisciplinary character and methodology of this thesis.

ABSTRACT

The most commonly used definition of health (DoH) is the one stated in 1948 by the World Health Organisation (WHO). It emphasizes that health is a state of *complete* physical, mental and social well-being. In current times of overshooting both planetary boundaries and social limits, the question arises whether this DoH is still fitting. Considering realizing healthy and sustainable diets (HSDs) as one of the keys for facing the 21st-century societal and planetary challenges, this report focused on the DoH in European policy aimed at realizing HSDs. The viability of the European DoH was evaluated in a comparative mixed-methods approach, combining a scientific literature review with qualitative and quantitative policy analyses on eight European high-income countries. A unique conceptualization was used of sustainability as being interrelated to human health, planetary health and the food system.

The analyses of European and national policy documents showed that the operationalized DoHs are not aligned with the 1948 WHO DoH. Vastly holistic definitions of sustainability as described in scientific literature are currently absent in European policy, leaving the DoHs not viable to effectively face the 21st-century challenges. Several science-policy gaps were found on different levels that substantiate this conclusion. The European DoH mainly focused on human health, prevention and treatment of diseases. HSDs were found to be promoted primarily to address these goals, instead of being a health goal on their own. The identified anthropocentric bias, with economic growth as the ultimate goal of health policies, unravels a lack of intrinsic value of sustainability in European health and sustainability policy. Moreover, the potential of the food system to benefit *both* human and planetary health is not acknowledged in national health policies.

In conclusion, the food systems perspective in policy can be the unifying concept to improve both human and planetary health status, in order to face the challenges of the 21st century. European policy could benefit from the implementation of a focus on resilience in policy, combined with acknowledging the interrelations between all concepts in the eye of sustainability. The insights provided in this report can be used for effective policy-making to improve health in the eye of sustainability, food systems thinking, and as policy guidance towards the realization of HSDs, especially in the European context. All in all, raising awareness in both science and European policy can contribute to increasing currently lacking coherence and creating more efficient policies in the realm of health and HSDs. Future research is advised to substantiate the outcomes of the different analyses by taking policy outcomes and policies on environmental sustainability into account, and to expand on diversity of analysed countries.

LIST OF ABBREVIATIONS

DoH	definition of health, focused on human health
EC	European Commission
ECDC	European Centre for Disease Prevention and Control
EEA	European Environment Agency
EFSA	European Food Safety Agency
EGD	European Green Deal
EMA	European Medical Agency
EU	European Union
F2F	Farm-to-Fork Strategy
FAO	Food and Agriculture Organisation
GDP	Gross Domestic Product, a measure of the value of the total production of goods and products within the borders of a country, often in a given year.
HiAP	Health in All Policies
HLPE	The High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security (UN body)
HSD	healthy and sustainable diet
NCD	non-communicable disease
OHJEP	One Health European Joint Program
PUAFH	the third Programme for the Union's Action in the field of Health
R&I	research and innovation
SDG	United Nations' Sustainable Development Goal
SDG3	Sustainable Development Goal 3: "Ensure healthy lives and promoting well-being for all at all ages"
SFS	Safe and Sustainable Food Systems [Partnership]
UN	United Nations
UNFSS	United Nations Food Systems Summit 2021
WHO	World Health Organisation

TABLE OF CONTENTS

INTRODUCTION

The most common interpretation of the concept of sustainability refers to environmental (or ecological) sustainability. However, taking into account the needs of the present and future generations addressed in the 1987 Brundtland definition (1), it becomes clear that the concept also encompasses health status, both planetary and human health. This link between planetary and human health has also been applied to the progress of the United Nations (UN) Sustainable Development Goals (SDGs, **Figure 1**) and sustainable development in general (2–7). The SDGs are designed to give direction to outcomes and indicators of policies related to human and planetary health on a global, European and national level. Since a multisectoral and interdisciplinary approach is identified as the way forward to tackle the global sustainability-related problems (8,9), a clear definition of health and insight in the context-specific application is necessary for effective policy-making. In the context of policies on sustainability, there are three established lenses that emphasize the complex interrelationship between human and planetary health and a call for action: the Doughnut Model (**Figure 2**), the Global Syndemic and the Food Systems Approach. These three lenses can be used as hallmarks in research to face the challenges of the 21st century on different levels, and here they are applied to the European context. Considering realizing healthy and sustainable diets (HSDs) as one of the keys to make necessary changes, this report focuses on the European definition of health in that trajectory. By giving insight in the current definition of health in both scientific, as well as European policies, this report contributes to sharpening actions towards creating effective policies to face today's societal and planetary challenges.

Figure 1. The 17 United Nations (UN) Sustainable Development Goals (SDGs) (74). *SDGs 2, 3, 12 and 13 are important for realizing HSDs, while SDGs 8, 9, 10, and 17 are addressed in realizing sustainable food systems.*

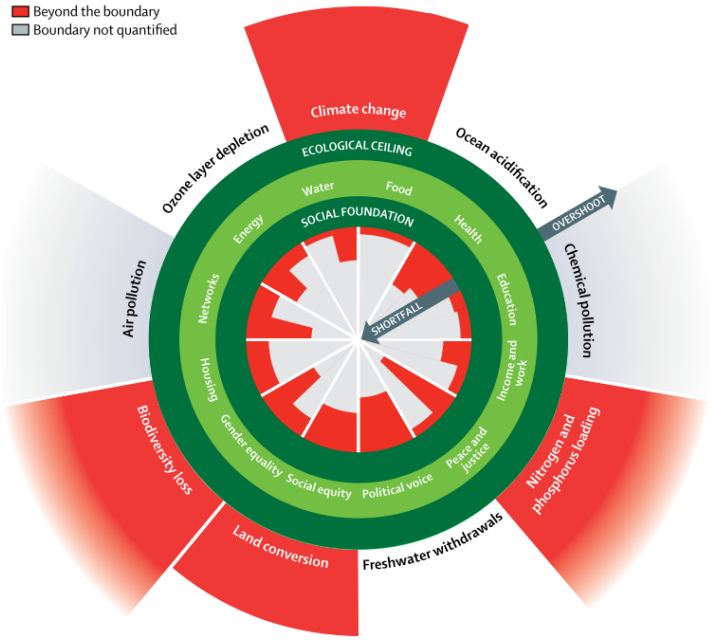


Figure 2. The Doughnut Model: shortfalls and overshoot. *Dark green circles show the social foundation and ecological ceiling, encompassing a safe and just space for humanity. Red wedges show shortfalls in the social foundation or overshoot of the ecological ceiling. The extent of pressure on planetary boundaries that are not currently being overshot is not shown here* (49).

Definitions of human health

Next to this holistic approach of addressing the interrelatedness between the different aspects of sustainability, an important part of sustainable development focus on improving human health. Especially SDG Goal 3: "Ensure healthy lives and promote well-being for all at all ages", which explicitly focuses on human health. Since almost

no country is currently on track to meet these goals by 2030, which is expected to have negative effects on national economies (10), action in the field of human health is necessary. Yet there have been many attempts in scientific and non-scientific literature to grasp the concept of health and to specify or operationalize it in different ways (5,11–37). These attempts vary from being reductionistic or monistic – aiming at a one-size-fits-all definition – to having a holistic or pluralistic approach – leaving space for contextual adjustments and interpretations. Nevertheless, almost all of them call on global or large-scale action to improve health status. The definition of health as stated in the Constitution of the World Health Organisation (WHO) emphasizes that health is (much) more than the absence of disease:

> *"Health is a state of* ***complete physical, mental and social well-being, and not merely the absence of disease or infirmity****. The enjoyment of the* ***highest attainable standard of health*** *is one of the* ***fundamental rights*** *of every human being without distinction of race, religion, political belief, economic or social condition."* (38)

This generic positive definition removes the conceptual dualism "health-disease", which was the main interpretation in the first half of the 20th century, and brings the concept closer to individual wellbeing that is partly separate from state intervention (21,39). Although this definition has received a lot of critique, it has not been changed since its adoption in 1948, and it has shaped many policies, programs and research until now. The question remains whether this conceptualization is still fitting as basis in modern times, regarding sustainable development in acute necessities.

Health status and diets

Moreover, it is known that unhealthy lifestyles or diets are related to or causing diseases and decreased health status (2,40,41). The dietary patterns from the current food systems are identified as unsustainable (42) considering the impact on human life expectancy: 26% of all avoidable adult deaths in 2018 have been attributed to poor diets, of which two-thirds were due to risks related to dietary composition and one-third to risks related to total energy intake and body weight (43). Therefore, a swift transition towards healthy diets for both human and planet is necessary, either defined as healthy diets from a sustainable food system (40), or as sustainable (and) healthy diets (5,44–46). Taking a HSDs perspective can thus be used as a starting point in the food systems transformation towards making sustainable, safe and healthy diets available, accessible, affordable and desirable for all (47).

Improving 'health' is a global and national goal in the realization and implementation of HSDs. National (public) health status and its drivers have a complex interrelation with the global and local food system, which thereby affect the global sustainability status and the possibility of achieving the SDGs. Environmental health is increasingly threatening and influencing human health under the current influence of climate change, irresponsible use of resources and overconsumption. This picture becomes even more complex: as human and planetary health are interrelated, we need to act synergistically to create a sustainable situation for current and future generations. However, what is meant specifically with this cornerstone concept of 'health' differs between disciplines, policy levels, domains, or contexts, while integrated approaches are available as well. Furthermore, while definitions and conceptualizations have a large impact on the outcomes and designs of policies, conventional conceptualizations in medicine and public health tend to overlook the social, political and ecological effects (48). To enable the transition towards HSDs, there is a need for insight and appropriate definitions, for example of 'health' (33,34,45) towards realizing a sustainable future for food systems and diets.

Three lenses towards HSDs

With the former in mind, three lenses can be used to outline the interrelationships between important concepts in realizing HSDs in Europe. The first lens is the Doughnut Model for human wellbeing by Kate Raworth (**Figure 2**), which shows the integrated vision of how human activity currently is overshooting the ecological ceiling, while falling short on the social foundation (49). Based on the SDGs, this economic model shows the dependence of human wellbeing on planetary health, reflects underlying inequalities within and between countries, and stresses the need of a transformation in economic theory and policymaking, in order to centre 'balance' and 'thriving' instead of 'growth' of gross domestic product (GDP). The message is clear: both planetary and social limits are reached, and we need to act now in a holistic manner, in order to realize acting within the safe and just space for humanity.

The second lens for looking at the societal challenges of sustainable development, is the syndemic nature between human and planetary health. *The Lancet* Commission report by Swinburn and colleagues identified the collective of three separate pandemics impairing health status – obesity, undernutrition, and climate change – as The Global Syndemic (50). A syndemic is characterized by biological and social interactions between conditions and states, interactions that increase a person's susceptibility to harm or worsen their health outcomes (51). This means that the human or public health status depends on and influences the planetary health status, and vice versa – and both are decreasing rapidly.

The food systems approach is the third and final lens used in this report. A system's approach appears appropriate to address the complexity of the interactions between the Global Syndemic (50,52,53), and to "address the underlying causes of The Global Syndemic and its policy inertia, [and] forge synergies to promote health and equity" (50). Specifically, our food systems are currently exceeding planetary boundaries, contributing to environmental degradation, vulnerable to shocks (46,47,54), while at the same time being unfair and creating social injustices (55). A transformation to sustainable food systems would foster the global outcomes of human and planetary health, social equity and economic prosperity (50,53), which is a globally agreed upon urgent action to be taken (41,47). Food systems have a large impactful potential in realizing more sustainable diets (44,56). Therefore, taking up this perspective following a multisectoral and interdisciplinary approach (8,9) in gaining insight in the context-specific definition of health, can contribute to effective sustainability policy-making.

DoH in European policy

Therefore, the aim of this report is to investigate the definition of health (DoH) in the transition towards HSDs in European policy, using the three aforementioned lenses. As European policy already has an established focus on the realization of HSDs and usage of the food systems approach, this report will focus on Europe as a case context. It will evaluate the viability of the European DoH to tackle the 21st-century problems to realize a sustainable future. Based on a thematic literature review, the most important concepts for this framework and their interactions are identified. As the anthropocentric focus is present in both the Doughnut Model as well as the food systems approach, the DoH will be approached primarily from the perspective of human health and HSDs, while planetary health will be included secondarily to account for the realm of environmental sustainability.

In order to reopen the concept of human health to revision in policies, a mixed-methods analysis was used to analyse the health policies of eight European countries. The analysis consists of three parts, where the main focus lies on evaluating the DoH on a high policy level, operationalized as the formulation of eight national DoHs from health policies. The motives in these national DoHs are identified and compared with policies aimed at increasing sustainability on different governance levels. Eventually, the use of the food systems perspective will be evaluated in the European DoH in light of the 21st-century challenges.

METHODS

This report is designed to provide a comprehensive and comparative overview of the currently used definitions of health, in scientific literature and European policy, while taking into account the issues and limitations of modern times. The three lenses identified in the introduction are the leading principles. As such, the following research question guided this research:

> *How is 'health' defined in national human health policy in Europe in the context of realizing healthy and sustainable diets (HSDs), and is this definition viable to face the challenges of the 21st century?*

We explored this research question by investigating scientific literature, national health policies of high-income European countries, and sustainability policies from different governance levels, while incorporating a food systems perspective. The report is divided into four secondary research questions, with corresponding chapters, which are stated under the chapter titles, and a synthesizing chapter. It was conducted primarily as an elaborate mixed-methods literature and policy analysis, with both quantitative and qualitative research practices. Europe is taken as a case focus because the existing governance structure of the European Union (EU) has developed several projects, policies and plans over the past years that specifically aim to realize healthy and/or sustainable diets, and improve sustainability status in Europe, e.g. the European Green Deal [EC1; EU1-3] and its subsequent plans [EC2-7,9,19,23]. Multiple European countries are involved in these projects, policies and plans, EU-Member States as well as non-members. A sample of eight diverse European countries was chosen for the analysis (**Figure 3**) of which the methodology is more elaborately described in **Appendix I**. All chapters mostly have a descriptive character and rely on the analysis of policy documents of these countries, against the background of scientific literature.

Country selection

The widely-used categorization as formulated by the Danish sociologist Gøsta Esping-Andersen (57) was used as a clear framework to measure and compare different countries' health care policy. In this report, Esping-Andersen's framework was used to assess and compare the health care policy of different countries, and to categorize and select six European countries for the analysis. This categorization of international welfare state identities is based on three highly diverse political regimes, shaped by different patterns of de-commodification, social stratification and employment: conservatism, liberalism and social democratism. These countries are ranked along three levels (strong, medium, low) of correspondence based on the decommodification index. To capture the diversity in different welfare states in Europe, and to provide insight in the tendencies of European welfare states, two European countries per regime are chosen out of the total number of 18 countries that where categorized by Esping-Andersen (see **Appendix I**): France, Italy, Switzerland, The Netherlands, Denmark, Norway. The two European welfare states from the corresponding regime with the highest index score were

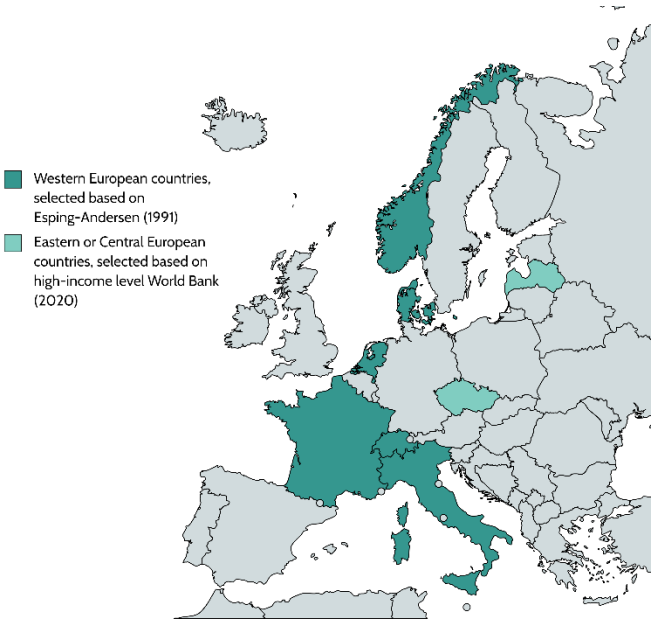


Figure 3. Eight selected European countries for the analysis.
Figure made in MapChart (172).

selected from the level 'strong' or 'medium'. Primarily, geographical diversity was taken into account in selecting, while The Netherlands was included because this research was conducted there.

Since this categorization does not represent countries from central or eastern regions in Europe, an additional categorization of countries was used to select two countries from this region: the World Bank classification of countries by income levels (58). As all six selected western-European countries based on Esping-Andersen are classified as "high-income", this level was chosen for further selection. To account for geographic diversity, Czech Republic and Latvia were chosen, based on availability of accessible documents on health policy in the country. Unless explicitly mentioned otherwise, it was assumed that all global, European or EU-level projects, laws or policies are accounting for the eight selected European countries[1].

Assessment methods

In order to set up a framework to investigate the national DoH in Europe, an explorative scientific literature review was conducted, thematically guided by the concepts of health, healthy diets and sustainability. As such, a historic overview of the definitions of human health, planetary health, and their interdependencies could be worked out. Primarily, Google Scholar was used to look for articles published in the last 20 years, by using key words like "definition of health", "human health concepts", "planetary health definition", "definition of sustainability", "syndemic human health and planetary health", "healthy diets OR healthy and sustainable diets", "healthy diets food systems" or "human health food systems", and related variations. Via snowballing, related reports or articles, and older articles were included in the review, resulting in a broadening of the publication period and additional key words.

Figure 4 depicts a schematic representation of the proposed and final analysis and results to define the national DoHs. It was expected that there were policy documents available in each country that addresses the regulations to realize HSDs, in which the definition of health (both human and planetary) and sustainability were present. However, there were often no specific health definitions stated in the policy documents, or the descriptions were multi-faceted. Therefore, these national DoH are summarized key goals and characteristics of the countries' health policies, either paraphrased or quoted.

All data for the European countries was collected digitally, in terms of scientific literature and policy documents, related web pages and press releases, or statements (referred to as 'policy documents'). For the national health policy documents, as well as for the documents related to goals of sustainability, the latest versions available of publications published in the last 10 years were used. The (governmental) websites of corresponding countries were used to access the relevant policy documents from e.g. Ministries of Health, Public Health Institute, or Health Council, depending on the specific organization in the European country, in order to formulate the national DoHs and related national policy goals.

A total of 96 national health policy documents were analysed. An overview of the analysed documents and websites per country can be found in Appendix II – *Table II.i*. All used policies were coded with a unique identifier using the following structure: [abbreviation country + number of policy document], e.g. [CZ4] for the fourth document in the list for Czech Republic. These identifiers are used in the text of this report to refer to the corresponding policy document. A total of 58 policies related to the goals of sustainability on different governance levels were analysed and coded using the abovementioned system. An overview of the analysed

[1] Since all selected countries except Norway and Switzerland are members of the EU, a lot of policies for the selected countries are regulated on EU-level and by the EC (131). It was assumed that Norway and Switzerland can be taken along in this analysis on the European policy level, as they are either or both part of the European Economic Area and the European Free Trade Association, and are therefore taking part in a lot of European and EU-regulated programs and policies. However, differences on policy-level can occur, which influences the involvement of these countries in EU programs and policies. Future research can use a more detailed approach to identify specific deviations for this country in relation to European policy coherence.

Figure 4. Visualization of the proposed and final health policy analysis to find the national DoHs.

policy documents and websites per institution or organisation can be found in Appendix II – *Table II.ii.* The selected documents provide an overview of the largest programs and projects on different government levels, and were assessed via the website of the UN, the website of the EC or EU, and the national health policies.

If the policy documents were not available in English or Dutch, Google Translate (both text and document translating function), the translator in Microsoft Word or the translating extension in Google Chrome was used to translate (parts of) the source to English. If documents were translated, quotes were used and sections were copied to the dataset after translation. Whether documents were translated or not, is mentioned in the tables in Appendix II as well.

Data analysis

Next to a literature review (CHAPTER 1), this research consists of an explorative and thematically guided textual, contextual and discourse analysis (CHAPTERS 2-4), concluded by a synthesis (CHAPTER 5). I analysed the policy documents by reading the sections in the documents that were related to (public) health, diet and sustainability in its entirety, followed by summarizing and copying of relevant phrases. I also searched for specific terms like 'health', 'disease', 'wellbeing', 'food', 'diet', 'lifestyle', 'food system', 'sustainable' or 'planet', to get insight in the context of which they are mentioned. Terms were added based on performed analyses on other documents, e.g. 'One Health' or 'Positive Health', resulting in a reiterative analysis. Translated and extensive documents were analysed by looking at the content page to look for relevant sections for the research questions. Textual and contextual analysis was performed, guided by the main themes identified in the scientific literature review. Relevant sections of the policies were copied to a Microsoft Excel sheet, in which I added a summary or motive (*Supplementary Data 1*). After the policies of all countries were analysed, this dataset with summaries and motives were interpreted in order to write the different chapters of the analysis. Sections or policies dedicated to COVID-19 or its impact on health (care) were not taken along in defining the national DoH, since not all countries had updated national health policies available from 2020.

National DoHs for all eight European countries were extracted from the national health policies, based on an elaborate analysis of these documents (see Table 1). These representations of operationalized higher-level policy DoHs are used to perform the qualitative and quantitative comparative analyses in CHAPTERS 2-4 of this report. To structure the reflection on the conceptualization of health, patterns in the DoHs were identified

after analysing and summarizing the national health policy documents (CHAPTER 2). I categorized the eight national DoHs, the context-specific categorization by using the seven guiding questions of Haverkamp et al. (33,35) (see Appendix III). In addition to the identified five currently dominant health concepts and corresponding aspects (from Boorse, Nordenfelt, Venkatapuram, WHO and Huber), the Meikirch Model of health was used as sixth, as this is currently gaining more ground in health (care) literature (19,59–62). I used the seven guiding questions of Haverkamp et al. (33,35) to position this model on the spectrum of health concepts. The final overview of six currently dominant health concepts was used to classify the eight national DoHs qualitatively on the correspondence with currently dominant health concepts. Furthermore, I designed a ranking score (0-5) to quantify this classification, in order to get more insight in the specific distribution of all aspects in the health concepts in the national DoHs. An approximation of the categorization of the European DoH was composed by taking the average of the seven dimensional scores. Appendix III provides a specification of the qualitative and quantitative scoring methods.

To put policy goals for human health of the eight European countries in the context of relevant policies, policies on health, sustainability or food were investigated in more detail, as well as the motives (CHAPTER 3). The references of 58 analysed publications and policies can be found in Appendix II – *Table II.ii*. The underlying patterns and proportions between human and planetary health are enlightened in the face of sustainability, using the specific motives and policy actions towards health improvement. This comparison was conducted for policy goals from different governance levels. First on the *global* level, by looking into the targets and progress on the UN SDG3: "Good Health and Well-Being" (63). Second, on the *European* level, based on European, EU and European Commission (EC) documents. An overview of extracts from important EU regulations on health, sustainability and food can be found in Appendix IV. Several large-scale European projects and subsequent regulations in the context of realizing HSDs in Europe are mentioned, but the amount of policies coming from these projects and their impact can be assessed to a minimal extend, as this is regulated on a national level. Therefore, the goals formulated in the original plans and regulations are used in this analysis. Relevant sections in the policies were found by searching for key words, like 'diet', 'food (system)', 'health', 'nutrition' or 'sustainable'. Third, the *national* level was investigated, by looking for action plans mentioned in the health policy documents and other (governmental) websites from e.g. Ministries of Health, Public Health Institute, or Health Council, depending on the specific organization in the European country (*Supplementary Data 1*).

In order to get insight in the presence and distribution of different food system domains in the national DoHs, I examined the food system as a linking approach between the two dimensions of sustainability (CHAPTER 4). I identified the following food system domains based on literature review: diet, consumer behaviour, food environment, food supply chains, food system drivers (56), and human rights (39,44,50,64,65). Scientific disciplines were used as representatives of the corresponding domains for more specific analyses, as they are often more specific than domains. Initially, the objective would be reached by defining domain-specific DoHs for all domains, based on scientific literature related to food systems (see Appendix V). The core elements of these domain-specific DoHs could serve as a basis for the qualitative and quantitative scoring, for which I designed a ranking score (0-10). However, there were no differing or specified DoHs found for the different food system domains. Therefore, the chapter was adapted to a descriptive analysis on the European presence of the food system domains, including the content analysis of the national DoHs and the statements of the selected countries who contributed to the UN Food Systems Summit (UNFSS) in 2021 (66). UNFSS statements were available for all countries except Czech Republic. These statements are included as the national visions on the food systems perspective and action towards realizing a sustainable food system. Moreover, a quantification of the presence of the food system domains this chapter was added based on a ranking score from 1-3 (1 = absent; 2 = partly present; 3 = clearly present).

Aiming to synthesize the different parts of the analysis on the DoH in European health policy, a summary and integration of described information and motives were put together (CHAPTER 5). Overarching motives and recurring patterns were extracted from the text in CHAPTERS 2-4 and compared with scientific literature (CHAPTER 1). The four dimensions of the food system, i.e. health, economy, environment and culture, as used by Biesbroek et al. (67), were used to structure a science-policy integration. Finally, the current use of the food systems perspective in European policy was critically evaluated

RESULTS

CHAPTER 1:
FRAMEWORKS FOR EVALUATING HEALTH POLICIES

How is the transition towards HSDs supported from a theoretical perspective, and how is health nationally defined on a higher policy level?

This chapter describes examples of available conceptualisations and relevant background information, based on an extensive literature review. As such, it provides an insight in the current scientific theoretical framework for how the transition towards HSDs is supported, as well as how higher-level policy DoHs in the European context can be understood, in order to critically evaluate the findings from different policies. First, the concept of sustainability is described from a global perspective, by looking into the definition of human health, healthy diets, and planetary health (**1.1.**). The concept of syndemics discloses the link between human and planetary health from a global systems perspective. Second, the food systems perspective is applied on HSDs, which acts as another connecting factor between human and planetary health (**1.2.**). Third, the higher-level policy perspective is taken up to specify contextualized definitions of health in Europe, i.e. national DoHs (**1.3.**).

1.1. The emerging concept of sustainability

The Brundtland report in 1987 defined *sustainable development* as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs", which essentially rests on political will (1). Since then, research and policy across all domains of science have increasingly focused on this concept and its promotion. Several important reports and concepts were built on this conceptualization (see **Figure 5**): planetary boundaries, the Doughnut Model and the SDGs.

The Swedish geoscientist Johan Rockström introduced the term 'planetary boundaries' in 2009, referring to the safe operating space for humanity to make sustainable use of the resources on earth (68). The following nine processes were identified that required planetary boundaries: climate change; rate of biodiversity loss (terrestrial and marine); interference with the nitrogen and phosphorus cycles; stratospheric ozone depletion; ocean acidification; global freshwater use; change in land use; atmospheric aerosol loading; and chemical pollution. The boundaries of the first three processes were already exceeded at the time of publication in 2009. The latter had been renamed to "novel entities" in 2015 (69) and recently it was argued that also this boundary is exceeded, based on the increasing pace of annual production and releases (70). This primarily biophysical conceptualization has shaped many research and policy initiatives related to sustainability efforts.

Taking the planetary boundaries to a higher and more economic level, Raworth introduced the Doughnut Model in 2017 (49,71). Here, the social dimension was included by focussing on justice, defining the doughnut as the "safe and just space for humanity" in the Anthropocene. Sustainability can thus be defined as follows: planetary health is covered by the ecological, while human health is influenced by the social foundation, and the effect of planetary health on human health further influences the latter. Combining the research of both Rockström and Raworth, the conceptualisations of sustainability become more holistic and insightful.

The SDGs are the most influential and overarching sustainability initiative for both policy and scientific research. These 17 goals succeed the UN's eight Millennium Development Goals (MDGs), which were launched in 2000 and aimed at improving human society by achieving these eight goals by 2015 (72). From September 2019, 'The Decade of Action to deliver the SDGs' was launched to achieve the Goals by 2030 (73). The reason for this transformative movement, as was noted, is that the limits of our current systems are close or already being reached, so change to a more sustainable way of living on and with this earth is necessary. Again we see

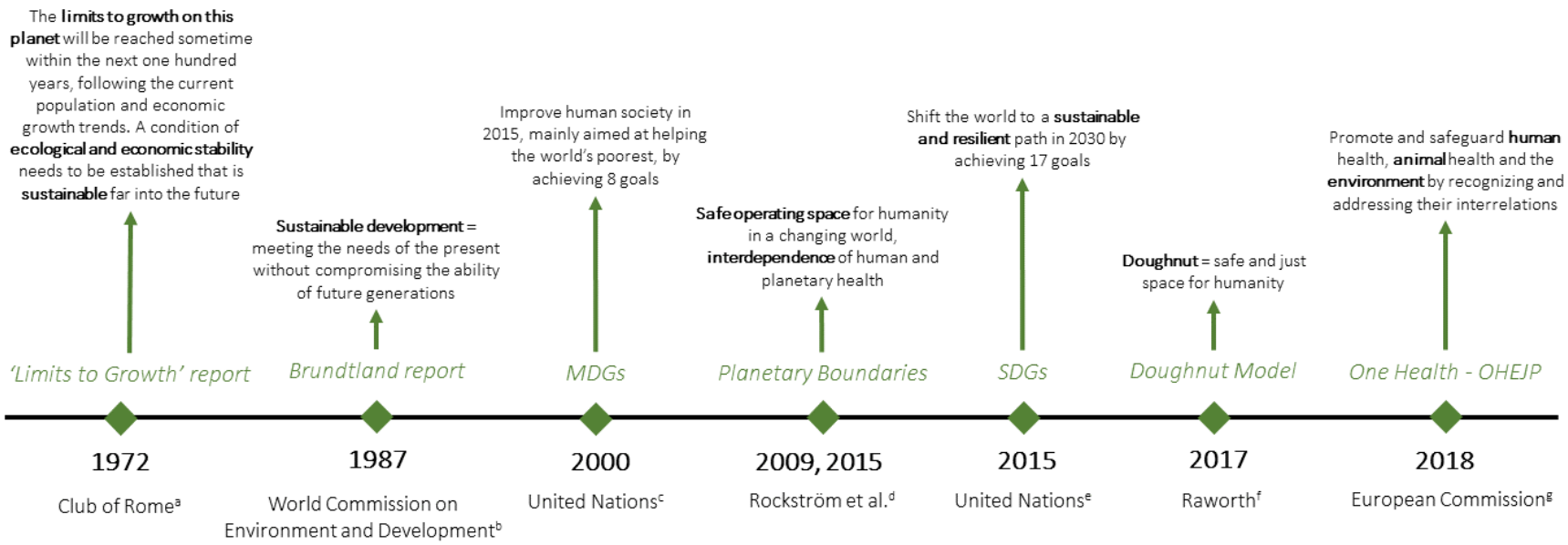


Figure 5. Developments and reports relevant for the conceptual framework of sustainability in a historical overview. *MDGs = Millennium Development Goals; SDGs = Sustainable Development Goals. References: a =* (89)*; b =* (1)*; c =* (72)*; d =* (68,69)*; e =* (77)*; f =* (49,71)*; g =* (81).

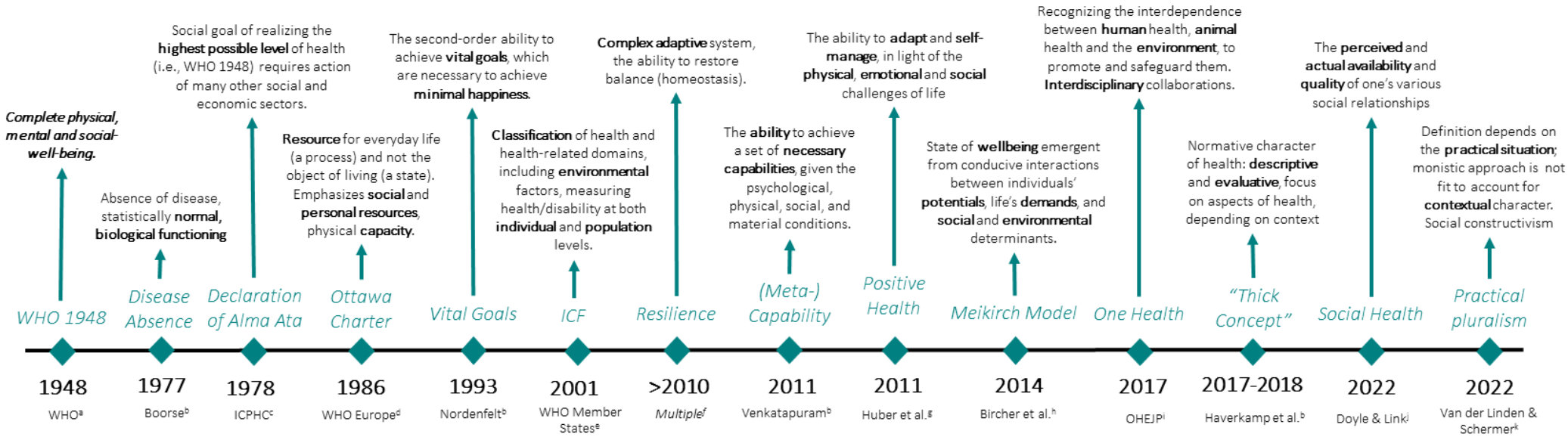


Figure 6. Scientific definitions of human health in a historical overview. *a =* (38)*; b =* (33)*; c =* (80)*; d =* (13)*; e =* (36,173)*; f =* (25,26,32,85,86)*; g =* (30)*; h =* (19,59)*; i =* (81,82)*; j =*(16)*; k =* (34).

exceeding (or exceeded) boundaries guiding action on scientific and policy level in the face of sustainability. The following sections dive deeper into the different definitions of the parts of sustainability.

Development of concepts of human health

Different definitions of human health have emerged since the 1948 WHO DoH (**Figure 6**). Markers of decreasing human health are often defined as the increase in non-communicable diseases (NCDs) and severe infectious disease outbreaks, malnutrition in all its forms, and the double and triple burdens of diseases globally (46,74,75). But socio-economic and environmental factors also play a role as determinants of health status, like access to health care, schools and education, work and leisure conditions, peace, shelter, education, food and diets, income, a stable eco-system, social justice, equity, and the chance to lead a flourishing life (13,39,74,76). This is even summarized in a separate concept of social health, defined as "the perceived and actual availability and quality of one's various social relationships", being part of the tripartite model of health in the human body (and mind) of physical, psychological and social aspects of health (16). These aspects have been captured in the holistic conceptualizations of the (interactive) biopsychosocial model (15,29,31). Furthermore, the last pandemic years of the coronavirus disease painfully exposed the interrelatedness between these markers, social and economic factors, and environmental sustainability, as well as the potential positive impact of policy (51,74,77–79). These developments emphasize the complexity of defining health, as well as the need for improving the outdated WHO definition – based on the post-war economic, social, cultural and epidemiological situation – to fit the present situation.

Remarkably, there seems to be a standstill in the wide scientific debate on the DoH: the WHO definition has not changed over 70 years, and although there have been many alternatives proposed in these years, no other conceptualisation reaches a sufficient level of consensus (23). Alternative DoHs are often a critical reaction to the 1948 WHO definition, since this is seen as a utopian vision, as Leonardi (23) described. He defined six problematic aspects of the WHO definition: the impossibility to achieve a state of "complete well-being"; the lack of operationalization or measurability; its broad range which is potentially conflating scientific assessments with moral and political arguments; its consequence of increased medicalization of society; the absence of exceptions in the permanent link between health and wellbeing; and in the positive relation between physical, psychological and social wellbeing. Leonardi shows that the WHO definition was interpreted as a political rather than a scientific statement, as an inspirational goal, or as being more related to happiness than health. Another criticism argues for the importance of an *operationalization* instead of a definition of health, in terms of the lived experience of health, which is what matters most to people (36). The WHO's International Classification of Functioning, Disability and Health (ICF) framework of functioning is proposed as ideal operationalisation of health, being useful for both policy and comparisons of clinical interventions.

The period since 1948 has however not only been marked by criticism, but also by large contributions of the WHO to all clinical sciences (23), expansion of ideas about health (21) and official reinterpretations of the 19948 WHO definition to improve health-related professions (e.g. the Ottawa Charter[2] (13) and Declaration of Alma Ata[3] (80)). The definition of health of minority groups is now also increasingly documented in literature to expand on the distribution of health within societies, unequal access to health care, and on underlying health disparities (27,50). A few holistic conceptualisations in particular have gained ground in the past decennia: Positive Health in The Netherlands, and the One Health approach on a European level.

[2] In the Ottawa Charter for Health Promotion (1986), health is defined as a resource for everyday life (a process) and not the object of living (a state). This conceptualisation emphasizes social and personal resources, as well as physical capacity, extending the responsibility for health promotion outside the health care sector to healthy lifestyle and wellbeing.

[3] The Declaration of Alma Ata introduced "the highest possible level of health" as replacement for "a complete state of well-being" to be strived for. This was seen as a more pragmatic target, helping to move away from the utopian vision. However, the historic definition was reaffirmed as part of this definition. Moreover, other sectors than the health sector are addressed to improve health status.

One Health is an interdisciplinary European cooperation program, approved by the EC in 2017 and launched in 2018. It aims to promote and safeguard human health, animal health and the environment, by recognizing the dependence of the first upon the latter two, and relying on human medicine, veterinary medicine and ecology (25,81). The issues that are frequently mentioned to be tackled with One Health are prevention of antimicrobial resistance, infectious diseases, and animal reservoir related threats, like zoonoses and food safety issues (82). Moreover, the interdependencies of the three components are mentioned: actions are therefore necessary in a cross-dimensional way. Lerner and Berg (25) evaluated the broad concept from the individual, population and ecosystem health level, concluding that these inherently influence each other for both humans and animals. For this approach, they address the normative and practical consequences of choosing certain conceptualisations of health, and propose the idea of resilience or balance as a characteristic of health (which is recently further explored by Lerner (83)). One Health has gained popularity and influence, and large international institutions and organisations promote the interdisciplinary research approach on a global scale (83). The EC granted The One Health European Joint Programme (OHEJP) in 2018, which aims to reinforce collaboration between institutes by enhancing transdisciplinary cooperation and integration of activities in the fields of foodborne zoonoses, antimicrobial resistance, and emerging threats (81). Although this approach seems holistic and equally prioritizing its three dimensions, it has an anthropocentric motivation: promote health and eradicate diseases (83) i.e. improving *human health*, by taking animal and planetary health into account in policy action.

Huber et al. (30) introduced the concept of Positive Health in 2011, and it was further elaborated in the primary care context (84,85). The authors argue that, although the 1948 WHO DoH is well suitable for primary care, it is no longer fit for purpose given the rise of chronic diseases. Comparable to the critiques by Leonardi, they note that the '*complete* state of wellbeing' is absolute, leaving most of the people currently unhealthy, and not measurable or operational in the current changed demography of populations and nature of diseases since 1948. These limitations emanate in health policy, for example in determining the outcome measures in healthcare (programs). Therefore, they propose to replace the present idealist and static definition by focusing on the individual capacity to adaptation, resulting in the dynamic formulation *"health as the ability to adapt and self-manage, in light of the physical, emotional and social challenges of life"* (30). As such, the concept of *resilience* was reiterated as the scientific definition of human health. The ICF also relates to Positive Health, as they both focus on the individual experience of health from three perspectives: bodily functioning (physical), human behaviour (personal or emotional), and participation in society (social). Positive Health emerged as a response to the Dutch health care system and the current issues in society. It has been proposed for many programs and policy plans regarding health care organisation and the role of the health professional, by implementing a health and capacity-focused approach instead of a disease-focused framework as taught in the Dutch medical training (85). Critique on this concept emphasizes the lack of separation in the levels of symptoms and impact factors, and the misunderstanding of the 'ability to adapt and self-manage' as a protection factor (by avoiding exposure to risk factors) instead of being pure health (24).

Another holistic conceptualisation of health and disease, which is gaining acceptance in the medical field, is the Meikirch Model (19,60–62). It states that health is "a state of wellbeing emergent from conducive interactions between individuals' potentials, life's demands, and social and environmental determinants". The central concept of resilience, as reiterated in other literature on human health (25,26,32,85,86), emanates from the Meikirch Model when health is defined as a complex adaptive system. Moreover, this definition of the model is applied to health care: by moving away from the current economical goal of profit maximization to reduce health care costs and improve wellbeing, it is proposed to see health care systems as complex adaptive systems (61), and to use the Meikirch Model for personal and population health care (60,62).

Attempts to classify and evaluate the abundance of DoHs in literature have emerged over time. Haverkamp, Verweij and Stronks (35) investigated the definition of human health comparing five commonly used health concepts. They concluded that each concept focuses on *specific aspects* of health, and that the meaning of 'health' cannot be captured by a single definition. Furthermore, they emphasized the *normative character* of the conceptualization of health, as this concept is found to be both descriptive and evaluative in different contexts. This idea was elaborated a subsequent paper (33), where the concept of health is identified as a *"thick concept"*, emphasizing the absence of a purely monistic definition of health. This standpoint is reiterated by Van der Linden and Schermer (34), who plea for a pluralistic approach in the process of defining health for practical reasons. Especially since certain aspects of the concepts of health and disease are standing out more or less depending on the situation, maintaining one definition of health could not account for the contextual character of the concepts. Leonardi also plead for accepting the "intrinsic and irresistible plurality of health", when following the social constructivism perspective (23). Taking up this epistemological point of view, which is also hinted at by Lerner and Berg (25), there are as many DoHs as there are people and groups who create and use the concept. In conclusion, while scholars described a variety of conceptualizations and approaches to human health over the past decades, they are converging to a more holistic, multi-dimensional or integrative DoH.

Development of concepts of planetary health

The holistic view on the definition of human health is also apparent in the current definitions of planetary health. The concept of resilience in terms of the capacity of a complex system to maintain a stable environment within a relatively narrow range, is used to describe both the health of the earth (68) as well as of humans, as referred to by e.g. Huber et al. (30). Planetary or environmental health is often referred to in the context of (environmental) sustainability. This brings the Brundtland definition of sustainable development up again, which inherently has an anthropocentric bias. This definition implies the only truly sustainable progress must be connecting aspects of social wellbeing, economy and environment simultaneously (87). However, the dimension of human health is not explicitly present here.

A clear definition of planetary health cannot be seen separately from the definition of human health (7): the human activities on earth determine planetary boundaries being reached and resources being depleted. The concept of planetary health was introduced by environmentalist movements in the 1970's and 1980's, to operationalize the impact of human activity. As such, it is inseparably connected with economic growth theory: natural, human and social capital are often the building blocks of measurements investigating sustainable development (88). This was already clearly described in the report 'Limits to Growth' by the Club of Rome in 1972 (89), which discovered the boundaries of human action and sustainable development in terms of food, production and population growth. The *in*VIVO Planetary Health network defined planetary health as "the interdependent vitality of all natural and anthropogenic ecosystems (social, political and otherwise)" in the 'Canmore Declaration of 2018: a Statement of Planetary Health Principles' (7). The final report of The Rockefeller Foundation–*Lancet* Commission on Planetary Health used the following definition (90):

> *"… the achievement of the highest attainable standard of health, wellbeing, and equity worldwide through judicious* ***attention to the human systems****—political, economic, and social—that* ***shape the future of humanity and the Earth's natural systems*** *that define the* ***safe environmental limits*** *within which* ***humanity can flourish****. Put simply, planetary health is the* ***health*** *of human civilisation and the* ***state*** *of the natural systems on which it* ***depends****."*

This definition emphasizes natural systems in general, but always in the face of human systems. The commission addresses societies to start action to tackle the drivers of environmental change, and call upon improved and interdisciplinary governance to strengthen planetary health. Comparable to the Doughnut Model, a redefinition of prosperity – i.e. away from economic growth towards flourishing – is put as the basis for solutions.

Systems are frequently chosen as central concept in evaluating planetary health. For example, in the context of health-sustainability indicators, Dora et al. (4) describe how unsustainable patterns of consumption and resource use are harmful for ecosystems, while human existence depends on certain ecosystems. The Planetary Health Alliance refers to ecosystems in their definition of the scientific field as "a solutions-oriented, transdisciplinary field and social movement focused on analysing and addressing the impacts of human disruptions to Earth's natural systems on human health and all life on Earth" (91). They describe the human impact on the Earth's biophysical conditions, and thereby the experienced environmental changes, by the following processes: water scarcity, changing food systems, urbanization, biodiversity shifts, natural disasters, climate change, changing land use and land cover, and global pollution. These eight processes partly overlap with the planetary boundaries described in **1.1**. The measurements of these nine processes can be also seen as indicators of planetary health, considering it optimal when all processes take place within these boundaries.

It is clear that in light of sustainability, planetary health has a specific anthropocentric definition, which is reiterated in the impactful paper of the EAT-Lancet Commission (92) "Food in the Anthropocene". The interrelation between human and planetary health is both shaping the definition, as well as evaluating it – comparable to the normative character of the concept of human health. Taking this interdependency into account, it follows that unhealthy living means a higher impact on planetary health, since more resources are used, e.g. in terms of economic, natural or health care resources.[4]

The interdependency between human and planetary health

Figure 7 depicts the interdependency between human and planetary health in the context of sustainability, based on the described findings above. Several indicators have been proposed to quantify this relation between health and environment, in order to track progress on environmental agreements (4,93). The concept of a syndemic, described in many contexts (11,48,50,51,53,94,95), enlightens how human health status is influenced by planetary health status and vice versa, and how this together influences the state of sustainability goals. *The Lancet* described the concept as follows (11):

> *"Syndemics […] is a conceptual framework for understanding* ***diseases or health conditions*** *that arise in populations and that are* ***exacerbated by the social, economic, environmental, and political milieu*** *in which a population is immersed. A syndemic, or synergistic epidemic, is more than a convenient portmanteau or a synonym for comorbidity. The hallmark of a syndemic is the* ***presence of two or more disease states that adversely interact with each other,*** *negatively affecting the mutual course of each disease trajectory, enhancing vulnerability, and which are made more deleterious by experienced inequities. […] In other words, syndemics* ***fundamentally rely on context****."*

Understanding the syndemic between exacerbation of planetary health and human health, *The Lancet*'s definition necessitates to define the environmental crises as diseases, in order for it to influence the diseases of human health. This framework also appears anthropocentric: it is mostly used in the context of threats to

[4] The specific indicators can vary here, although a few are more general than others, e.g. CO_2 emission, land use or biodiversity loss. The Kaya-identity (93,171) quantifies the human impact on climate in terms of the total emission level of CO_2, expressed as the product of four factors: human population, GDP per capita, energy intensity (per unity of GDP), and carbon intensity (emissions per unit of energy consumed).

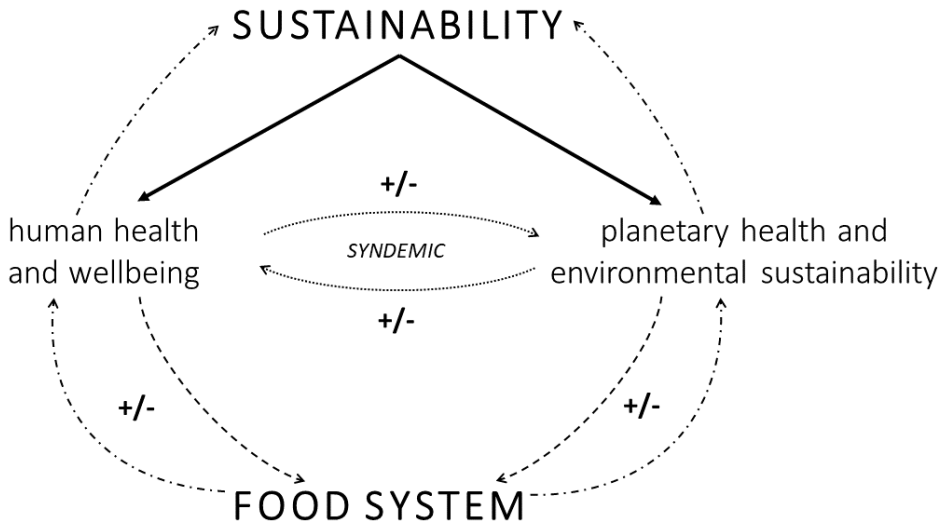


Figure 7. Visualization of the interrelationship between the concepts of sustainability, health and the food system, according to scientific literature. *Sustainability is defined by human health and wellbeing on the one hand, and planetary health and environmental sustainability on the other. These two concepts are linked to each other in a syndemic nature: if planetary health deteriorates, human health will be negatively affected (if not for current than certainly for future generations), while it will be positively affected when planetary health is increasing. Looking at these interactions from a food systems perspective, it becomes clear the food system acts on all these components by shaping the diets from production to consumption, thereby affecting both human health (health status is related to dietary quality) and planetary health (production processes affect environmental sustainability) in a positive or negative way. Vice versa, human health and planetary health also have their effect on the food system. The concept of sustainability evaluates the impact of the food system and all these components.*

human health (12,48,51,64,94,95), where these complex and multilevel phenomena have a great potential for policy and program implementers to promote population health and shape policies (48,95).

In 2019, *The Lancet* Commission on The Global Syndemic of Obesity, Undernutrition and Climate Change published their final report, where climate change was indeed defined as a pandemic, "because of its sweeping effects on the health of humans and the natural systems we depend on (i.e., planetary health)" (50). Although their goal was to address the public health problem of obesity, the final report identified common drivers and determinants of the "three gravest threats to human health and survival". While this approach is anthropocentric in taking human health as a starting point, the focus on and potential of planetary health is novel: the main driving systems are food and agriculture, transportation, urban design, and land use. Accordingly, actions that act on two or all of the pandemics are described to have the potential to benefit planetary health, which works through to the Global Syndemic system as a whole.

However, Helne and Hirvilammi (14) argue that the interconnectedness of human wellbeing and the vitality of ecosystems is not fully recognized in the dominant interpretation of sustainable development, which is based on human exceptionalism. This results in the delayed transition towards sustainability, and the current understanding of wellbeing in mainly economic terms, instead of an internalized relational understanding between the two. An area where this comes into play and where considerable attention has been paid to in order to make progress in sustainability-related goals, is the food system (4,5,47,55,96,97). Particular efforts are made to realize healthy and sustainable diets[5], where the sustainability of human health and planetary health is fostered, shaped by social, cultural and environmental influences (53).

[5] Although healthy (and sustainable) diets are an important focus point for sustainable food systems, there are many other issues that deserve equal consideration, like food security, nutrition security, food sovereignty. However, since this thesis focuses on high-income countries, it is assumed that serious food security problems in the selected countries are not the primary issue towards realizing a sustainable future, and that the countries have developed so their politics are able to focus on healthy and sustainable diets realization.

1.2. Healthy and sustainable diets and food systems

As such, it becomes clear that the food system deserves a place in the complex interrelationship between human health and planetary health in the face of realizing HSDs (**Figure 7**). Sustainability can be interpreted as follows, on this account: partly described by human health and wellbeing, and partly by planetary health and environmental sustainability, the interdependency of these two concepts (i.e. the syndemic) shapes the individual and common attribution to the sustainability status of our planet. The food system has an impact on all these dimensions, and can stimulate or deteriorate the health status of both human and planet, and therefore sustainability status in general. The feedback loops as identified in **Figure 7** are explained by the concept of a syndemic.

Definitions of healthy and sustainable diets

There are ubiquitous definitions and examples of healthy (and sustainable) diets, promoting human health, planetary health, or both, all necessitating *trade-offs* to be made to increase the most beneficial outcome. As such, the particular definition of human health and planetary health determines the characteristics of a healthy diet, resulting in many possible definitions (see **Appendix VII**). For example, the Food and Agriculture Organisation (FAO) defined a *sustainable diet* as followed (55):

> *"Sustainable diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are **protective and respectful of biodiversity and ecosystems**, **culturally acceptable**, accessible, economically fair and **affordable**; **nutritionally adequate**, safe and healthy; while optimizing **natural** and human **resources**."*

The four principle domains of sustainable food and nutrition security as described by Biesalski et al. (98) – i.e., dietary, economic, sociocultural and environmental – can be recognized in the concepts of this FAO definition. However, this FAO definition is not quantified and therefore lacks achievable goals, which is the main critique on its use (99). For my purposes, the lack of specification what "healthy" means in this context is important.

Recommendations for a *healthy diet* are designed to ensure adequate energy intake and essential nutrients, to promote all dimensions of individual health, and to prevent undernutrition and diet-related NCDs (risks). Although optimal component quantities differ between sources, there are some general principles that have reached consensus (44,47,99): increased intake of plant foods (fruits, vegetables, legumes, nuts, wholegrains); limited intake of starchy vegetables, free sugars, total and not-iodized salt, and total fats; preference of unsaturated fats over saturated or trans fats; and diversity and proportionality between food groups. The general advice can be reduced to consuming more plant-based foods and less animal-sourced foods, and less foods with a high degree of processing (44). Four dimensions are identified to be generally recognized: adequacy, diversity, moderation and safety (46,56). To illustrate, the WHO quantified and specified the basic principles of a *healthy diet* (100), which being consumed

> *"… throughout the life-course helps to **prevent malnutrition** in all its forms as well as a range of **noncommunicable diseases (NCDs) and conditions**. […] The exact make-up of a diversified, balanced and healthy diet will vary depending on **individual characteristics** (e.g. age, gender, lifestyle and degree of physical activity), **cultural context**, **locally available** foods and **dietary customs**. However, the basic principles of what constitutes a healthy diet remain the same."*

This definition has been taken up in many guidelines and reports. The recommendations are comparable to those of the Global Burden of Disease Study (101), although the latter complements the WHO guideline by adding the quantified diet-related risk contributing to the NCD burden in 195 countries. Despite the explicitly broadening character of the 1948 WHO DoH, the reductionistic and monistic focus on disease reduction and prevention are enlightened in these diet-related definitions.

However, diets optimized for sustainability are not necessarily also healthy diets, or vice versa, and quantification of optimal levels differ, synergies are often identified (47). To illustrate, the FAO and WHO together defined *sustainable healthy diets* as (44):

> *"… dietary patterns that* ***promote all dimensions of individuals' health and wellbeing****; have* ***low environmental*** *pressure and impact; are* ***accessible, affordable, safe and equitable****; and are* ***culturally acceptable****. The aims of Sustainable Healthy Diets are to achieve optimal growth and development of all individuals and support functioning and physical, mental, and social wellbeing at all life stages for present and future generations; contribute to preventing all forms of malnutrition (i.e. undernutrition, micronutrient deficiency, overweight and obesity); reduce the risk of diet-related NCDs; and support the preservation of biodiversity and planetary health. Sustainable healthy diets must* ***combine all the dimensions of sustainability*** *to avoid unintended consequences."*

Different dimensions of human and planetary health can be distilled from this definition, which clearly combines the 1948 WHO DoH and the Brundtland definition of sustainability: individual, population and ecosystem level, recognizing the social, economic, cultural and disease status. Apparently, the holistic and utopian character of this definition results in difficulties for quantifying and reaching the goals resulting from it. Moreover, there is a lack of specification of the "dietary patterns that promote alle dimensions of individuals' health and wellbeing", as well as the "unintended consequences". Indeed, neither the inherent links between human and planetary health nor the feedback loops between them are emphasized here, resulting in the illusion of having two separate goals for this diet, i.e. health and sustainability.

While the FAO in 2012 still stated that nutrition science had nothing to say about how to link human and ecosystems health (55), this changed when the EAT-Lancet Commission published a report in 2019 on healthy diets for both people and planet in the Anthropocene (40,92). This was the first modelled diet taking a holistic sustainability perspective into account, providing a detailed and quantified description of a healthy and sustainable diet (HSD). Although this diet is currently the best available description of a diet that complies with both human and planetary health, the practical reachability (i.e. economic or natural resources) and social acceptability (i.e. preferences or cultural appropriateness) are heavily debated and require impactful decisions on trade-offs (45,102–109). The notion of HSDs tries to promote the alignment of the environmental and health impacts of consumption patterns. As such, not only the components of the dietary recommendations are scrutinized, but also the bigger picture is getting involved: the design of a (healthy and) sustainable food system.

From nutrients to diets: systems thinking

Another important link between human health and planetary health in the face of sustainability, are food systems (see Figure 7). A food system gathers all the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the outputs of these activities, including socio-economic and environmental outcomes (110). While food systems have the potential to address both health and sustainability within all its domains, this required close governance (47,104,111,112).

Regarding the complexity of the components, interactions and dynamics of the food system, several designs of a system's approach or framework have been developed to describe the (global) food system. Although the main focus of nutritional science has been on nutrients, it has shifted to the more holistic approach of considering 'diets' (113,114) and the environment (6,19,40,92,105,108,115,116) in the 21st century. A system's perspective fits this more complex and dynamic approach well, and enables thinking about stimulating a food system's transformation, enacted via social and cultural pathways (67). Different areas of policy change are identified as potential catalysts of transforming food systems, e.g. shifting diets to promote nutrition and sustainability (8). Action from all actors in society is necessary to achieve the SDGs, but consumers cannot be seen as the solemn driving agents for change to sustainable diets. Indeed, responsible policies facilitating responsible consumption choices are necessary to realize the transformation towards sustainable diets and sustainable food systems (117).

Food Systems and Sustainability

Food systems can be viewed as both the problem and the solution in realizing HSDs, according to the FAO and WHO definition of healthy diets with low environmental impact, socio-culturally acceptable and economically accessible for all (44). On the one hand, they currently have a detrimental environmental impact and their sustainability is questioned by operating beyond the planetary boundaries and being globally unaffordable (47). Therefore, a food system transformation is necessary to still be able to globally reach the SDGs and Paris Climate Agreement (54). Although this has not yet been fully quantified, it has been proposed to add food as a planetary boundary to recognize the food system's significant impact (54).

On the other hand, food systems have a large potential to address the reduction of greenhouse gas emissions, and thereby protecting and respecting the planetary boundaries (103,118). Three action points on a global scale need to be implemented to feed 10 billion people within the planetary boundaries, saving at least half of the ecosystems: shifting towards healthy diets; increasing productivity while transitioning to regenerative production practices; and reducing food waste and loss by 50% (54). This means that the safe and just space for humanity depends partly on a safe, just and sustainable food system. Healthy diets are indicated as an impactful starting point for this transformation towards a more sustainable food system (47,112).

However, the dimensions of nutrition and health, or their interrelations with the food system, are until now covered to a low extent in food system related reports and literature (119). The necessary changes in farm and production structures to create healthier diets has also received little attention (119), while for Europe specifically it is already known that a change in agriculture is necessary to reach the sustainability goals and reduce transgression of planetary boundaries (112,120,121).

Moreover, 'sustainability' in sustainable food systems can mean different things in diverse research projects. For example, the SUSFANS project focuses on the European food system and the evaluation of food system goals under the notion of 'sustainable food and nutrition security' (109,122–124). Emphasis lies here on securing adequate food and nutrition in a sustainable, i.e. tenable, manner design for the food system, and not on promoting health status. By contrast, Hebinck et al. (104) identified four universal societal goals for sustainability to assess the sustainability of the food system against: healthy, adequate and safe diets for all; a clean and healthy planet; economically thriving, robust food value chains; and just, ethical and equitable food systems. The framework they present can be used as a policy tool to promote the shift to sustainable food systems. Nevertheless, many evaluations of food systems interventions are aimed at increasing food security and reducing hunger (125), understood as minimal requirements, instead of improving health status specifically, understood as maximalization.

Food System Dimensions

The UN body addressing the science related to nutrition and food security, is The High Level Panel of Experts on Food Security and Nutrition (HLPE) of the Committee on World Food Security. To guide policy interventions, the HLPE described the different domains of the food system parts in an analytical framework for diets and nutrition (see **Figure 8**) (110): *drivers*, like urbanisation, technology change, climate and economic growth that lead to structural changes in food production and consumption patterns; *components*, food production and distribution (food value chains) and food consumption (consumer choices) guided by the (public & private) governance environment that shapes the modalities for linking supply and demand for food; or *outcomes*, healthy diets, sustainable food supply (climate-smart and resilience) and equity (smallholder farmers and poor consumers) that could either support each other (synergies) or become conflictive (trade-offs). The complexity of the different components and stakeholders, including their interactions are summarized in this framework. Frameworks like this are useful for policy (makers), as they are an action-oriented simplification of the food system and its dimensions. Indeed, sustainable diets can be viewed as the interplay of a particular food environment and food system design, where consumption choices are made that can be regulated by policies (117). As such, policy can be pragmatically designed to act on one or more of these components. Finally, drivers of the food system can affect the health status of both human and planet, which in turn influences the sustainability status of the entire system (see **Figure 7**). Having insight in these food system dimensions and drivers are important to understand the policies aimed at realizing HSDs via a sustainable food system.

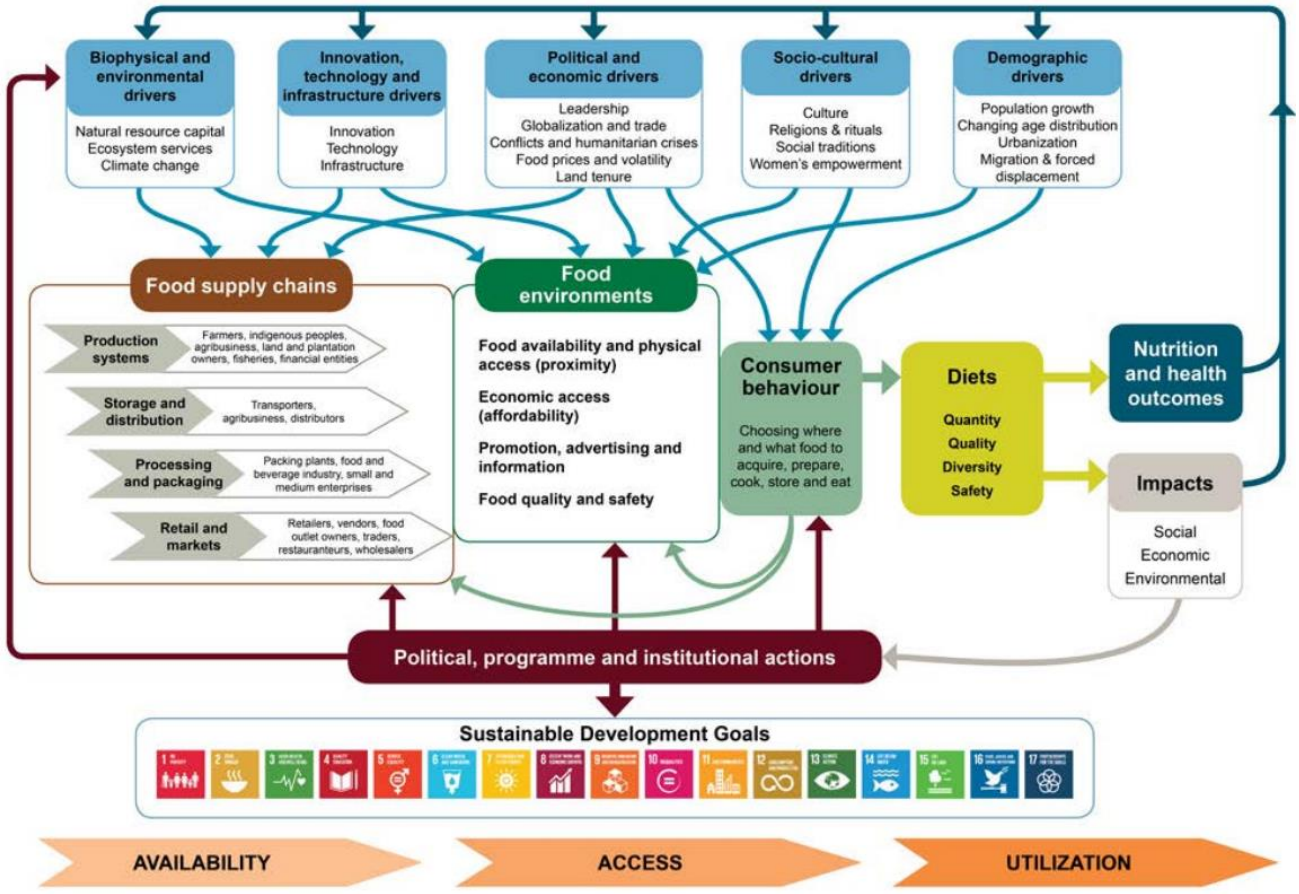


Figure 8. High Level Panel of Experts on Food Security and Nutrition Framework of the Food System (110). The entire food system is identified to have an influence on the outcomes of all seventeen SDGs, while these also have an impact on the different parts of the food system, e.g. on the food system drivers.

Health in the Food System

In order to effectively act on policies aimed at realizing HSDs, it is important to acknowledge that while health is not the main object of the food systems perspective, it certainly is a substantial cornerstone. Health can be placed differently: as a driver, a goal or an outcome-by-design, or as the *raison d'être* of the food systems (104,109,119,126). The FAO identified in 2012 already that health has a specific place in designing sustainable food systems, by making it one of the six headings, fitting to the 21st century public health vision "for food systems and food culture which realizes the consequences of under-, mal- and over-consumption" (55). Accordingly, the WHO has published two projects aimed at linking food systems and health promotion, by making health either the central goal of food systems in the 'Food Systems for Health' action program (127) (**Figure 9**), or the desired outcome in the 'Food Systems Delivering Better Health' framework (**Figure 10**), by identifying the pathways through which food systems negatively affect human health (128). Moreover, for the European food system it was claimed that a change in food system design by implementing a circular structure and partly taking up components of defined HSDs, large positive effects can be gained (120).

As such, it appears there is a reductionist tendency to operationalize health towards achieving HSDs in an integrative food systems approach: including certain dietary components, social structures and economic conditions are seen as the recipe towards achieving human health. Planetary health is promoted in order to sustain the possibilities of the food system as it is designed, and to respect planetary boundaries. **Figure 7** shows how the food system has a potential positive or negative impact on human and planetary health, which can be recognized in policy design in order to stimulate beneficial outcomes on health gain. A clear definition of health is therefore necessary, both for a descriptive and evaluative purpose in light of the implementation of HSDs using a food systems perspective.

1.3. Higher-level policy definitions of health: national DoHs

As described above, *scientific* literature presents a variety of definitions of health, and developments of interrelationships between these concepts. This diversity can be extended to a higher level of abstraction and specifications: *policies* aimed at improving human and planetary health. In order to get insight in the weighing of certain concepts or interpretation of European or EU policy on a national level, a total of 96 national health-related policies of eight European countries were analysed (see the overview in **Appendix II** – *Table II.i* and *Supplementary Data 1)*. The operationalizations of the higher-level policy definitions of health, understood as the national DoHs of the selected European countries, are depicted in **Table 1**. The national health policy documents (see also **Figure 4**) that serve as the basis for the formulations of the corresponding national DoHs are mentioned in the last column of **Table 1**.

It was clarified that many countries addressed HSDs as a component of their national health policy, together with other components or priority areas which are expected to benefit national health status. The interdependency between human health and planetary health could be extracted from the national health policies in a less complex interrelationship: low planetary health, i.e. decreased environmental sustainability and increased environmental hazards, can negatively affect human health status. Remarkably, contrarily to what was expected from **Figure 7**, environmental sustainability or planetary health was not explicitly mentioned in the national DoHs as influencing human health, or depicted as an individual goal with an inherent value in national health policy (**Table 1**). Environmental sustainability was specifically addressed in terms of environmental hazards that could negatively affect human health, which is only one type of feedback loop from **Figure 7**. **CHAPTERS 2-4** of this report address these references in more detail, as well as the motives that can be detected in the national health policies and DoHs.

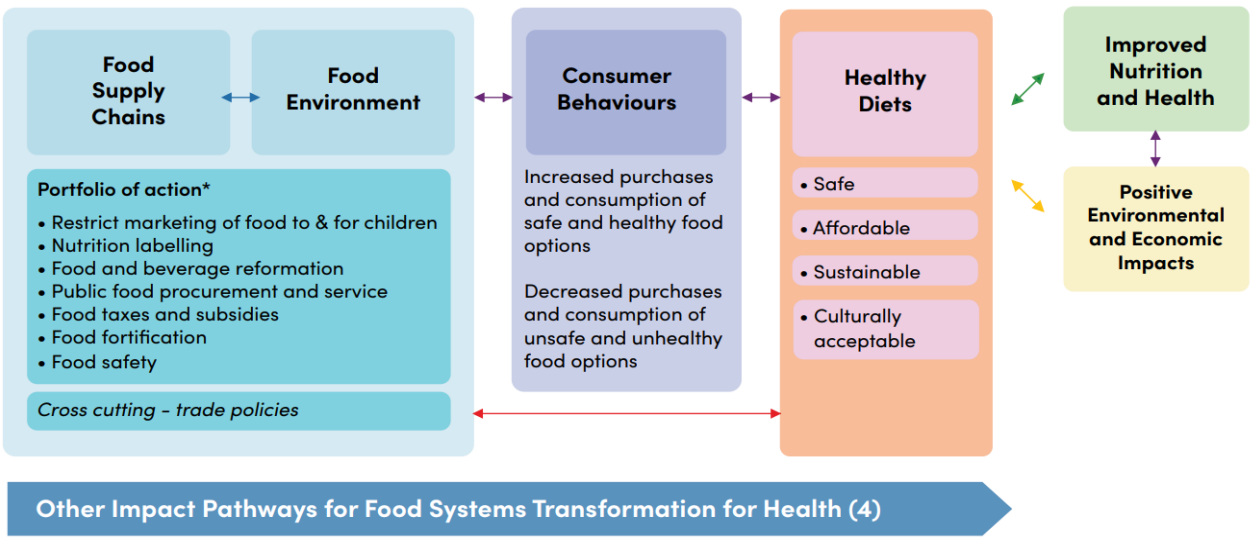


Figure 9. Portfolio of action for food supply chains and food environments to deliver healthy diets. From the WHO action program 'Food Systems for Health' (127).

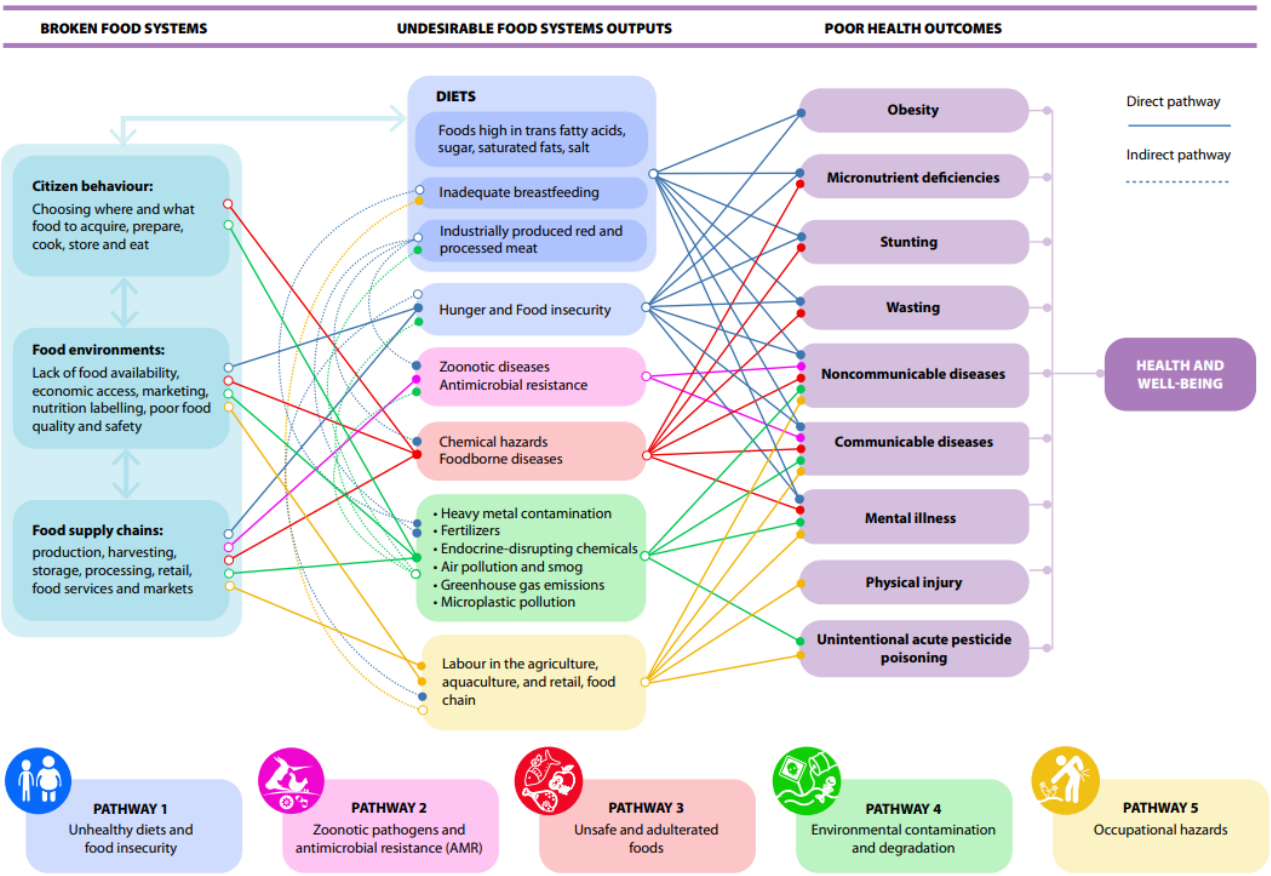


Figure 10. Five interconnected and interrelated impact pathways through which food systems negatively affect human health. From the WHO report 'Food systems delivering better health' (128)

Table 1. *Formulations of the higher-level national definitions of health (DoH) for the identified eight European countries, based on national policy documents related to human health.*

Political system	European country	National DoH	References
Conservatism	France	Health is determined by individual, environmental, social and economic factors which have an influence throughout an individual's life. It can be improved by life-long focusing on prevention, better treatment options and access to health care, improving social and systemic inequalities, and reducing environmental and systemic risk factors. The challenges to the health care system and inequalities are related to diseases, hazards, social, economic and environmental factors; the health risks associated with exposure to pollution and toxins; the risks of infection; chronic illnesses; new demographic, epidemiological and social issues; and the health risks linked to the health system itself. Health actions that increase capacity-building and decision-making in individuals' own health are preferred.	FR3, FR4, FR5
	Italy	Health is a constitutional right for everyone, and there is a public responsibility for its protection. Health inequality and access to health services are determined by gender, citizenship and socio-economic status. Health is being protected by preventing risks associated with food safety, food security and climate change, by preventing diseases and premature deaths, and by promoting healthy habits. This results in strengthening the vision that health is the result of a harmonious and sustainable development of human beings, nature and the environment (One Health). The environment, including lifestyles and social and economic conditions, is a fundamental determinant for psychophysical well-being and therefore for the health of people and populations. Adequate nutrition is a prerequisite for good health. The person and the communities are centralized in the context of health and social health planning.	IT2, IT3, IT7, IT8, IT9, IT11
Liberalism	Switzerland	Health is determined by perceived health status, life expectancy, years lived in good health, good access to healthcare, and diseases that can shorten life or impact quality of life. Many factors help determine a person's health: genetic predispositions, behaviour and lifestyle, environmental influence as well as socio-economic and cultural living conditions. Unequal health opportunities can be depending on socioeconomic status, which negatively impacts health. Individual health behaviour and conditions conducive to a healthy life are key factors to prevent chronic diseases and care-intensive health problems. The population's quality of life is preserved and promoted, including the constitutionally enshrined protection of health and personal development. A better environment benefits the whole population and increases health equity. Being in natural landscapes and protecting the environment has a positive impact on health.	SW1, SW2, SW3, SW6, SW8
	The Netherlands	Health is influenced by many factors, related to social, environmental or spatial, mental, educational and economic dimensions. To improve health, we focus on the first 1000 days, cross-domain work, and an adaptive approach. Health care and cure are central concepts that can be improved via the health care system, which is grounded in solidarity. Lifestyle improvement and prevention of chronic diseases are core issues to reduce the national burden of disease. Years spend in (perceived) good health are indicative for population health. Resilience, and the ability to adapt and self-manage are important concepts for improving and remaining a good health status. Aging vitally is a goal for health policy related to the increased ageing in society. Health inequalities are associated with education level, socio-economic status and ethnicity. A healthy diet needs to be introduced in relation to spatial planning and aging vitally, in order to stimulate a healthy lifestyle.	NL1, NL2, NL3, NL4, NL5, NL9, NL11

Socialism	Denmark	Health is a prerequisite for all to be able to live the life one wants, and Danes have a shared responsibility for their own and each other's health. Prevention of diseases and unhealthy lifestyles, strengthening the health care system, more time for individual patients and tackling the social inequality in health, are the current pillars to improve health in Denmark. Health, happiness and wellbeing go hand in hand. Quality of life can be improved when patients are active partners in their own disease management or treatment, and modern technology can be an outcome here.	DK1, DK2, DK3, DK4, DK5, DK6, DK9
	Norway	Good health is of great significance both in terms of an individual's quality of life and in terms of ensuring that society has a healthy and productive population which can contribute to economic growth and prosperity. Physical and mental health is the result of an interaction between individual characteristics and factors that may be protective or involve risk. Environmental health encompasses the factors in the environment that directly or indirectly influence health at any given time. Good health is a common responsibility, leads to good lives, and therefore diseases must be prevented and social inequalities reduced. A good and healthy diet can help in preventing diseases and make them easier to live with, and promotes mental health.	NW1, NW2, NW3, NW4, NW5, NW6, NW8, NW14
–	Czech Republic	Health is connected with wealth: what makes societies prosper and flourish also makes people healthy – policies that recognize this have more impact. It is set out as one of the basic human rights and its improvement is the main goal of social and economic development. Health does not originate in the hospital but in the family, at school, and the workplace – in fact at any place where people live, work, rest and grow old. Health is determined by a number of interacting factors, such as personal, social, environmental, economic and social factors, and can be promoted by reducing preventable diseases and premature deaths. Health is a societal value that is reflected in in all actions, in all policies, resulting in the interconnectedness between the health and the social system.	CZ1, CZ2, CZ3, CZ4, CZ6
–	Latvia	Health considers physical, mental, emotional and social health. The environment and animal health influence the health status of human. One is healthy when one eats healthily, regularly engages in physical activity, does not smoke, does not drink alcohol and other addictive substances, and does not engage in addictive processes. Healthy and active lifestyles need to be promoted, while the spread of infections, inequalities and social inclusion need to be reduced to increase health. Everyone has equal rights to receive the necessary health promotion, disease prevention and health care services. Lifelong good health is also one of the goals of targeted and personalised social services. The environment can provide risk factors for health and diseases.	LV2, LV3, LV5, LV7

CHAPTER 2:
MOTIVES AND CATEGORIZATION OF NATIONAL DOHS IN EUROPE

How is health operationalized in Europe in the national DoHs, and how can high-level national DoHs be qualitatively and quantitatively categorized according to concepts of health for specific contexts?

In order to understand whether the operationalized DoHs in Europe are relating to the overarching goal of sustainability (**Figure 7**), the national DoHs were analysed in more detail. From the defined eight DoHs (**Table 1**), specific motives were derived for the national health policies, specified by the goal of improving human health (**2.1**), and planetary health or environmental sustainability (**2.2**). To get more insight in differences and similarities between the national DoHs, I identified the presence of particular categories, and made a comparison with currently dominant concepts of health is made (**2.3**).

2.1. Motives and insights in Europe for improving national human health status

Several arguments, reasons and themes can be identified in the European policies for improving health on a national level. Based on the analysis of statements and goals of the national health policies focused on the goal of improving human health, these interrelations are schematically visualized in **Figure 11**. A cascade of priorities was identified by looking at the descriptions and arguments of the national health policies. There are different levels: core concepts from *European programs* bring about several *policy goals*, which have more specific *focus points* themselves. These focus points work together to realize the *main motive* in improving European health status, which can be recognized by several *outcomes*. It becomes clear that the *end goal* in health-related policies is of economic nature, and therefore that health is a means towards reaching this goal. Some outcomes, interrelations or feedback loops on earlier concepts are not mentioned in the national health policies, for example the impact of these policies or improvements in human health status on planetary health. With this figure and conclusion in mind, four motives and two insights can be identified in the coming sections. The rationales for this scheme are described in more detail and examples from the specific countries are provided.

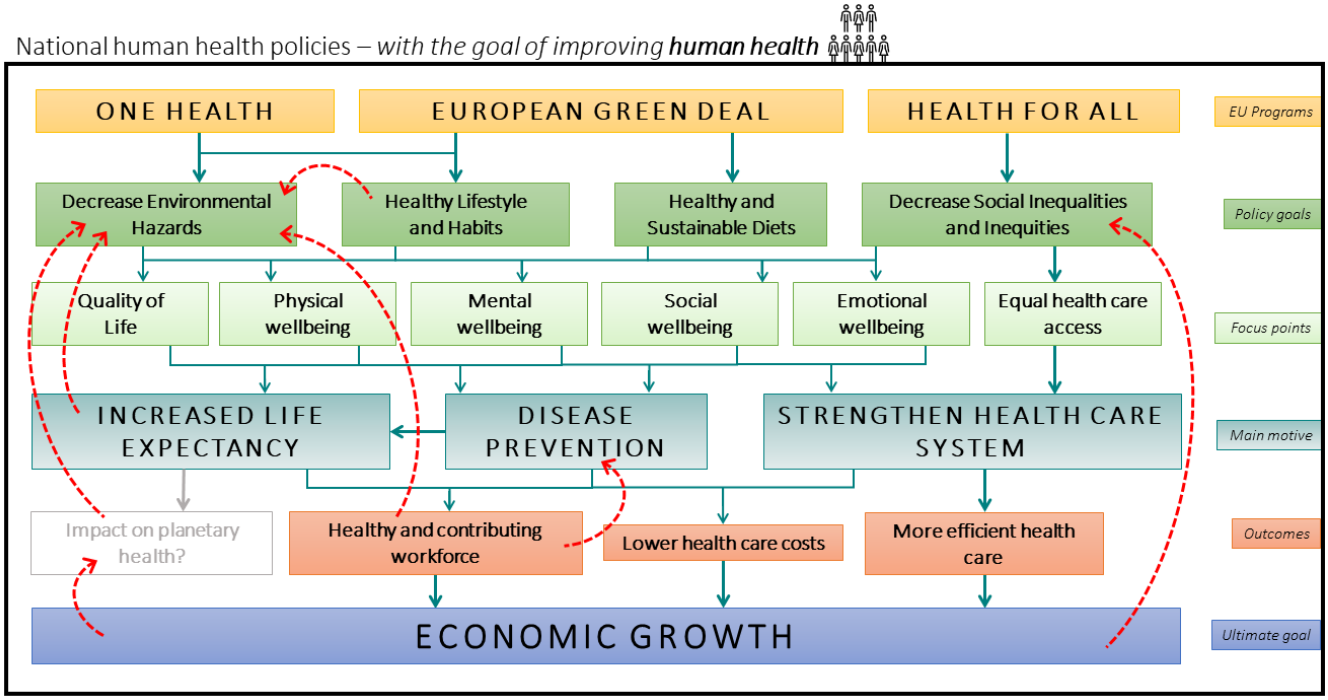


Figure 11. Cascade of priorities and motives for improving national human health status in European health policy. *The ultimate end goal of improving health in a European society explicitly appeared to be of economic nature. Stated policy plans and goals or outcomes of programmes are depicted in boxes in colours to the corresponding levels; absent or unstated goals or outcomes are depicted in grey boxes; relations and interdependencies are visualized with green arrows. Red dotted lines are suggested feedback loops based on policy documents and literature, which were absent in the policies. Improvement in these acknowledgements will likely have a positive or negative impact on earlier concepts or themes, while these interrelations were not addressed.*

Healthy and sustainable diets as a health goal

The first motive is the lack for most countries of available documents that aim to realize HSDs specifically, in which the DoH could be analysed. However, healthy diets, foods or lifestyles were in every country a clear goal of the policies that aim to improve public health or health status in society. Often, the European Green Deal was referred to as actuator to implement and promote HSDs, which is reflect by in **Figure 11**. As such, HSDs can be identified as a subsequent health goal in Europe. However, it was not possible to analyse the specific DoH in the way that was depicted in the research question (see **Figure 4**).

Norway was the only country which explicitly recommended "a sustainable and environmentally friendly diet" in 'The Norwegian National Action Plan for a Healthier Diet 2017-2021' [NW2-3]. The Netherlands also took environmental sustainability into account in their national dietary guidelines: foods that deliver health benefits were recommended, only after being reviewed on ecological impact of these foods and the food system [NL1-2] (129). Denmark addressed sustainability with regard to the health care system and risk factors for health due to climate change or emissions in the government health plan 'Make Denmark Healthier 2022' [DK2]. France did not mention sustainability in the national policy documents, but only in their foreign policy in the 'International Strategy for Food Security, Nutrition and Sustainable Agriculture' with regard to the development of sustainable food systems and agriculture [FR10]. The concept of sustainability was absent on the Italian websites or in documents related to health, except for the 'National Prevention Plan 2020-2025'. Here, sustainable development was related to the One Health approach and where the health sector was put forward to promote "sustainable consumption" [IT7]. Switzerland did not mention diet or sustainable consumption at all in their 'Health 2030 Strategy' or other documents, while sustainability was mostly aimed for in relation to the health care system [SW1-3, 8]. However, in one of the earlier goals in the Swiss 'Health 2020 Strategy', a focus on diets was introduced considering food safety and undernutrition or micronutrient deficiencies to "[i]mprove health protection by avoiding unnecessary medical exposure to radiation and by introducing supplementary health-observation systems to prevent the population from being exposed to contaminants or eating a diet deficient in vital micronutrients" [SW4]. The Latvian policies stated explicitly that a healthy diet or nutrition are contributing to health in an individual [LV3], and how unhealthy dietary habits are related to the development of NCDs specifically. Latvia uniquely mentioned dental health as being affected by dietary habits as well. Czech Republic stated nothing about diet or food in their current policies, but "unhealthy eating habits" were mentioned as an important risk factor for disease development and early mortality [CZ1-3]. The latter two countries did not mention sustainability in relation to diet or food practices, but focused on healthy or safe food to avoid risk factors for health.

Taken together, Europe showed a diversity in approaches to take up HSDs. Environmental sustainability as a component of these diets was only represented in the more northern European countries, while healthiness of the food or healthy eating habits was an omnipresent motive to improve the health status of the country's society. The latter was mostly operationalized as promoting a reduction of disease incidence. Sustainability was often mentioned in terms of health care system strengthening, in order to deliver more efficient and better health care to those who need it, or in terms of food or diets that are environmentally-friendly.

Physical health status and the individual

The second motive is a clear focus in all European countries on preventing diseases, the accompanied burdens and decreasing (early) mortality, both with and without relation to these diseases. An example could be found in for the Swiss 'Health 2030' policy:

> *"In later years, people tend to suffer from* ***health problems and chronic diseases*** *that often require intensive treatment. [...]* ***The risk of developing diseases that can shorten life or impact quality of life could be reduced.*** *These include cardiovascular diseases, cancer, diabetes, musculoskeletal disorders, respiratory diseases, dementia and mental illness. Key to this is* ***individual health behaviour*** *and* ***conditions conducive to a healthy life****." [SW1]*

The policies and plans that were not specifically aimed at reducing a certain disease or disease burden, were often related to reducing the risk factors that are associated with disease incidence. As such, reduction of both prevalence and incidence of diseases was promoted.

To summarize, the European countries specified their policies for improving health in society often in terms of reducing preventable diseases. This objective was worked out in national plans and policies related to diet, lifestyle, and health care provision, i.e. the documents that were researched in this report. For example: adherence to a healthy diet could reduce the incidence of obesity or diabetes type 2. The reason for aiming at lower disease prevalence, (early) mortality and increased life expectancy often came down to economic arguments: healthy people can contribute to society as absenteeism is reduced, and health care costs are reduced. The relation to the environment and animal health was mostly identified as invasive or in terms of risk factors. Therefore, the anthropocentric bias on improving health was clearly apparent. These interrelations are showed in Figure 11, sectioned in the different goals and outcomes of the cascade, which ultimately ends in the goal of economic growth. The insights that gave rise to this second motive are elaborated in the sections below.

Disease prevention

The focus on disease prevention was also apparent in the other countries. The French 'National Health Strategy 2018-2022' aimed to "promote a behaviour which is favourable to health", which was operationalized by health promotion actions, health education and preventive actions [FR3]. The latter was specified by primary, secondary and tertiary prevention, of health problems or diseases. Moreover, this Strategy mentioned three of "the enormous challenges the health system faces" which are related to diseases: the health risks associated with exposure to pollution and toxins, the risks of infections, and chronic illnesses [FR5]. Czech Republic addressed the citizens' responsibility to prevent diseases, by taking up beneficial health behaviours like proper nutrition, eating habits, and physical activity [CZ1]. In Italy, a healthy diet was promoted by the National Institute of Health to prevent certain specific diseases: "[e]ating in a correct and balanced way helps to prevent and treat some pathological conditions such as obesity, hypertension, diseases of the cardiovascular system, type 2 diabetes and certain types of cancer" [IT9]. Switzerland resonated this view by aiming for a modern and high-quality and financially sustainable health system accessible for everyone in their 'Health 2030' plan [SW1]. This policy highlighted the discrepancy between health and sickness in a unique way by focusing on technology:

> *"Good health is key to a person's* ***quality of life*** *and to being able to* ***live in dignity****; this is true at all stages of life. It is set to play an even greater role in future, as* ***technical advances create new diagnostic and treatment possibilities that will further blur the boundary between what is considered sick or healthy"*** *[SW1]*

Denmark even referred to illness as "the biggest barrier to living the life we dream of, [which] strikes socially unequally, and inequality in health starts early in life" [DK1].

Environment as a risk factor

The environment was also addressed in the context of disease prevention in European health policy: it was well-described how the environment can be a risk factor for human health, in terms of toxins, (air) pollution, food-related contaminants, microbial contamination, zoonoses or the consequences of climate change [e.g. FR5; IT7; NL3; SW1,6; NW2,3,6; CZ1; LV3,5,6]. The influence of the environment, i.e. environmental or planetary health, on human health was both positively and negatively indicated as one of the four priority health care issues. On the one hand, health promotion (physically and socially) can be stimulated by the living environment and social structures which seduce people to move and play, make healthy choices, relax or meet each other. On the other hand, health protection (physically) can be stimulated by focussing on the environment as a disease burden in terms of air pollution and noise.

This positive influence of environment in terms of nature and landscapes was reiterated in the policies of Switzerland [SW2,6], Norway [NW5] and Czech Republic [CZ3]. Switzerland mentioned: "A better environment benefits the whole population and increases health equity" [SW3], while Norway identified connecting with nature as specifically promoting mental health [NW5], and Czech Republic prioritized

supportive environments to improve population health [CZ3]. However, the influence of diets, health status or human actions on the environment or planetary health status was not taken along in any of the policies – with the exception of the consumption of sustainable diets, which are environmentally sustainable by design. This can be identified in Figure 11 as a missing motive or goal (grey box), and a feedback loop (red dotted arrow). As such, it appears that the human health status was the primary priority and that a holistic perspective was partly present.

Increased life expectancy

Additionally, several countries included an increased life expectancy as a health goal in the national policies. In 2015, Norway set several public health objectives, of which one was to become in the top three countries in the world with the highest life expectancy [IT9; NW16]. Another objective was to have added years of life in good health and well-being for all. Both were aimed to be improved with the Norwegian 'National Action Plan for a Healthier Diet 2017–2021' [NW3], in which a good and healthy diet was stated to prevent chronic disorders and make them easier to live with [NW8]. Only the latter goal was resonated in the Dutch 'National Note Health Policy 2020-2024' [NL3], which specified the goals in the Coalition Plan for that period. Here, the higher life expectancy was only identified as a driver to change the health care system and as reason for the increase in NCDs in society.

The Netherlands therefore defined "ageing vitally" as one of the four priority health care issues which will be acted on between 2020 and 2024. People need to be able to participate in society, aligned with their capacities, to increase their quality of life and wellbeing, and possibly be able to live with their chronic diseases, according to the Dutch. Although the Swiss "perceive their health status as good or very good" until the age of 70, Switzerland had a comparable reasoning in their 'Health 2030' policy: "Ensure healthy ageing" by improving prevention of non-communicable diseases and promoting child and adolescent health [SW2]. Norway explained the reason for this focus on ageing in good health and quality of life, and implementing a healthy diet: "(…) for the elderly to both meet their needs and use their resources. (…) With the right competence, the service will be able to prevent mistakes, strengthen the individual's health and quality of life and save time and costs" [NW8]. However, the impact of this longer life expectancy on the environment or planetary health was not described by the policies, which is depicted as a missing feedback loop in Figure 11.

The status of individuals in society

Ultimately, the contribution of individuals to society is important for prioritizing health improvement, which was a trend visible in all policies. Czech Republic made this the most explicit, by stating:

> *"It is no exaggeration to say that **disease is a drain on the national economy** and that **'investment in health' has a direct impact on other economic sectors and prosperity of society**. From a macroeconomic perspective, interventions in the chosen areas will lead to the basic preconditions for development - i.e. **ensuring a healthy workforce**." [CZ1]*

Some countries also referred to the improvement of equal access to the health care system in order to increase population health, since social and environmental inequalities could result in less access to appropriate or timely treatments [FR3,5; IT7; SW1; NL5,11; DK1; CZ1; LV3]. This approach focused on the provision of treatments as the main purpose of the health care system, which again implied a focus on diseases or negative health states that require these treatments. The Italian National Institute of Health stated:

> *"Many scientific studies have shown the importance of **prevention and health promotion to reduce the incidence of diseases and mortality** and consequently **the costs to the National Health Service and society** and to promote the maintenance of well-being and quality of life" [IT9].*

Norway stated something similar by reiterating that the importance of a

*"…**systematic, targeted effort to prevent malnutrition will in itself be cost-saving.** A better follow-up of nutrition in the elderly in the municipalities can help **prevent malnutrition**, **illness** as a result of malnutrition, **further functional decline** and **admission to nursing homes or hospitals**." [NW8]*

This showed the connection between health status in terms of diseases and mortality, and economy in terms of health care costs. The social dimension of health is very influential here, according to all policy documents that referred to this social inequality in relation to health status, health care access or risk factor exposure.

Patient- or person-centred approach

Related to health care (system) reforms, countries showed a patient- or person-centred approach in health care delivery as a means to strengthen the health care system and improve health care efficiency. As part of these plans, Latvia [LV3], Czech Republic [CZ6] and Italy [IT7] mentioned the goal to specifically increase decision-making capacities or capacity-building of the people in the country. Italy furthermore noted the "centrality of the person" as one of the organizational principles of the National Health Service (SSN):

*"[It is] **expressed in a series of rights that can be exercised by individual citizens** and which represent duties for all health professionals, from doctors to those who program territorial assistance. The main rights are: **freedom of choice** of the place of treatment; the right to be informed about the disease; right to be informed about the therapy and to oppose or **give consent (informed consent)**; the patient's right to **be "taken care of"** by the doctor or the health team throughout the therapeutic process; right to **privacy**; the duty of health planning to put the **protection of citizens' health** (which is the main reason for the establishment of the NHS) **before all choices, compatibly with the economic resources available."** [IT3]*

Again, the Italian health service was specified to treatments and diseases. This tendency is apparent for other countries as well. Norway stressed that

*"[w]hat is important for the individual should be the starting point for the health and care service, also in the work with food and nutrition. A **person-centred approach** involves addressing the **breadth** of physiological, psychological, social, cultural and religious needs associated with food and meals." [NW8]*

Also The Netherlands focused on an individual approach, by introducing the policy goal of "Suitable Care" [NL11] and "the Right Care at the Right Place" [NL12] by stressing prevention, cure, care, working on medical-ethical questions, cooperation and space for everyone working in health care.

Multidimensional and integrated view on health

The third motive is an integrated and interdisciplinary view on health, which was explicitly apparent for many countries. Besides the physical dimension of health, interpreted as incidence and prevalence of diseases in the previous section, many more dimensions were addressed in the policies. The person-centred approach, which was identified above for many countries, already necessitated a domain-transcending manner of dealing with health improvement.

Dimensions of health

All countries mentioned the physical, mental and social dimension of health. Latvia extended this with the emotional dimension, by addressing bullying among children, domestic violence, using addictive substances, stress, tension, depression and insomnia, which are all prevalent health problems in Latvia [LV2,3]. Moreover, prejudices against people living with mental illnesses was addressed, as this was stated to possibly hinder the possibilities of receiving professional assistance in case of mental and emotional disorders, together with insufficient availability of high-quality information [LV3]. Again, a focus on disorders or medical diagnoses was apparent here. The Czech 'Health 2030' plan referred to the 1948 WHO DoH and describes it as:

*"… a useful definition, but it is **more about direction** and getting **as close as possible** to that goal. Thus, health is not a goal in itself, but **a means to the realization of harmonious human development**." [CZ1]*

This showed a unique perspective on operationalized national health in view of the 1948 DoH, which was linked to economic development later in the plan: "Health is connected to wealth" [CZ1, see also the Czech national DoH]. Norway phrased this focus on an overarching goal in a comparable manner:

> *"**A population in good health is an objective in itself, and is one of society's most important resources.** A focus on public health work is a **foundational investment** for better lives and a sustainable society. […] Good health is of great significance both in terms of an individual's quality of life and in terms of **ensuring that society has a healthy and productive population which can contribute to economic growth and prosperity**." [NW6]*

Explicitly broad perspective on health

The cross-domain approach of Positive Health was broadly taken up in the Dutch health policies. In the National Statement Health Policy 2020-2024 [NL3] this concept was used as an umbrella term, and referred to as a "connector" for different domains, policies and organisations on local and regional level, like health care and wellbeing organisations, health insurances and municipalities. It was stated that Positive Health and comparable concepts for vitality and resilience could help making a difference between "not being able to" and "not wanting to", and to use appropriate timing and clear language:

> *"It is not only about what someone **is not able** to do anymore, but about what someone **is able** to do, **finds important** and **possibly wants to change**. Above all, it is not only about the physical aspects of health, but also about the **capacity to adjust, quality of life, self-manage, resilience, participation and meaningfulness**." [NL3]*

The Netherlands emphasized the necessity to look at health from a broader perspective, by including education, sports, housing, social security and living environment. Since "vulnerable people" live shorter and less years in good health, the Coalition Agreement 2021-2025 agreed to keep health care affordable, available and accessible [NL5], in order to create a healthy, fit and resilient generation in 2040 [NL12]. In this spirit, the programs aimed at reducing health disadvantages are based on three pillars: a focus on the first life phase, cross-discipline working and an adaptive approach [NL11]. Switzerland also addressed this broad perspective, by stating that "the state of people's health in Switzerland is determined by up to 60 per cent by factors not related to health policy", including education, social security, employment situation or income, the environment, traffic and living conditions [SW4]. The country proposed an interdepartmental collaboration at the federal level to address the improvement of these social and environmental determinants. Italy also planned an intersectoral approach to address alliances and synergies between different forces, in order to act effectively on all health determinants [IT3]. Italy specified the necessary broad approach to health as followed [IT7]:

> *"Affirming the centrality of the person and communities in the context of health and social health planning means **recognizing that individual and collective health is a process whose balance is determined by social and economic as well as biological factors**."*

Wellbeing and quality of life

Additionally, wellbeing or quality of life was frequently mentioned as being part of health, or even comparable to health for individuals, since the terms were used interchangeably. This was done mostly in reference to the 1948 WHO DoH, or a broader description of the health state of the people. Section **2.3.** elaborates more on this. For example, Italy mentioned in the 'National Prevention Plan' that the environment "is a fundamental determinant for psychophysical *well-being and therefore for the health* of people and populations" (emphasis added, IT8]. In relation to prevention and health promotion, the Italian National Institute of Health emphasized its importance "to reduce the incidence of diseases and mortality and consequently the costs to the National Health Service and society and to promote the *maintenance of well-being and quality of life*" [emphasis added, IT9]. Here, we see how health was considered different from well-being and quality of life, but that the concepts were related in a positive manner.

Capacity-building and strengthening people's skills in society was mentioned in relation to improvement of wellbeing here, as well as by Switzerland [SW4], which focused on self-competence in health issues. The Swiss 'Health 2020' policy described that it's focus is "people and their well-being", and that the health system "needs to continue being developed around them and their needs" [SW4]. Moreover, its vision is that "[m]ore people stay healthy or enjoy a high quality of life despite chronic illness" [SW8]. The Danish health policy for 2022 emphasized that the health and well-being of their children and young people needs to be ensured [DK1]. Norway referred to a healthy diet as important element to promote physical and mental health: "Good food and good meals create well-being in kindergarten, at school, in the nursing home and in the hospital" [NW4], which "makes us stronger and thrive better" [NW8]. The Norse [NW4,7], Latvian [LV2] and Czech [CZ1] plans mentioned well-being or quality of life in relation to psychosocial, emotional or mental health, and addressed this as specific goals to be improved. Czech Republic 'Health 2020' policy focused on the societal and economic relevance of good health, which can promote well-being:

> *"**Empowering people** to have control over their health and its determinants strengthens communities and **improves lives**. Without people's active involvement, many opportunities to promote and protect their health and to increase their well-being are lost. (…) **What makes societies prosper and flourish also makes people healthy** – policies that recognize this have more impact." [CZ3]*

Welfare and wealth

This motive of linking welfare or wealth to health status was apparent for several countries, both in a causal as well as an inclusive manner. Czech Republic made this the most explicit in the 'Health 2020' plan by stating: "Health = wealth. Health is a major societal and economic resource and asset. Good health benefits all sectors and the whole of society" [CZ3]. The Netherlands also related health to welfare by referring to the goal and reasoning for reducing differences in health:

> *"**The rich and higher-educated often live longer and in better health.** […] Moreover, from a recently published Monitor Broad Welfare from the Central Bureau for Statistics (CBS) it was concluded that population groups with a **low social economic status** and a non-western background **share less in broad welfare**" [NL3].*

For Denmark this motive was apparent in a governmental bill put forward that obliges current and future governments to monetarily safeguard welfare when the population (amount of children and elderly) is increasing [DK1].

Health in all Policies

The "Health in all Policies" principle aims to address health promotion by including non-health policies. This was explicitly mentioned by Latvia [LV3]. The goal of the Czech 'Health 2020' program was specifically described as "[striving] to contribute to addressing the complex health issues of the 21st century with respect to economic, social and demographic developments, primarily by way of disease prevention and health protection and promotion" [CZ3]. However, these dimensions were not apparent anymore in the 'Health 2030' program [CZ2]. Moreover, while the importance of the environment to create resilient communities was confirmed by the Czech priority of the 'Health 2020' plan of creating "supportive environments" [CZ3], this was not explicitly present in the 'Health 2030' plan. Resilience was mentioned in relation to ecosystems and health care systems in the subsequent goals, but was not explicated in terms of communities anymore.

The social dimension of eating and healthy diets were also highlighted in many policies. For example, 'The Norwegian National Action Plan for a Healthier Diet 2017-2023' stated:

> *"An **unhealthy diet is associated with social inequality**, and may lead to **disease and a poor quality of life**. (…) The nutritional value of what we eat is important, but it is **just as important to make mealtime a meeting place for social interaction and inclusion**." [NW3]*

Both Czech Republic and Switzerland identified the preserving and improvement of population health and quality of life as the main function and responsibility of the State [CZ3,4; SW2]. Switzerland extended the State's responsibility for human health improvement even to personal development, quality of life and being able to live in dignity [SW2]. The constitutional and fundamental right to health was literally reiterated in all countries, except for Norway, although their focus on health for the entire population appears to presume it.

Digitalization of health care

Several countries also addressed digital health care, or E-health, in their national health policies. Mostly this was mentioned to address the need to develop these infrastructures and new ways to provide health care, which are fit for the future. Latvia stated that the implementation of the E-Health programme (electronic health record; e-booking; e-prescription etc.), according to the policy decided by the State, is the activity and responsibility of the National Health System [LV9]. Switzerland draws a comparable argument in their overview of national health strategies [SW5]. France [FR1,2], Italy [IT5] and Denmark [DK10] had a separate policy document about digital health. The Netherlands referred on the one hand to digitalisation of health care as a burden for the health care system [NL15], but on the other hand as a policy ambition and goal to improve elderly care at home [NL14, NL15].

Concludingly, an integrated approach to health was apparent in the policies of most countries, since various dimensions of health were addressed. However, the interactions and feedbacks between these dimensions and subsequent policy goals were almost never elaborated to the extent of linking human health and planetary health. Health was seen as an overarching concept by recognizing the need for a Health in all Policies approach, and the economic end goal is established in this approach. The links with wellbeing and quality of life were still of different natures, keeping the utopian character of the multidimensional "complete health and wellbeing" of the 1948 WHO DoH alive in current policies.

One Health

One specific integrated view on health is the fourth motive: the concept of One Health, which was frequently addressed in the national policies. The Dutch National Institute for Public Health and the Environment, the RIVM, had a specific section on their website dedicated to this view [NL9]. The website referred to the One Health portal as a digital platform to facilitate human-veterinarian information transfers and cooperation, for knowledge institutes or professionals in the field of zoonoses and its risk factors. However, an official report on this subject was currently still lacking. Moreover, while this concept of health was generally present in the governmental policies, the specific One Health concept remained absent in the latest coalition agreement for 2021-2025, despite the description of its integral character by the necessity to look with a broader view to health [NL11]. Latvia mentioned this tripartite interrelationship in the context of safe and high-quality food. Its 'Public Health Guidelines for 2021-2027' referred to the animal health sector as having an important role in maintaining human and animal health, as well as food supply chain continuity and creating sustainable food systems [LV3]. There was even a specific plan available for reducing antimicrobial resistance by using a One Health approach [LV9]. Italy, on the other hand, addressed One Health in the National Prevention Plan 2020-2025 by taking up "a vision that considers health as the result of a harmonious and sustainable development of human being, nature and the environment" [IT3]. Again, the necessity for an intersectoral and multidisciplinary coordinated approach to health promotion was put forward here.

All in all, there was often not a clear description present in the national health policies what was exactly meant with One Health. If it was present, however, there was a redirection to the European implementation of the concept in policies and plans. The core elements of the umbrella terms were then reduced to the concepts referring to "human health", "animal health" and "planetary health", although not as elaborately as described in literature (25). The main goal of addressing One Health in European health policies appeared to be to improve human health (see Figure 12). The impact of human health status on the other two dimensions in this model was not described, and therefore it was considered a receiving concept.

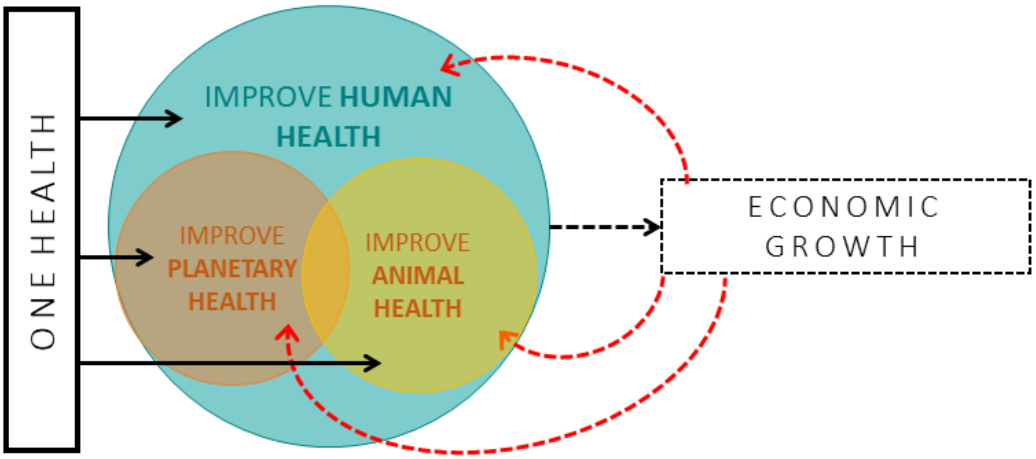


Figure 12. Visual representation of the goals of One Health in European policy. *Although it aimed to improve human health, planetary health and animal health (black arrows), health policies appeared to address to improve the latter two in order to improve human health. The final goal of human health improvement was economic growth (black dotted arrow), but in European policy the description of the feedback of this progress on the dimensions of One Health was lacking (red dotted arrows). As such, the proposedly integrative One Health approach appeared to address human health improvement.*

Absence of a food systems perspective

A first insight is the absence of a food systems perspective in most national policies related to health. A healthy (and sustainable) diet was often mentioned as objective for health improvement, as described above. However, this was only one domain of the food system: consumption and consumer behaviour. The relation between the food systems domains, national DoHs national health policy will be elaborated on in CHAPTER 4. Two countries referred to the food system in their national policy documents. The Dutch Health Council mentioned the dependence of reaching the global sustainability goals on the organisation of the food system, in a meeting about food, health and sustainability [NL2]. It mentioned that the recommendations from the EAT-Lancet report were aligning with the current Dutch 'Recommendations for Good Food 2015', of which an update is expected in 2023. Latvia mentioned the food system in relation to the One Health approach, particularly focusing on the animal health sector, which "plays a fundamental role in maintaining human and animal health, in the continuity of the food supply chain and in the sustainability of food systems, making a significant contribution to public health." [LV3].

Also specific food system domains were touched upon in the health policies, for example the food environment and consumer behaviour, as described by the social dimension above, diet, or human rights. Especially the latter dimension got considerable attention in some countries. This as described in relation to food security or nutrition security by Italy [IT8] and Norway [NW4], but also in terms of protecting the (constitutional) right to health for all people, for example by Italy [IT3], Latvia [LV3], Czech Republic [CZ3], Switzerland [SW2] or Denmark [DK1]. Moreover, social inequalities and health inequalities were mentioned as barriers to access (suitable) health care and improve health status in various countries [FR3; IT3,9; SW1,3; DK1; NW6; CZ3,6; LV2,3]. As such, reducing these inequalities were important goals for health policy, which were specifically stated in several national policies as well [FR3,4; SW4; DK3; NW3; CZ3; LV2,3]. This motive can also be identified in Figure 11, where the impact of reduced health inequalities was positively indicated on the health care system, and eventually, on economic growth.

Nevertheless, the integral perspective that the food system aimed to promote, connecting human and planetary health in the eye of sustainability (Figure 7), was not apparent in most of the European policies on health.

International health policies

A second insight is that there were also international or global health policies or strategies found for some countries when looking for the national health plans, e.g. for France and Norway. In summary, it can be stated that some countries explicitly recognize a broader definition than their national DoH. These policy documents were not included in the analysis, to get a better view on the national DoH from this country's perspective specifically. Besides, the health goals and action plans described in these programmes were not taken along in CHAPTER 3 of the analysis, as these policies were most likely to be implemented outside the European country of interest. Worth mentioning however, is France's objective to develop sustainable agricultural and food systems in the international strategy for 'Food Security, Nutrition and Sustainable Agriculture – France's Action 2019-2024' :

> *"Faced with the consequences of climate change and the erosion of biodiversity, it will be* ***critical to develop and promote the transition towards sustainable agricultural and food systems****, from an economic, social and environmental perspective* ***to meet the challenges of climate change as well as to ensure the food security and nutrition of populations****." [FR10]*

This view was not reiterated in their *national* health plan, or in those of other European countries. Moreover, concepts of food security and nutrition were not explicitly mentioned in national health policies, except for Italy's 'National Prevention Plan's Macro-objective "Environment, Climate and Health" in relation to risk factors linked to climate change [IT8], and Norway's action plan for a better diet which aimed to contribute to sustainable and environmentally friendly development [NW4]. Besides, the universal right to health was mentioned in international or global health policies in European countries. As such, the human rights perspective was more represented in these policies, leaving an apparent difference for national and global action.

2.2. Motives in Europe for improving planetary health status

Based on the motives described in 2.1, a different network of motives and insights was identified for improving planetary health, since specific parts of the European national health policies focused on improving planetary or environmental health status. The reasons for these actions are described in Figure 13, which shows a cascade of priorities and motives comparable to Figure 11 for improving human health. The policies referred to several European programs that aim at improving or benefitting planetary health or the environment, which are elaborated in CHAPTER 3. The subsequent goals of these plans were to decrease environmental hazards, introduce healthy lifestyles and habits and HSDs, and decrease social inequalities and inequities, which together aimed at increasing environmental sustainability, as described along different levels in Figure 13. The national health policies focussed on the decrease of environmental hazards as the most important outcome of these plans, as this contributes to a healthy society and more efficient food production, since there will be less negative effects from natural environments.

However, other outcomes – positive or negative consequences – were not enlightened in the national health policies. Feedback loops were missing, which would describe what the effects of the outcomes will be on the existing programs or situations. The same accounted for the lacking descriptions of the improvements in a healthy society or more efficient food production. As described above, the ultimate goal of improving human health in Europe explicitly was to stimulate economic growth. Therefore, implementing this part of the cascade of priorities for improving human health (Figure 11) in these policies aimed at improving planetary health (Figure 13), it becomes clear that the main goal of these policies implicitly is to promote human health. As such, the ultimate end goal of these policies addressing planetary health could be assumed to be of economic nature as well. This was neither described specifically in the analysed policies, nor were the effects (feedback loops) described of economic growth on the possibilities to implement policy plans or the reduction of environmental hazards.

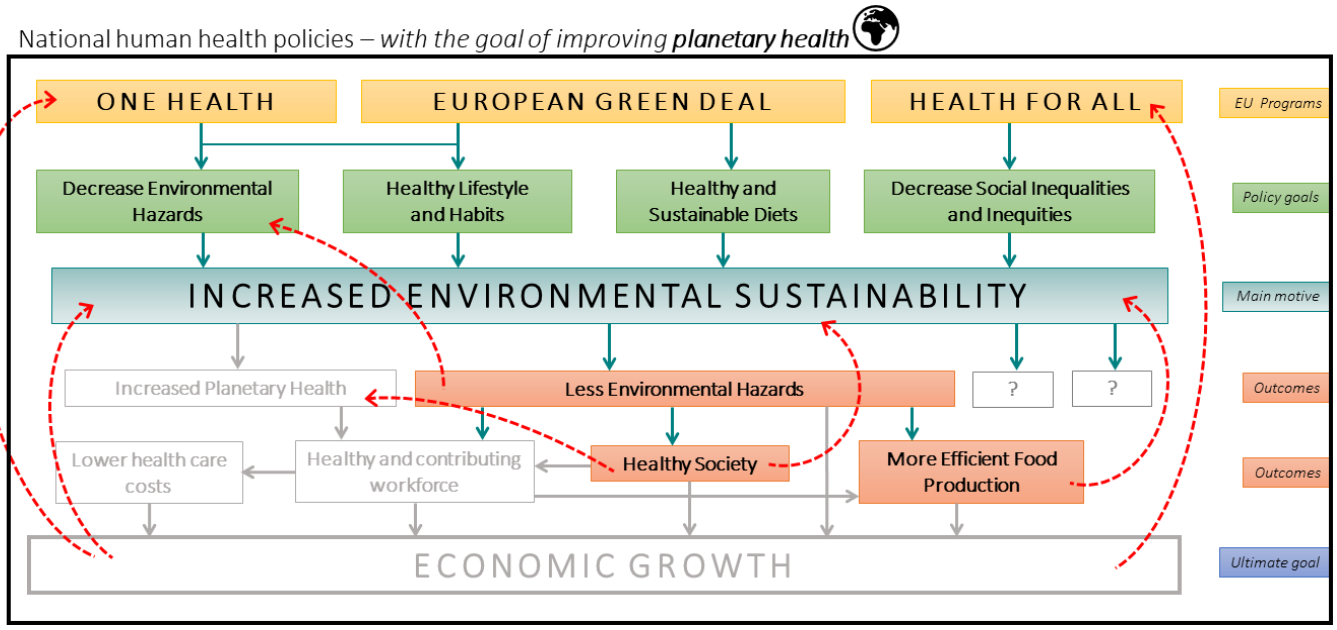


Figure 13. Cascade of priorities and motives for improving national planer health status in European health policy. Combining parts of Figure 11 here, the ultimate end goal of improving planetary health in a European society implicitly appeared to be of economic nature, mediated by human health improvement. Stated policy plans and goals or outcomes of programmes are depicted in boxes in colours to the corresponding levels; absent or unstated goals or outcomes are depicted in grey boxes; relations and interdependencies are visualized with green arrows. Red dotted lines are suggested feedback loops based on policy documents and literature, which were absent in the policies. Improvement in these acknowledgements will likely have a positive or negative impact on earlier concepts or themes, while these interrelations were not addressed.

2.3. Categorization of European national DoHs

After having identified the different reasons and motives for human health and planetary health promotion in European policy on a precise level, there is a need for comparing the eight national DoHs on a more abstract level. Using the seven guiding questions by Haverkamp et al. (33,35) to determine the best suitable heath concept in a certain context, the eight national DoHs were qualitatively compared to existing health concepts, based on Table 1 and the motives in 2.1. and 2.2. Subsequently, these categorizations were quantitively scored. By doing this, the connection between operationalized DoH and scientific DoH was established. This helps in organizing the national DoHs and European tendencies, which can support effective policy-making. The results of the combined qualitative-quantitative approach can be found in Table 2 and the spider map of Figure 14. The definitions of the dimensions can be found in Appendix VII.

Currently dominant health conceptualizations

Haverkamp et al. (33,35) selected five health concepts for their categorization, as these are the "most prominent". Two of them have already been addressed in this report: the 1948 WHO DoH and the Huber DoH, i.e. Positive Health (see CHAPTER 1 and Figure 6). The other three concepts were elaborately described by Haverkamp et al. (33) in their practice-oriented review on the concept of health. Those descriptions of the DoHs were used for the analysis below, accompanied by the Meikirch Model (CHAPTER 1).

The Boorse DoH defined health as the complete absence of disease, where disease was defined as a state that "reduces one or more functional abilities below typical efficiency". As such, "health" or "being free from disease" is a purely descriptive quality of an organism, and is not necessarily valuable in itself. The Nordenfelt DoH was more explicit about the value of health for persons, and defined health as the second-order ability to achieve "vital goals." These goals are where people's action is oriented to and whose accomplishments are necessary to achieve minimal happiness, i.e. a condition in which there is a satisfactory state of all things that a person addresses high priority to. The Venkatapuram DoH emphasized capabilities in defining health, and described it as a capability to achieve a set of central human capabilities as described by Martha Nussbaum as necessary constituents of a good human life.

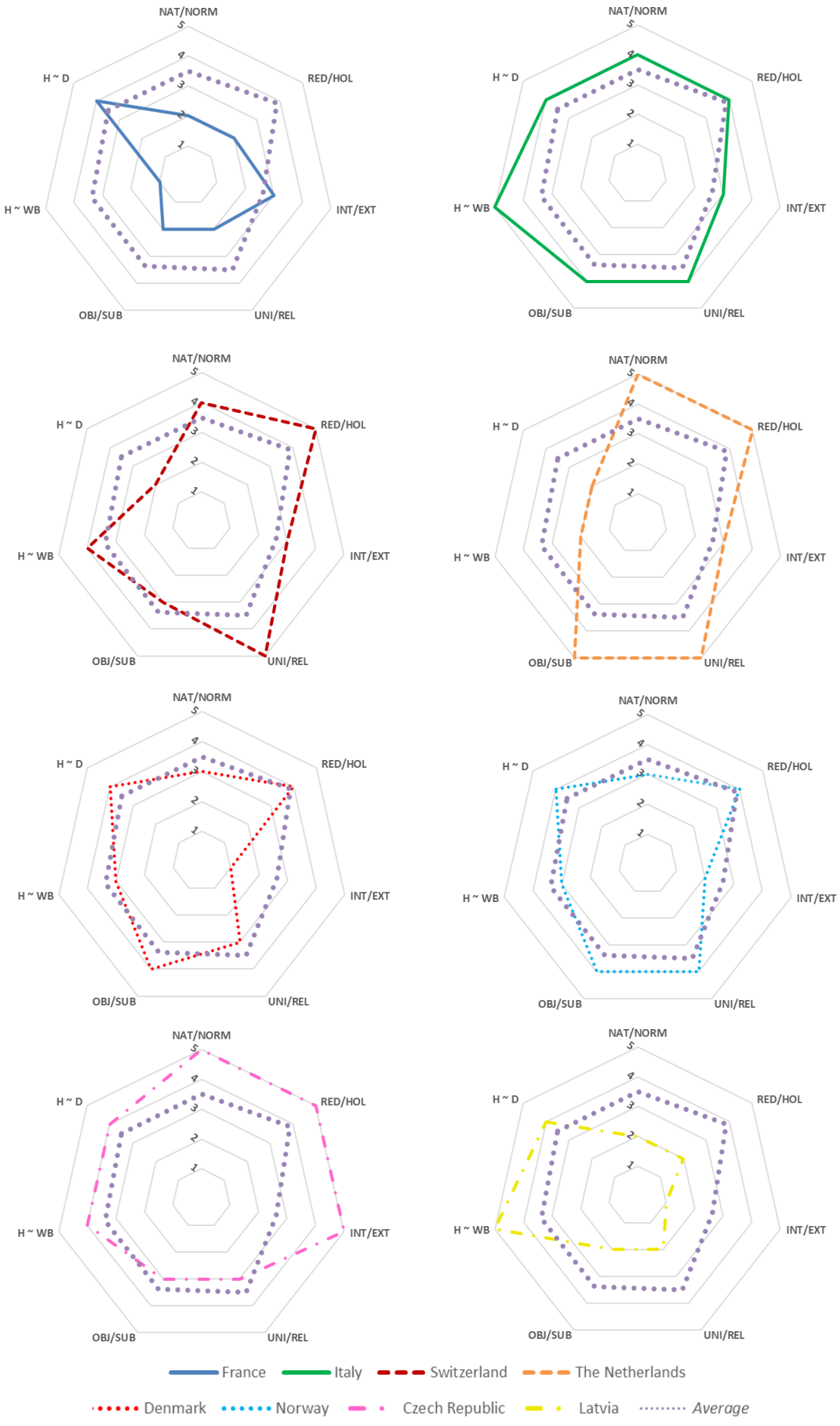


Figure 14. Quantitative classification of eight national DoHs, based on the guiding questions by Haverkamp et al. (33,35) ***and Table 2.***
The dimensions are described as [dimension scoring 1]/[dimension scoring 5]. The average score of all countries is depicted as well. NAT = naturalism; NORM = normativism; RED = reductionism; HOL = holism; INT = internalism; EXT = externalism; UNI = universalism; REL = relativism; OBJ = objectivism; SUBJ = subjectivism; H = health; WB = wellbeing; D = disease; ~ = relation between.

Table 2. *Qualitative classification of national DoHs, based on guiding questions, corresponding aspects and quantitative scoring of the national DoHs as described in* ***Appendix III*** *NAT = naturalism; NORM = normativism; RED = reductionism; HOL = holism; INT = internalism; EXT = externalism; UNI = universalism; REL = relativism; OBJ = objectivism; SUBJ = subjectivism; H = health; WB = wellbeing; D = disease; ~ = relation between.*

	France	Italy	Switzerland	The Netherlands	Denmark	Norway	Czech Republic	Latvia	*Average*
NAT/NORM	2	4	4	5	3	3	5	2	*3,50*
RED/HOL	2	4	5	5	4	4	5	2	*3,88*
INT/EXT	3	3	3	3	1	2	5	1	*2,63*
UNI/REL	2	4	5	5	3	4	3	2	*3,50*
OBJ/SUB	2	4	3	5	4	4	3	2	*3,38*
H ~ WB	1	5	4	2	3	3	4	5	*3,38*
H ~ D	4	4	2	2	4	4	4	4	*3,50*
Most resembling health concept	*Boorse/ WHO*	*WHO/ Meikirch Model*	*Meikirch Model*	*Positive Health*	*WHO/ Nordenfelt*	*WHO/ Nordenfelt*	*Venkata-puram*	*Boorse/ WHO*	*WHO/ Nordenfelt/ Meikirch Model*

Dimensional comparison of national DoHs

Remarkably, two of the three types of welfare states were showing comparable patterns (see **Figure 14**). The liberalist welfare states Switzerland and The Netherlands both showed the most resemblance with Positive Health, although the latter state was scoring more extreme on most dimensions. The socialist welfare states Denmark and Norway were the most comparable to each other, and resembled a combination between the WHO and Nordenfelt DoH. They showed very moderate scorings on all except the internalism-externalism dimensions, opposite to Switzerland, The Netherlands and Czech Republic with more outspoken dimension scores. The Eastern European countries were comparable to each other as well, although Czech Republic showed more extreme scores, resulting in more resemblance with the Venkatapuram DoH, while Latvia scored closer to a combination between the Boorse and WHO DoH. The conservative states France and Italy were both resembling mostly the WHO DoH, while the first combined this with the Boorse DoH and the latter with the Nordenfelt DoH. Nevertheless, their patterns were very different. France and Latvia both showed a comparable and extreme scoring pattern, except for their opposite scores on the relation between health and wellbeing.

The countries that scored high on normativism and holism, often showed more comparison to relativism and subjectivism. The countries that scored high on internalism, identified health and disease as being conversely correlated. The countries that referred to health and wellbeing as similar and interchangeable concepts in their policies, or as health being a state of wellbeing, were scoring very differently on many of the other dimensions. Three extreme scores are worth mentioning, as the other countries were scoring very differently on these dimensions. First, France showed uniquely no relation between health and wellbeing in their policy documents. Second, the Czech DoH showed uniquely a resemblance to externalism. Third, the Dutch DoH was uniquely subjectivistic, although many other countries were scoring on more subjectivism than objectivism.

In conclusion, there was a variety between countries in the way the national DoHs were categorized according to the different dimensions. As such, a diverse picture could be made of the most resembling health concepts for the countries, while the European average differed from this as well. Although some patterns could be recognized between the scores of different domains, the overall picture was divergent.

The European DoH

The most diversity was visible for the dimension describing the relation between health and wellbeing, and the dimension describing the scale between internalism and externalism, while the least diversity was found in the

dimension describing the relation between health and disease. Nevertheless, the differences between the national DoHs in Europe were great, when looking at the categorizations of the DoH and the comparisons with existing health concepts. Most European countries tended towards a more normative, holistic DoH, which was equally internalistic-externalistic, neutral, somewhat relativistic. Moreover, health and disease status would be reversely correlated, and health added to wellbeing or was even considered similar. The average of all scores for the national DoHs resulted in a moderate scoring pattern, somewhat more normative, holistic, internalistic, relativistic and subjective, where health was a prerequisite for wellbeing, and health and disease were reversely correlated, or absence of disease was even necessary for achieving health. This average European DoH would be most resembling to a combination of the WHO, Nordenfelt and Meikirch Model DoH.

CHAPTER 3:
POLICY GOALS FOR SUSTAINABILITY ON DIFFERENT GOVERNANCE LEVELS

How can the national DoHs be compared with the goals of sustainability, i.e. human health and planetary health, on the global, European, and national level?

This chapter summarizes relevant policies and policy goals for sustainability, i.e. human health and planetary health (see **Figure 7**). This enlightens the specific motives and policy actions towards health improvement, as well as proportions between human and planetary health in the face of sustainability (see **Table 3**). Subsequently, the national DoH can be put in the context of these policies and goals. Three different governance levels were analysed: *global*, by looking into the targets on SDG3 and its progress for each country (**3.1.**); *European*, based on European, EU and EC documents (**3.2.**); and *national*, by using governmental publications and (action) plans (**3.3.**). The analysed EU, EC and national publications and policies can be found in **Appendix II** – *Table II.ii.*

3.1. The global level

In the same year the WHO set up their constitution and subsequent DoH, the Universal Declaration of Human Rights was drawn up by the UN. Based on the post-war ideals of protecting individuals and societies, article 25 prescribed the minimal value of health human beings have a right to:

> *"**Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family**, including food, clothing, housing and medical care and necessary social services, **and the right to security** in the event of unemployment, **sickness, disability**, widowhood, **old age** or other lack of livelihood in circumstances beyond his control."* (130)

This Declaration serves as a global guidance, or even the basis, for many policies and programs on different governance levels related to development and innovations, albeit implicitly. As such, it is a powerful and guiding document. Health was here defined mostly in terms of minimal necessities to stay alive, was related to security as well.

The Global Sustainable Development Report [UN3] emphasized sustainable food systems accompanied by healthy nutrition as one of the entry points for transformation towards a sustainable future. This report called for action on sustainability, among others, by transitioning "towards food and nutrition systems that foster universal good health and eliminate malnutrition while minimizing environmental impact". Regarding the food system, it stated that all countries should improve food quality, build resilience and reduce environmental impact, by taking responsibility for the entire food consumption value chain. This asks for immediate action within an integrative approach. This showed how health is a global goal in the face of sustainability, while the main focus was to design systems in order to reduce risks to health.

The WHO identified several *risks to health* in the 'World Health Statistics 2021' report, in order to monitor those which "contribute to a considerable fraction of burden of disease and result in premature and preventable deaths" [WHO1]: childhood malnutrition (stunting, wasting and overweight), anaemia, intimate partner violence, tobacco use, alcohol consumption, obesity, physical inactivity, trans-fatty acids, variable access to safely managed water and sanitation, outdoor air pollution and household (indoor) air pollution, and hypertension. The SDG health-related targets aimed to reduce these health risks, and multisectoral plans and policies were set up to address their progression. However, social inequalities tended to hinder the progress in reducing the exposure to these risk factors, and therefore in achieving these targets.

UN SDG3: "Good health and well-being for all"

> *"Sustainable Development Goal 3 of the 2030 Agenda for Sustainable Development is to **"ensure healthy lives and promoting well-being for all at all ages"**. The associated targets aim to reduce the global maternal **mortality ratio;** end **preventable deaths** of newborns and children; end the **epidemics** of AIDS,*

Table 3. *Analysis of policy goals related to improving human health in the face of sustainability in the eight European countries.*

	National		European		Global	
	Action Plans	*Motives*	*Plans and projects [a]*	*Motives*	*SDG Progress [b]*	*Motives*
France	E-Health Strategy [c] Prevention plans [d] Food Security, Nutrition and Sustainable Agriculture [e]	*Disease reduction; prevention; reduce economic burden; digitalization; reduce inequality; food security; strengthen health care system*	European Health Union EU Legislation on Health, Food and Sustainability EGD: - Farm-to-Fork Strategy - Inception Impact Assessment - SFS Framework European Health Union Third PFUAH EU4Health One Health Food 2030 HiAP SFS Partnership Three pillars: 1. Crisis preparedness and response 2. European Beating Cancer Plan 3. Pharmaceutical strategy	*Anthropocentric bias; disease reduction and prevention; improving health care systems; digitalization; food system transformation; food safety; reduce environmental and toxic hazards; tackle climate change; reduce health risks; connection human health, planetary health and animal health (One Health); effective and coherent action in health crisis; economic development; integrative approach; socio-economic consequences; enable sustainable development; HiAP*	OS: 81.24% SS: 57.77% SDG3P: Significant challenges remain; Moderately improving	*Disease reduction and prevention; improving health care; reducing deaths; food system to improve sustainability; reduce health risks (safety); increase productivity; interdependency human health and planetary health to enable sustainable development*
Italy	Legislation on Food hygiene and Nutrition hygiene [f] National E-health information strategy 2011-2014 [g] Healthy diet [h, j] National Prevention Strategy [i]	*Centrality of person; prevention; One Health; intersectoral approach; disease reduction; early mortality reduction; human rights; HiAP; digitalization; food safety; economic affordability; strengthen health care system; resilience*			OS: 78.34% SS: 73.59% SDG3P: Challenges remain; On track or maintaining SDG achievement	
Switzerland	National Strategy on Addiction [k] Dementia [k] Heath Equity [k] HIV and STIs [k] NOSO Strategy: Hospital and nursing home infections [k] National Strategy Prevention of NCDs[k] Palliative Care [k] Quality strategy HIA (healthcare) [k] Vaccination [k] Increase health care equality [l]	*Disease reduction; early mortality reduction; responsibility for own health and of planet; reduce economic burden; increase equality; strengthen health care system*			OS: 80.79% SS: 52.06% SDG3: Significant challenges remain; Moderately improving	
The Netherlands	Guidelines Good Food [m] National Prevention Agreement [n] National Dementia Strategy [o] Ageing vitally, Care and Cure [p]	*Disease reduction; reduce early mortality; reduce economic burden; One Health approach; prevention; strengthen health care system; health as care; digitalization*			OS: 79.85% SS: 44.40% SDG3P: Challenges remain; Moderately improving	
Denmark	Danish Super Hospital Programme 2021 [q] National Strategy For Personalised Medicine 2021-2022 [r] Digital Health Strategy [s] New direction for prevention [t] Strengthened quality in the local health service [t] Time for the individual patient[t]	*Disease reduction; reduce early mortality; strengthen health care system; person-centred approach; reduce health inequalities; prevention; digitalization*			OS: 85.63% SS: 66.23% SDG3P: Challenges remain; Moderately improving	

Norway	National Dementia Plan 2020 The Norwegian National Strategy Against Antibiotic Resistance 2015-2020 [u] A Society For All: The government's strategy for the equality of persons with disabilities for the period 2020-2030 [u] Norwegian National Action Plan for a Healthier Diet [u] National Alcohol Strategy 2021–2025[u] The government's action plan for the prevention of suicide 2020-2025 [u] National Overdosis Strategy 2019-2022 [u] National Diabetes Plan 2017-2021 National Brain Health Strategy 2018-2024 [u] Partnership for a Healthier Diet [v]	*Mentions SDG2, 3 and 12* [zz] *Enable sustainable development; disease reduction; reduce premature mortality; strengthen health care system; healthy diet; increase equality; responsibility for own health*			OS: 82.35% SS: 61.74% SDG3P: Challenges remain; Moderately improving	
Czech Republic	National Electronic Health Strategy Digital Czechia [w] National Mental Health Action Plan[w] Czech National Cancer Control Programme [x]	*Refers to SDG1, 2, 3 and 6* [w] *Enable sustainable development; disease reduction; reduce premature mortality; strengthen health care system; increase equality; reduce economic burden*			OS: 80.47% SS: 67.59% SDG3P: Significant challenges remain; Moderately improving	
Latvia	"One Health" Plan for Containing Antimicrobial Resistance and Prudent Use of Antibiotics for 2019-2020 [y] Oncology Plan for medicinal products in 2023 [z]	*Integral approach; reduce diseases; reduce mortality; One Health*			OS: 80.28% SS: 67.47% SDG3P: Significant challenges remain; Moderately improving	

EGD = European Green Deal; SFS = Sustainable Food Systems; OS = overall score; SS = spillover score; SDG3P = progress on SDG3.

References: a= see **Appendix II** – *Table II.ii*; b = [UN4]; c = [FR1-2]; d = [FR3]; e = [FR10]; f = [IT4]; g = [IT5]; h = [IT6]; i = [IT7]; j = [IT13]; k = [SW5,8]; l = [SW4]; m = [NL1,2]; n = [NL4]; o = [NL10]; p = [NL11]; q = [DK6]; r = [DK8]; s = [DK10]; t = [DK1]; u = [NW1-3]; v = [NW16]; w = [CZ1]; x = [CZ5]; y = [LV9]; z = [LV3]; zz = [NW3].

*tuberculosis, malaria and other communicable diseases; reduce **mortality from non-communicable diseases**; strengthen the **prevention and treatment of substance abuse**; halve the number of deaths and injuries from **road traffic accidents**; ensure univers**al access to sexual and reproductive health-care services**; achieve **universal health coverage**; and reduce the number of **deaths and illnesses from hazardous chemicals and pollution**." [UN1]*

The United Nations affirmed the necessity of good population health in order to achieve the goals of sustainable development and primary environmental care. This interconnection was elaborated on the SDG-website explaining the topic 'Health and population' [UN1], referring to The Commission on Sustainable Development, the World Summit on Sustainable Development in 2002 and its outcome, and the outcome of the UN on Environment and Development – Agenda 21. Humans "are entitled to a healthy and productive life, in harmony with nature", and therefore health must be taken care of by realizing "absence of a high prevalence of debilitating diseases, while obtaining health gains for the whole population requires poverty eradication" [UN1]. Thus, action to increase human health must include action on planetary health, recognizing both economic as well as human rights-based motives.

The third SDG is defined as "Ensure healthy lives and promote well-being for all at all ages", or in short "Good Health and Well-Being" (SDG3). The most important indicators for measuring global progress on this target were life expectancy and healthy life expectancy, which are both related to the burden of disease [WHO1]. The fourteen indicators[6] used to track progress on SDG3 per country by the annual 'Sustainable Development Report' [UN4] were differing partly from the identified health risks above and referred mostly to the categories diseases, health care, or premature or preventable deaths. The SDG3 homepage [UN2] showed an infographic on the impact of COVID-19, which enlightens a broad view on health. Although they referred mostly to the same three aforementioned categories, the increase in anxiety and depression prevalence showed an additional mental health dimension.

Regarding the progress on the SDGs [UN4], different trends could be identified for the overall score, spillover score and SDG3-specific progress (see **Table 3**, column 'Global'). For the overall score, summarizing the progress for all 17 SDGs (see **Figure 1**), Italy as rated lowest, followed by the Eastern European and liberalist countries. The socialist countries ranked the highest. However, Italy ranked the highest for the spillover score, describing the spillover effects of one country on other countries' abilities to achieve the SDGs. The Netherlands scored the lowest, followed by France and Norway, meaning they caused less positive and more negative spillover effects. The progress on SDG3 specifically was two-fold for the eight countries: while almost all countries except Italy were moderately improving on their achievements, half of them still had significant challenges left to make progress on SDG3.

Policy actions from SDG3

Several national health policies explicitly stated to be (partly) aligned with the SDGs in general [FR11; SW3; NL12; CZ1; LV3]. All of the policies described goals that aligned with one of the SDGs, like food security, promoting sustainable agriculture, reducing health inequalities, or education and capacity-building. Although SDG3 primarily related to human health status and improvement, only two countries referred to this goal specifically in their policies. First, Norway mentioned individual SDGs, i.e. SDG2, 3 and 12, to which the 'The National Action Plan for a Healthier Diet' [NW3] contributed to achieve. Second, Czech Republic showed a table with the "overlay of SDGs and specific objectives of the Strategic Framework", referring to SDG1, 2, 3 and 6 [CZ1]. The Czech 'Health 2030' plan also referred to SDG3 to be "decisive for the health sector" [CZ1]. However,

[6] The indicators are: Maternal mortality rate; Neonatal mortality rate; Mortality rate, under-5; Incidence of tuberculosis; New HIV infections; Age-standardized death rate due to cardiovascular disease, cancer, diabetes, or chronic respiratory disease in adults aged 30–70 years; Age-standardized death rate attributable to household air pollution and ambient air pollution; Traffic deaths; Life expectancy at birth; Adolescent fertility rate; Births attended by skilled health personnel; Surviving infants who received 2 WHO-recommended vaccines; Universal health coverage (UHC) index of service coverage; Subjective well-being.

the particular subgoals or indicators of SDG3 were not directly mentioned at all in the national health policies in Europe. Any policy actions coming forth from SDG3 were therefore not directly identifiable.

Conclusion global level

Three conclusions can be drawn from this SDG progress data for Europe, besides the main conclusion that none of the countries were currently on track of meeting the SDG3 targets. First, there were still differences between countries in Europe on achieving the global health goals. Second, the country rankings could differ among objects of study depending on the level of analysis, i.e., one country scored high on the health goal of neonatal mortality rate, while the same country scored low on life expectancy at birth. Third, while a high overall score indicated progress on many SDGs, (significant) challenges for achieving SDG3 could still be present. What one needs to keep in mind, however, is that these patterns were measures of indicators mostly based on disease status, health care, or premature or preventable mortality, and not on a broader operationalization of health (in a certain context).

Additionally, the formulated goals and motives to promote health within achieving the SDGs showed a clear acknowledgement of the link with planetary health improvement. Here, the specifications of health promotion could be reduced to disease eradication and prevention, improving health care and reducing deaths. Although diets were not directly mentioned in the analysed goals and projects, the food system was addressed related to potential improvements in sustainability status, and to reduce health risks. Moreover, the economic motive was reiterated in the UN's formulation of the human's right to live a "healthy and productive life" [UN1].

3.2. The European level

As explained in *Chapter 1*, realizing HSDs is one of the possible operationalizations of increasing Europe's sustainability status, and thereby human health and planetary health status. Specifically for Europe action on improving dietary factors is necessary, according to the WHO 'European Food and Nutrition Action Plan 2015-2020' [WHO-EU1], since this region is severely affected by NCDs and experiences a double burden of malnutrition in many Member States. The Action Plan described how health and well-being is being undermined by malnutrition in all its forms and NCDs, resulting from unhealthy diets, and increasing social and economic costs for different actors. Consequently, to improve health, well-being and quality of life in European populations, promote healthy ageing and reduce health inequalities in times of limited resources, a healthy and varied diet must be promoted and accessible, while vulnerable groups must be supported [WHO-EU1].

Several large-scale European projects and subsequent regulations are important to mention in the context of realizing HSDs in Europe (see Figure 15). The originally formulated goals were used, while these can be implemented and specified on a national level in European countries.

European Union and decentralized agencies

Many European countries benefit from the agreement on the European single market, which guarantees the four freedoms: free movement of persons, goods, services, and capital. This single market comprises the EU Member States and several other European countries through the agreement of the European Economic Area, and Switzerland through bilateral treaties (131). Norway and Switzerland are both part of the European Free Trade Association, which was realized in 1960 together with Iceland and Liechtenstein. It allows the four Member States to participate in the EU single market.

In the field of public health, the EU serves as a complementing and supporting body between Member States. Although it works for better health protection through its policies and activities, it does "not define health policies, nor the organisation and provision of health services and medical care" [EU4]. Instead, it supports governments across the EU by funding health projects, and formulating laws and standards for health products and services [EU3]. Below (p.49) the EU regulations related to health and food are described in more detail, amongst others that "the EU has a leading role to play to strengthen health systems including global health security preparedness and response capacity" [EC5].

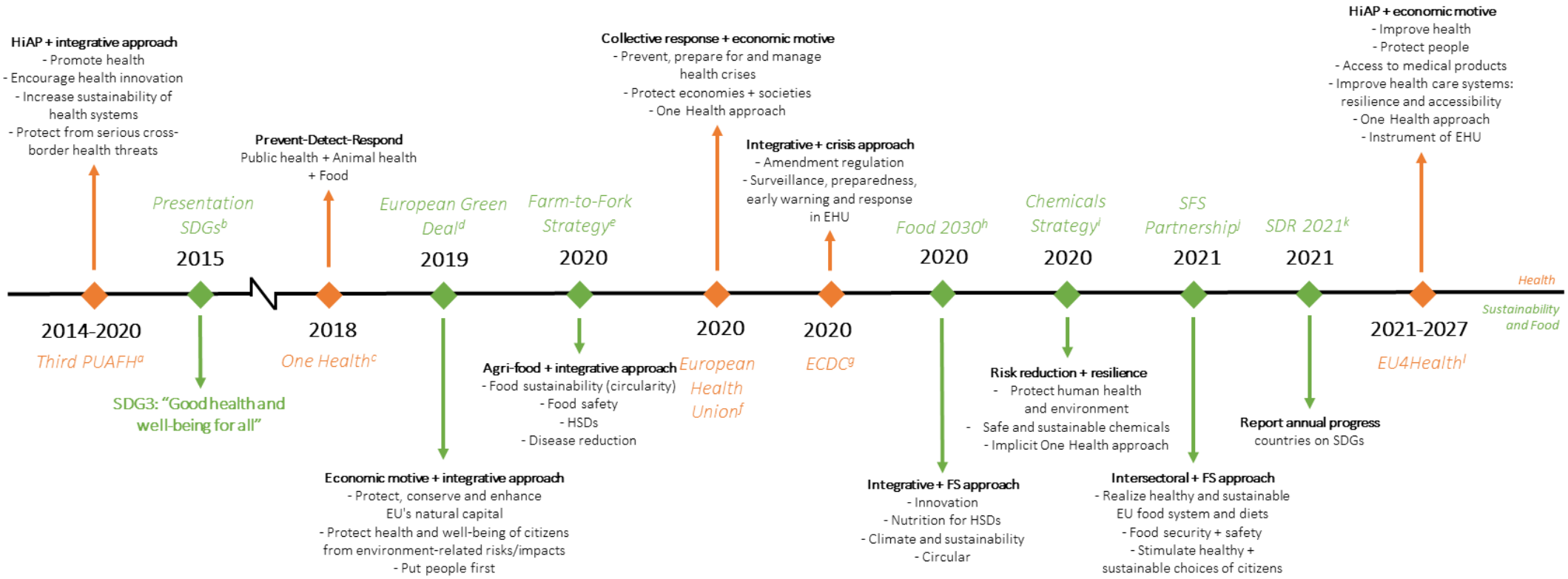


Figure 15. European programs and policies related to health (orange), sustainability and food (green) in a historical overview. *EU = European Union; ECDC = European Centre for Disease Control; EHU = European Health Union; FS = food systems; HiAP = Health in All Policies principle; HSD = healthy and sustainable diet; SDR = Sustainable Development Report.*
References: a = [EC15-18]; b = [UN2]; c = [OH1-4]; d = [EC1]; e = [EC2]; f = [EC4]; g = [EU5; EC5]; h = [EC19,20]; i = [EC23,24]; j = [EC6-8]; k = [UN4]; l = [EC9-13].

Although were not analysed in detail, four decentralized agencies are worth mentioning here as they have a large impact on the practical regulation of health and dietary practices in Europe: the European Medical Agency (EMA), European Food Safety Agency (EFSA), European Centre for Disease Control (ECDC) and European Environment Agency (EEA). All four agencies advise national governments on health issues, with the common goal of safeguarding human health or reducing risk factors to health through various means. However, none of the agencies provided a specific definition of human health on their websites, and all of the agencies mostly operationalized health improvement as (contributing to) diseases reduction [EU5-10]. While the EFSA website provided a definition of animal health, bee health, plant health and nutrition in corresponding topics, human health was absent [EU7]. Moreover, it was described how safeguarding animal health, bee health and plant health are serving the protection of public health, economies and the environment in general. This aligned with the EU's statement on health policy, which "focuses on protecting and improving health, giving equal access to (…) healthcare (…), and coordinating any serious health threats (…)," as "disease prevention and response play a big part in the EU's public health focus" [EU3]. The reductionistic approach and anthropocentric bias in health promotion became apparent here as well.

European Legislation on Health, Sustainability and Food

The latest version of the Treaty on the Functioning of the European Union (TFEU) set out the regulations of the EU from October 2012 [EL1]. Although it adopted no regulations about 'diet', 'food' or 'nutrition' specifically, there were several articles that related to regulating the health status in the EU. Appendix IV provides extracts of these relevant articles in light of health, sustainability and food, from the TFEU [EL1], General Food Law Regulation [EL8], Food Information to Consumers Regulation [EL7,9], and several other EU action plans [EL2-6,10-12]. It can be concluded that health promotion was largely laid out in EU legislation. However, the intrinsic value of human health, planetary health or sustainability appeared to be debatable, as the main motive remained to be of economic nature.

According to TFEU Articles 26 and 114, a high level of health protection should be ensured by the EU Member States, for the establishment and functioning of the internal market. This means that the EU needs to support Member States in their policies and activities by complementing and supporting national health policies, promote the coordination between their programs, and stimulate cooperation between Member States, while the Member States keep the sovereignty to define their own health policies, according to TFEU Articles 9 and 168. These articles made clear how, on a European level, public health is reduced to a means towards sustaining the system of the EU: the internal market. This was also apparent in provisions 1 and 4, and Article 22 of the General Food Law [EL8]. As such, human health appeared to have no intrinsic value, but its safeguarding serves an economic motive. The regulation on the EU health programme 2014-2020 (see below) confirmed these motives in its title 'Health for Growth' [EL3].

In the TFEU, there was no mention of 'diet', 'food' or 'nutrition'. While 'planet' was also absent, the 'environment' in terms of planetary health was addressed several times: Articles 11, 114 and 191 specified comparable motives for the EU for contributing to safeguarding the environment as for health. Stimulation of sustainable development (and the SDGs), action on climate change and reduction of risk factors coming from the environment all needed to be worked on in EU policies and programs, to sustain functioning of the internal market. As such, also planetary health appeared to have no intrinsic value, as its safeguarding serves an economic motive.

A focus on safety was also outstanding in the General Food Law Regulation [EL8], which established the EFSA as the main authority to regulate this on EU level by giving scientific advice. 'Sustainability', 'the 'food system' as a whole, or 'diet' were not mentioned here. Its focus was to regulate the free movement of safe and wholesome food, which contributes to "the health and well-being of citizens, and to their social and economic interests" [EL8, provision 1]. Human 'health' protection was aimed at by reducing risks, which could bring about adverse health effects [EL8, Article 2.9]. These adverse health effects were further specified to be related to disease development: a change in body function or cell structure that might lead to disease or health problems

[EC22]. However, health was not defined or specified in other terms than reduction of its negative, or the effects of promoted or prolonged health on a higher level [EL8, provisions 33 and 36; EL9]. Plant health, animal health, human health and the environment were all mentioned in relation to each other, which showed the recognition of their interrelations.

The Provision of Food Information to Consumers Regulation [EL7,9] specified this aim as a part of the Farm-to-Fork Strategy (see p.54*Farm-to-Fork Strategy (2020)*) and the Sustainable Food System Framework initiative (see p.55). It covered "the provision of consumer information relating to the nutritional, climate, environmental and social aspects of food products", and as such contributed to increasing EU's sustainability status. However, there was no definition of 'health(y)' or 'sustainability' available in the regulation. Safety seemed to be the guiding principle here as well, while this was specified to be applicable to different dimensions: health, economic, environmental, social and ethical considerations [Article 3]. Moreover, a high level of consumer health protection and the effect on public health were the ultimate objectives.

Several legislations were related to human health or planetary health, and three of them showed an economic incentive to implement action on health in sustainability in particular. The council decision 'Promoting healthy diet and physical activity across Europe' [EL10-11] prioritized healthy diet and regular activity to address the European obesity epidemic and its socio-economic consequences. A healthy diet, generally specified in composition, was mostly advised to reduce risk factors to health and consequential diseases [Article 20,22]. However, Member States were only advised to take action on these topics by the EU. The recommendation 'Promoting health-enhancing physical activity for all' [EL4] focused on regular physical activity, as this contributes to healthier individual lifestyles. The main reason was that a lack of physical activity results in a higher risk to certain diseases and premature mortality, and has great socio-economic effects on society [provision 1, 4]. The economic motive to promote individual health was very explicit here: "In turn, this ensures a healthy workforce – a key prerequisite for meeting the European Union's economic growth and competitiveness targets" [recommendation 2]. Although a cross sectoral approach was recommended, there was no mention of food, nutrition or diet in the document.

Programs related to health

Third Programme for the Union's action in the field of health (2014-2020)

> *"The general objectives of the Programme shall be to **complement, support and add value to the policies of the Member States** to improve the health of Union citizens and **reduce health inequalities** by promoting health, encouraging **innovation** in health, increasing the **sustainability of health systems** and protecting Union citizens from **serious cross-border health threats**." [EC15]*

In action between 2014 and 2020, the third Programme for the Union's action in the field of health (PUAFH) aimed to improve health in the EU. The 1948 WHO DoH was used to guide the plans towards health promotion [EC15]. Although this program applied to all Member States, respect for their sovereignty and responsibilities "for the definition of their health policy and for the organisation and delivery of health services and medical care" were emphasized in implementing the PUAFH [EC15]. Moreover, the focus on communicable and non-communicable disease prevention and risk reduction was well-represented in this program, in the context of an ageing society [EC15-17]. For the third PUAFH, the goal was to increase healthy life-years, in order to improve health status in the EU, and to "enable the elderly to enjoy a healthy and active life as they get older" [EC15]. Besides, patient empowerment, antimicrobial resistance, reducing health inequalities, increasing gender equality, and innovative, sustainable and efficient health care were addressed.

The first thematic priority was to "Promote health, prevent diseases and foster supportive environments for healthy lifestyles taking into account the 'health in all policies' [(HiAP)] principle" [EC15]. Although not specified in this regulation, the HiAP principle aims to improve health by addressing it from multiple perspectives and policy domains, and the "need to incorporate an explicit concern for health in the policies of all sectors" [WHO-EU2]. The international basis for this integrative governance principle can be found in the Declaration of Alma Ata (80) and the Ottawa Charter (13), which both promote an interdisciplinary and cross-

domain approach to health improvement. One of the objectives for this first priority mentioned diet, but also the economic incentive for and the multi-dimensional approach to improve health:

> *"**Cost-effective promotion and prevention measures** in line, in particular, with the Union strategies on alcohol and nutrition, and including actions to support the exchange of evidence-based and good practices for addressing risk factors such as tobacco use and passive smoking, harmful use of alcohol, **unhealthy dietary habits** and physical inactivity, taking into account the **public health aspects of underlying factors**, such as those of a **social and environmental nature**, with a focus on Union added value." [EC15]*

Examples for this first objective, joint actions on implementing best practices were realized on promoting health and preventing NCDs to reduce health inequalities and scale up integrated care in 2018 [EC16]. Additionally, this joint actions were realized in the field of nutrition in 2019, which aimed to increase the offer of healthier processed foods [EC17].

Interestingly, as part of the second thematic objective to protect citizens from cross-border health threats, the regulation of the third PUAFH specified that action should be covered for "threats caused by biological and chemical incidents, environment and climate change". It stated that the climate-related objectives, which need to be addressed by 20% of the Union budget, are contributed to by spending on serious cross-border health threats associated with climate change [EC15]. The interdependency of planetary health and human health status is apparent here, although the incentive to address climate change remained to improve human health under this program. Examples of projects under this objective were aimed on increasing collaboration, vaccination uptake, and strengthening of health preparedness and response to biological or chemical terror attacks [EC16-17].

The third and fourth thematic objectives, "Contribute to innovative, efficient and sustainable health systems" and "Facilitate access to better and safer healthcare for Union citizens" focused on the health care system and bigger societal structures. These further showed the integral approach to health promotion on a European level. Examples of actions under these objectives were the digitalization of health care, a person-centred approach, (inter)national cooperation and regulation on pharmaceutical products [EC16-17]. This program was succeeded by the EU4Health program in 2021 (see p.52).

One Health (2018)

The One Health European Joint Program (OHJEP) was launched in 2018, funded by the Europe Horizon 2020 program, in order to collectively address the reduction of existing and emerging threats of zoonotic disease and antimicrobial resistance [OH2-4]. To reach this goal, the initiative, aimed at improving collaboration and integration between public research institutes across Europe guided by a three-step concept: Prevent-Detect-Respond [OH2,4]. These steps corresponded partly with the objective of the European Health Union [EU11] (p.47), although the order is different. The OHJEP currently established collaboration across 22 countries between 43 public health, animal health and food organisations, and the Med-Vet-Net Association, a European Network of Excellence for Zoonoses research. The three research domains that were addressed were foodborne zoonoses, antimicrobial resistance and emerging infectious disease threats, through Joint Research Projects, Joint Integrative Project and education and training in these three fields. One of the seven work packages they addressed is "Sustainability". However, this was understood in terms of increasing efficiency and viability of the program itself, instead of improving planetary health or human health status [OH1]. Thus, it showed a focus on risk reduction to human health specifically. Besides, the role of diets or lifestyle was not explicated in the first or latest annual report [OH3-4].

The One Health approach was explicitly taken up as a guiding principle for ECDC as part of the European Health Union, "together with other relevant EU Agencies, to the issue, considering the interactions between humans, animals and the environment" [EC5]. However, a more elaborate description of this approach or its specific aims was not provided here, nor in the document presenting the European Health Union [EC4]. The Centre appeared to focus primarily on threats from communicable diseases on a large scale, as the negative health impact of these types of diseases was described in the proposal by referring to COVID-19.

European Health Union (2020)

In the annual 'State of the Union 2021' report, the EC focused on three pillars to lay the basis for a healthier Europe: crisis preparedness and response, a Europe's Beating Cancer Plan, and a pharmaceutical strategy for Europe [EU11]. Moreover, in 2020 the EC presented the plan to implement a European Health Union in order to reinforce "the EU's resilience for cross-border health threats" [EC4]. As such

> *"… the EU can be **equipped to prevent, prepare for and manage health crises** both at the EU and global level, with all the **societal and economic benefits** that it would bring. A strong European Health Union will protect our way of living, our economies and societies. **If public health is in danger, the economy inevitably suffers.**" [EC4]*

In the Health Union, the 27 Member States cooperate to detect emergency situations, prepare for them, and react collectively, in order to provide the means to prevent and respond to future pandemics, build resilience of the EU's health care systems, and improve prevention and (after)care for diseases like cancer [EU11]. To realize this, the EHU "implements the obligation to ensure high level of human health protection as defined in the Charter of Fundamental Rights of the European Union" [EC4]. As such, "a reinforced framework for cross-border cooperation [is recommended] against all health threats in order to better protect lives and the internal market as well as to maintain the highest standards in the protection of human rights and civil liberties" [EC4]. Although these actions were proposed for both the European as well as the national level, a specification or guideline on implementation on a national level was absent.

Subsequently, as part of this European Health Union, it was proposed that the ECDC would take up the task of "addressing surveillance, preparedness, early warning and response under a strengthened EU health security framework" [EC5]. As the name suggests, the primary approach was to increase health status via reducing (mostly communicable) disease prevalence and incidence, and reduce related risk factors. However, the role of diets or food was not addressed in this proposal. The focus on reducing diseases to increase health is emphasized by the increased responsibilities the EMA were proposed to get in realizing a European Health Union [EC4], as this agency regulates medicine approval in the EU.

In line with this European crisis preparedness plan, the EC proposed in 2021 to take up a position in the WHO's World Health Assembly, in order to work collectively on a WHO Framework Convention on Pandemic Preparedness and a WHO Framework Convention on Pandemic Preparedness and Response for global governance [EC14]. The focus lied here on preventing "serious cross-border health threats" and zoonoses, following the One Health approach, which was however not further specified. The ultimate objective was to increase international cooperation in response to pandemics within the United Nations system.

EU4Health (2021-2027)

> *"**Embedded in the 'One health' approach**, which recognises the interconnection between human health and animal health and more broadly with the environment, the EU4Health Programme can support Member States in the transition to **better preparedness** and the **reinforcement of their health systems** and support them in achieving the health-**related United Nations Sustainable Development Goals (SDGs).**" [EC9]*

The currently active EU health program 'EU4Health' was adopted in 2021 and will guide informed policymaking and research until 2027. The three pillars mentioned in the State of the Union 2021 report [EU11] were the urgent health priorities that the EU4Health program addresses towards creating a European Health Union, together with digitalisation, improving vaccination rates and reducing antimicrobial resistant infections [EC12]. While the plan was adopted as a response to the COVID-19 pandemic and to strengthen the crisis response capacity of the EU, the program aimed to increase effectiveness, resilience and accessibility of the health care systems by taking actions for long-term improvements [EC9-10; EC12-13]. The One Health approach was a clear guiding principle in realizing an integrative approach, to achieve the SDG targets related to health, and SD3 in particular [EC9]. Besides, the integrative approach was established by the common ground of the HiAP principle

on which several EU programs[7] were designed to synergize, related to agriculture, Member State collaboration, planetary health (environmental sustainability) or economy [EC9]. The EU4Health regulation defined the principle as follows:

> *"['HiAP'] means an approach to the development, implementation and review of public policies,* ***regardless of the sector,*** *whereby the health implications of decisions are taken into account, and which seeks to* ***achieve synergies and to avoid harmful health impacts*** *being caused by such policies, in order to improve the health of the population and health equity."[EC13]*

In light of the COVID-19 pandemic, it was explicated that although Member States are responsible for their health policies, they are "expected to protect public health in a spirit of European solidarity", and thus need support from the EU on cooperating and coordinating their crisis responses "to safeguard the health and well-being of people in the Union" [EC9]. This appeared to focus on disease incidence and prevalence reduction or prevention, as well as on pharmaceutical responses, in order to reduce the socio-economic burden of these situations, and safeguard the economical functioning of the EU and its citizens.

Moreover, prevention of NCDs – cancer, cardiovascular diseases and diabetes, in particular – was mentioned in relation to joint action programs aimed at helping to reduce the burden of these diseases and related risk factors [EC10-11]. A major strand of action touching on all four general objectives, was to address cancer in the Europe 'Beating Cancer Plan', as this NCD has the highest mortality rate in the EU [EC10-11; EC13]. Although HSDs were mentioned in Annex II to the Commission Implementing Decision [EC11], they were not in other documents. In the final regulation, 'diets' were only mentioned in the Annex describing possible eligible actions under the program: in terms of promoting healthy diets or in terms of unhealthy diets as a health risk factor to be addressed to promote health and disease prevention throughout the lifetime of an individual [EC13]. Here, achievement of the SDGs was addressed: all SDGs in general to tackle climate change, and SDG3 specifically to reduce the burden of NCDs. It was stated that mainstreaming climate action to spend at least 30% of the total amount of Union budget on supporting climate objectives, these goals were contributed to [EC13]. However, a definition of health or sustainability, or a reference to food or the food system was absent in this final regulation.

Programs related to sustainability and food

European Green Deal (2019)

In 2019, the EC proposed a large-scale strategy to commit to tackling climate and environmental-related challenges: the European Green Deal (EGD). It aimed to reduce emissions, create jobs and growth, address energy poverty, reduce external energy dependency and improve our security of supply, and improve our health and wellbeing [EU1]. Together this will contribute to Europe becoming the first climate-neutral continent by 2050. In order to achieve these aims, the "value given to protecting and restoring natural ecosystems, to the sustainable use of resources and to improving human health" must be increased, as "[t]his is where transformational change is most needed and potentially most beneficial for the EU economy, society and natural environment" [EC1]. The economic incentive indicated in the motives of national health policies came forward here again. One of the objectives was "working with nature to protect our planet and health", while nature was seen as an ally in tackling climate change. Thus, health was seen as an objective and motive to implement this strategy towards a more sustainable Europe. This also became clear from the following quote, which identified protection of the human population as the primary driving force.

> *"[The European Green Deal] is a new growth strategy that aims to* ***transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy*** *where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use. It also aims to* ***protect, conserve and enhance the EU's natural capital****, and* ***protect the health and well-being***

[7] e.g. the Horizon Europe programme, the EGD, the Single Market Programme, the Digital Europe Programme, and the Programme for Environment & Climate Action (EC9).

of citizens from environment-related risks and impacts. At the same time, this transition must be just and inclusive. It must put people first, and pay attention to the regions, industries and workers who will face the greatest challenges. […] The EU has the collective ability to transform its economy and society to put it on a more sustainable path." [EC1]

The EGD underlined the interrelations and mutual reinforcements between areas for action, necessitating careful attention to potential trade-offs between economic, environmental and social goals [EC1]. Social inclusion and human rights were taken care of by The European Pillar of Social Rights. A decisive role for the consumer could also be identified, which aligned with the patient-centred approach apparent in the national health policies. As such, an integrative approach with consistent use of all policy levers is needed to enable a true transformation.

Several deeply transformative policies are part of the EGD, which are mainly focused on responsible and sustainable use of energy, the production-side of the food system, and preserving and restoring natural capital in Europe. This partly aligned with the identified planetary boundaries by Rockström et al. (68,69). Two policies, 'Preserving and restoring ecosystems and biodiversity' and 'A zero pollution ambition for a toxic-free environment', focus on reducing risk factors for human and planetary health. Nevertheless, the definition of "health" or "healthy", is not elaborated or specified in the EGD proposal [EC1], nor in the official communication documents [EU1-2].

Farm-to-Fork Strategy (2020)

"The Farm to Fork Strategy is a new comprehensive approach to how Europeans value food sustainability. It is an opportunity to improve lifestyles, health, and the environment. The creation of a favourable food environment that makes it easier to choose healthy and sustainable diets will benefit consumers' health and quality of life, and reduce health-related costs for society. People pay increasing attention to environmental, health, social and ethical issues and they seek value in food more than ever before." [EC3]

Another transformative EGD policy was the 'Farm-to-Fork' strategy (F2F), which aimed to design a fair, healthy and environmentally-friendly food system [EC1]. The entire food value chain was addressed in this impactful action plan, which strived to stimulate sustainable food consumption and promote affordable healthy food for all, by improving information for consumers and the position of farmers. As such, a circular economy will be stimulated, and the European food system appraised for its safe, nutritious and high quality food "should now also become the global standard for sustainability" [EC1]. Being at the heart of the EGD, and being central to achieve the SDGs in Europe, the Farm-to-Fork Strategy "addresses comprehensively the challenges of sustainable food systems and recognises the inextricable links between healthy people, healthy societies and a healthy planet" [EC2]. Under objective 2.4., the EAT-Lancet paper was addressed to explain the benefits of a more plant-based diet to reduce the environmental impact of food systems and the risks of life-threatening-diseases:

"2.4. Promoting sustainable food consumption and facilitating the shift to healthy, sustainable diets
Current food consumption patterns are unsustainable from both health and environmental points of view. (…) The provision of clear information that makes it easier for consumers to choose healthy and sustainable diets will benefit their health and quality of life, and reduce health-related costs." [EC2]

Here, the term HSDs was mentioned specifically as an objective to improve both human health and planetary health via changed food systems.

These interrelations between our health, ecosystems, supply chains, consumption patterns and planetary boundaries have become clear in the COVID-19 pandemic. Consequently, the F2F stated "it is clear that we need to do much more to keep ourselves and the planet healthy" [EC3]. While the quote above suggested that the F2F tied into the wants and needs of the European citizens to value food more, these claims appeared to be mainly based on the abundant information and regulation on food *safety* in Europe. Food safety is concerned with reducing harms and risks to human health, and as such reducing diseases. This interpretation of health

improvement by reducing (risk factors for developing) diseases was also apparent in the F2F: although a clear definition of "health" was absent, it was mostly mentioned in relation with healthy diets in terms of nutrition[8], adherence to dietary recommendations and healthy food choices. Even animal health and plant health appeared to be ultimately improved in order to reduce hazards to human health, while not for the sake of the animals or the environment in itself. A review on the Farm-to-Fork Strategy will be published mid-2023.

Although some sectoral legislations started at production level already included objectives of sustainability as guiding principles, similar objectives do not yet exist for the whole food system [EC3]. Therefore, the F2F announced to adopt a horizontal regulatory instrument an law at EU-level to accelerate the transformation. As a response, the 'Sustainable Food System Framework Initiative' was proposed in 2021, "which could act as a guiding framework instrument that coordinates and drives changes across the food systems as well as an operational tool within and across its different sectors to overall improve the sustainability of the EU food system" [EC3]. In line with the F2F, it aims to ensure "that all foods placed on the EU market increasingly become sustainable", which could "ultimately transform the EU food system into a positive contributor to the health of people, of the economies and of the planet." [EC3].

Food 2030 (2020)

> *"Food 2030 provides* ***a vision and policy narrative*** *that through a well-governed and more systemic R&I policy, we can develop impactful solutions to the* ***urgent, complex and interconnected challenges inherent to food systems*** *that need to be* ***transformed to respect planetary boundaries****, to provide hea****lthy safe and nutritious food and diets*** *for all, and to sustain a* ***diverse fair and inclusive thriving food economy****." [EC19]*

To realize a sustainable food system to tackle challenges from malnutrition, climate change, resource scarcity, biodiversity loss, soil degradation, a growing and ageing population, urbanisation, food waste and food poverty, the EC published the 'Food 2030' policy in 2020 (**Figure 16**) [EC19]. This research and innovation (R&I) vision and policy framing supports the achievement of the EGD and F2F objectives, and stimulates a just and fair food system transformation towards HSDs and food and nutrition security for all, that respects planetary boundaries [EC19]. It aimed to "achieve a resilient food system that is fit for the future[, while f]ood systems need to also deliver co-benefits for people's health, our climate, planet and communities" [EC20]. These objectives showed a clear integrative approach of increasing both human health and planetary health, in the face of future challenges using the food systems perspective.

Using a systemic approach, Food 2030 aims to provide solutions to four overarching priorities: food systems innovation and empowerment of communities; nutrition for HSDs; climate-smart and environmentally sustainable food systems; and circular and resource-efficient food systems [EC19-20]. Several pathways were identified to address these priorities, which were all elaborated in the publication (see **Figure 16**). The interrelations between these pathways enable "co-creation across the different parts of the food system [which] can lead to the expected co-benefits, and a greater farm-to-fork coherence working under a food system R&I policy framework" [EC19]. Food 2030 integrated the economic, social and ecological aspects of the SDGs by viewing the first two as integrated parts of the biosphere. As such, the program added to the commitment and achievement of the EU to the SDGs, since this view showed how all SDGs are directly or indirectly connected to sustainable and healthy food systems [EC19]. The proposed plans towards sustainable food systems with HSDs showed an integrative approach, while addressing the challenges, needs and socio-economic motives to reach these ends.

[8] "The Commission will also seek opportunities to facilitate the shift to healthier diets and stimulate product reformulation, including by setting up nutrient profiles to restrict the promotion (via nutrition or health claims) of foods high in fat, sugars and salt" (EC3). This quote shows the focus on disease reduction, since foods high in fat, sugars and salt are related to development of NCDs, and therefore increased healthcare costs and reduced economic growth.

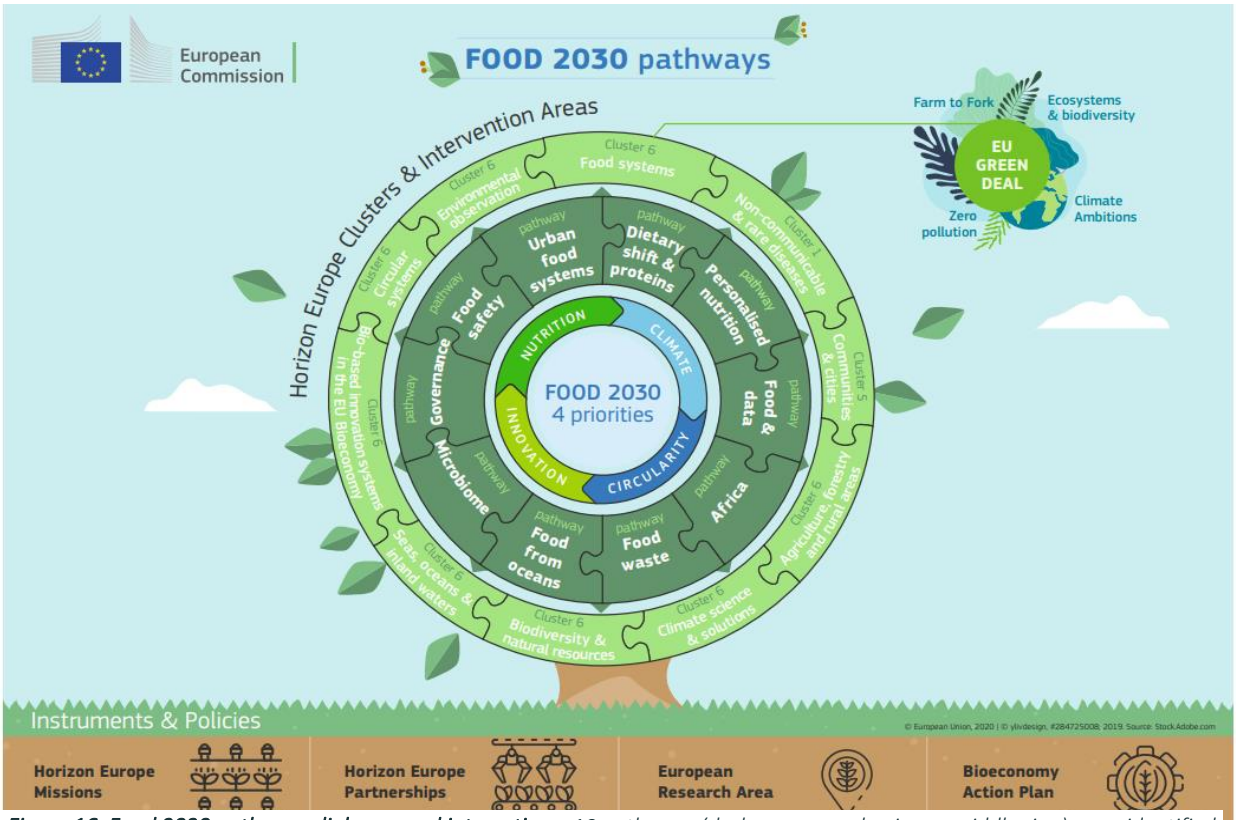


Figure 16. Food 2030 pathways: linkages and interactions*. 10 pathways (dark green puzzle pieces, middle ring) were identified by Food2030 to address four priorities: nutrition, climate, circularity and innovation (inner ring). Many of the pathways have strong interconnections (overlapping light green puzzle pieces, outer ring), where "co-creation across the different parts of the food system can lead to the expected co-benefits, and a greater farm-to-fork coherence working under a food system R&I policy framework. In addition, the pathways will deliver on issues linked to (…) the EU circular and sustainable Bioeconomy Strategy and Action Plan. Investments in food systems R&I also provide promising avenues (…) to deploy a reinforced EU budget (…) to prepare for a better future." (EC19)*

Chemicals Strategy for Sustainability (2020)

In line with the EGD, the 'EU Chemicals Strategy for Sustainability – Towards a Toxic-Free Environment' [EC23] described the EU's vision towards regulating chemicals in a circular economy. It stated that harmful chemicals can be a threat to human health and the environment: "hazardous chemicals raise the same concerns, certain chemicals cause cancers, affect the immune, respiratory, endocrine, reproductive and cardiovascular systems, weaken human resilience and capacity to respond to vaccines and increase vulnerability to diseases" [EC23]. Besides this focus on disease, there was also an emphasis on the concept of resilience and capacity to respond in the biological sense, in the light of sustainability. It aimed to better protect citizens and the environment, and to boost innovation for safe and sustainable chemicals [EC24]. Although the One Health approach was not specifically mentioned here, the promotion of human health, animal health and planetary health by the EU, and their interdependencies were addressed in this plan to improve the sustainability status of the EU. Protection and reduction of risks for human health and the environment were central in this plan, but a definition of these concepts was absent.

Partnership on Safe and Sustainable Food Systems (2021)

> *"A transition towards **more healthy, sustainable, safe and fair food systems** is imperative, but also **complex** due to the barriers to change built into social systems and the many **interconnections with feedback loops** resulting in unexpected consequences, synergies and trade-offs. **This challenge calls for a systems approach,** which acknowledges the interactions and interdependencies between farming and fishery, agri-food production, food processing, packaging, logistics, retail, food services, household consumption and waste management." [EC7]*

Under Horizon Europe, the EU proposed to set up a partnership for sustainable food systems in 2021: the 'European Partnership for Safe and Sustainable Food System for People, Planet & Climate' (SFS Partnership) [EC3; EC6-8]. Although a lot of sectors were included in the plans, it seemed that the agricultural and production-related domains were not well-represented yet in the proposals, as this was organised otherwise. Moreover, it was part of the SFS Partnership aims to align and connect with the agri-food-production domains, with the Partnerships Accelerating farming systems transition: Agroecology living labs and research infrastructures, Agriculture of Data and Animal Health and Welfare [EC6]. The aim is to structure and support a network of living labs and research infrastructures accelerating the transition towards agroecology throughout Europe, towards creating an overview of the challenges in the current food systems, and understanding the complexity of food systems [EC6]. As such, the goal was to realize a sustainable and healthy food system, and corresponding diets.

> *"This implies building a **socially responsible food value chain** that progressively reduces the environmental and climate footprint of the Union food system, and ultimately **transform the EU food system into a positive contributor to the health of people, of the economies and of the planet.** This will strengthen the **food system's resilience** and ensure lasting **food security** in the face of climate change and biodiversity loss. Food products, processes and consumption patterns need to change, while maintaining or improving **high standards of human health** (including **food safety**), **plant health, animal health and welfare**, as well as improving the incomes of primary producers, favouring bio-based solutions and reinforcing the **EU's competitiveness**." [EC3]*

Accordingly, health was one of the shaping aspects of designing safe and sustainable food systems for Europe, if not a prerequisite. The term "health" was used in the documents both as a goal (descriptively) and as a benchmark (evaluative), although it was not specified what was exactly meant with it. Concepts like food security and food safety were mentioned in this context. The focus appeared to be on healthy and sustainable choices to be made by European citizens, and how to accomplish and stimulate this. The EGD was addressed for its shaping character in this partnership, which brought economic motives forward as a result. Governance is therefore necessary to align public and private goals.

Conclusion European level

Taken together, on a European level there were several programs, projects and laws enacted which (partly) aim to increase sustainability or human health status, or both. The number of policies was significant, and they had different, very specified aims. However, concrete definitions of health applied to humans or our planet, of policy principles or the food system, were absent. Therefore, it was hard to get insight in the overview of plans and specific policy actions.

The main motives for action in these projects and policies could be reduced to disease reduction, agricultural or production-related actions, ensuring safety of food and environmental aspects, and economic or EU productivity. Most of the programs and policies on the European level already showed a high degree of integration of different disciplines, knowledge levels or policy domains. This was reinforced by the HiAP principle to improve health across different policy and governance levels. The One Health approach was also significantly represented in policies on improving health in the EU, while this primarily related to disease reduction and crisis responses.

Although sustainability is a highly valued concept on a European level, which was operationalized in the different projects designed to contribute to increasing European sustainability on different levels, a specific definition or single operationalization of this concept for the European context was missing on the website of the EC, European Union or in the analysed policy documents. Several patterns and motives were comparable to the ones identified in the national health policies and national DoH. Nevertheless, a clear comparison could be made, due to the lack of a proper definition of sustainability or health on a European level. The concepts appeared to be used with the presumption of generally known and substantially converging definitions.

3.3. The National level

Although global and European governance can offer direction to novel policies or projects related to sustainability, health is still a national responsibility for European Member States, based on the sovereignty principle. The national health policies (see **2.1.** and **2.2.**) often mentioned several action plans or programs that will be or are already implemented in the country on a national level. Most of these action plans were set up in reaction to the identified health problems in the country. They could also be designed as a response to align with global or European action plans or programs, or as a part of them. Additionally, they could be implemented when the country recognized the importance of the global or European program to address improvement of national health status. Therefore, reasons for the implementation of these plans can be bottom-up, top-down, or a combination of both, respectively. While the motives described for the national health policies mostly aligned with the motives for implementing action plans on a national level, an overview of the insights from the national policies is provided below.

Another motive that was identified in the national health policies is that action on health was often equated to or operationalized as action on health care or the health care system. Examples were found in the Dutch policies aiming at "care and cure" and "fitting care" [NL11], Italian policies focussing on the right to respect for the person and provision of free medical care to promote health [IT1,3,7], the Danish 'Digital Health Strategy 2018-2022' which focused on quick and proper treatment supported by digitalization of health care [DK10], or the Swiss strategies on increasing health equity and health care equality [SW5,8]. Surprisingly, Czech Republic and Latvia showed focus on the health care system and its design in their national action plans to a lesser extent. While their national health strategies were quite extensive, the action plans that were described are minimal and were mostly related to disease reduction or treatments [CZ1,5; LV3,9]. Several countries also had an action plan or program available on E-health or digitalization of health care [FR1-2; IT5; NL4; CZ1], which often tied in with the larger national health strategy.

An integral approach towards reaching the goals set out in the national health policies was apparent for most countries on a national level. A focus on prevention of diseases and reducing early mortality could also be found in the national action plans for all countries. An overarching motive was to enable and stimulate sustainable development, which is mentioned by several countries, often in relation to the SDGs in general [IT7; SW3; DK10; NW2; LV2]. Norway and Czech Republic even referred to the specific SDGs in their national health policies, in order to align with the higher governance levels [NW3; CZ1]. The environment was rarely mentioned in these national action plans on health improvement, and when mentioned, environmental risk factors or benefits to health status were mostly referred to (see **2.1.**).

A few countries had action plans available related to diet or nutrition [FR3; IT6; NL1-2; NW1-3], but none of the countries addressed food in terms of action on the food system to increase sustainability. Scientific evidence was the leading source for advice on health programs. One unique collaboration was exemplary here. The Norse ministry of Health had a specific 'Partnership for a Healthier Diet' [NW16], which stated that "the food industry and the health authorities collaborate to improve the diet of the population". This particular collaboration could be seen a taking up the food system perspective, as it used insights from food and trade organizations, food and beverage manufacturers, food retailers and food service industry. The partnership contributed to the national objectives of public health in Norway:

*"-Norway will become one of the three countries in the world with the **highest life expectancy**.*
*- We will have **added years of life with good health** and well-being for all.*
*- We will reduce **social inequalities** in health.*
- We will create a society that promotes health for the entire population." [NW16]

As such, several priority areas were identified to adhere to a healthier diet, i.e. reduce salt, sugar and saturated fat intake, increase fruits and berries, vegetables, whole grain foods and seafood consumption, and influence consumer behaviour to increase awareness and knowledge about health and diet [NW16]. Nevertheless, the food system was not explicitly mentioned here.

In conclusion, the national health policies specified their objectives to several action plans with particular motives to increase human health, sustainability or food. A recurring motive was to increase the economic burden, by reducing early mortality and disease development, and by increasing health (care) equity and equality. This economic motive shows how human health promotion was mostly viewed in terms of efficient care, treatments and the health care system. Safety, in terms of risk factors to health and food safety, was also a clear objective in all policies on human health. In the face of sustainability, human health was as such reduced to a commodity on the national level and planetary health was primarily addressed as a risk factor to human health.

CHAPTER 4:
THE FOOD SYSTEMS PERSPECTIVE ON NATIONAL DOHS

How are concepts of health defined for specific domains relevant for a food systems perspective, and how can national DoHs be qualitatively and quantitatively compared to these conceptualizations?

The food systems are identified as an important link between human health and planetary health in the eye of sustainability (CHAPTER 1). Moreover, they have a large potential to make significant impact in improving human health and planetary health by transforming towards healthy and sustainable designs. As such, insight in the current incorporation of the food systems perspective in European national health policies is necessary to establish efficient sustainability policies. In order to do so, this chapter identifies seven different food system domains important for the realization of HSDs (4.1.). Although there were no distinguished DoHs found for the different food system domains, the presence of these domains in the national DoHs are mapped (4.2.). Additionally, to get insight in the countries' vision and actions on incorporating the food system perspective in policies, the country statements for the UN Food Systems Summit 2021 were analysed on their content and tone. Subsequently, the presence of the different food system domains in these statements were mapped (4.3.).

4.1. Identification of food system domains

The integrative approach of the food systems perspective is inherently an interdisciplinary way of thinking for research and policy goals (9). However, the specific scientific domains involved differ per framework of food systems used for the purpose. Departing from the HLPE food systems framework (see Figure 8), different domains can be identified on several levels. However, taking healthy diets specifically as an entry point for food systems (47,56), five domains with subsequent key elements can be identified as important for investigating food system indicators, as Kennedy et al. (56) described: diet, consumer behaviour, food environment, food supply chains and food system drivers. This entry point aligns with the perspective and goals of this report. Moreover, these domains are apparent and more specified in the HLPE framework, e.g. for the domain food system drivers in five subsequent drivers. These five food system domains (56) were therefore used here, accompanied by the domain of human rights (39,44,50,55,64,65).

The latter domain can be specified into two aspects that are part of human rights: laws and regulations, and the right to food or health. These were added separately for two reasons. On the one hand, because human rights are identified as the social foundation in the Doughnut Model (49), implicitly as a food system driver within socio-cultural drivers (110), or as the basis for action on HSDs from the right to health or food. The "right to (adequate) food" (65,77,132) , i.e. a "sustainable diet" (55,110), and the right to "the highest attainable standard" (64,133) focus on the attainable *optimums*. This is also recognized in the post-war ideals of protecting individuals and societies, specified in the Universal Declaration of Human Rights, article 25 (see 3.1.). On the other hand, human rights are explicitly important for the operationalization of the goals in (inter)national policy-making. In contrast, laws and regulations are in general more focused on norms and safe or acceptable *minimums* which is apparent in concepts as "food security" and "food safety" (44,56,104,124).

Explicit reference to these different food system domains were not identifiable in the national health policies for the European countries, nor were there specific DoHs found for the different food systems domains when looking into scientific literature or related organisations. Due to this inability to analyse and quantify in the proposed way (see Appendix V), a more descriptive analysis of the implicit references to the food system domains in the national DoHs is presented in 4.2.4.2. Food system domains in national DoHs

In summary, currently there are no specific DoHs available in domains or organizations related to food systems, nor are there identifiable differences between the core elements in the DoH for the different domains. If there are DoHs present, they are mostly alike and not differing between food system domains, or they refer to the 1948 WHO DoH. However, the contribution of the different domains towards improving health, or the

domain-specific visions to reach this, are therefore not identifiable. Although the food system can use health as an outcome and includes different domains with diverging core elements, the food system domains appear to be converging on the DoH. At least the DoH in the different domains appears implicit and not specified, or taken from an overarching source like the WHO, thus not unique. This substantiates alignment between food system domains on the direction and conceptualization of health, while indicators of health and specific action points could still differ.

4.2. Food system domains in national DoHs

Health can be an outcome of a sustainable food system, and therefore it is insightful to map the different food system domains in the defined national DoHs in Europe. The presence of the different food system domains in the national DoHs is described visually in **Figure 17**. The exact scores can be found in **Table 4** . A great diversity was identified between distribution of the countries, but also within the countries for the different domains. The greatest differences between countries was found for the domain diet, food environment and the two domains of human rights.

For example, while the French DoH did not address diet at all, the importance of this domain for health was clearly apparent in the Norse, Dutch and Latvian DoH:

> *"A **good and healthy diet** can help in preventing diseases and make them easier to live with, and promotes mental health." (DoH Norway)*

> *"A **healthy diet** needs to be introduced in relation to spatial planning and aging vitally, in order to stimulate a **healthy lifestyle**." (DoH The Netherlands)*

> *"One is healthy when one **eats healthily**, regularly engages in physical activity, does not smoke, does not drink alcohol and other addictive substances, and does not engage in addictive processes." (DoH Latvia)*

The remaining countries recognized the importance of this domain to a lesser extent, for example by focussing on a healthy lifestyle in general, disease reduction, or referring to individual or social factors. The right to food and health, was not mentioned at all by France, The Netherlands and Norway, while the other countries clearly referred to the importance of this domain. This was mostly phrased as "health as a (constitutional) human right" or in terms of the right to food security (DoH Italy, Switzerland, Czech Republic, Latvia). Switzerland expanded

***Table 4. Presence of different food systems domains in the national DoHs,** as defined in **Table 1, and the statements during the UN Food Systems Summit 2021.** Scores for quantifying the presence of the eight food system domains range from 1 to 3: 1 = absent; 2 = partly present; 3 = clearly present.*

		France		Italy		Switzerland		The Netherlands		Denmark		Norway		Czech Republic		Latvia		*Average*	
		NDoH	*FSS*	*NDoH*	*FSS*	*NDoH*	*FSS*	*NDoH*	*FSS*	*NDoH*	*FSS*	*NDoH*	*FSS*	*NDoH*	*FSS*	*NDoH*	*FSS*	*NDoH*	*FSS*
Food System Domains	Diet	1	2	2	3	2	3	3	1	2	3	3	3	2	-	3	1	*2,25*	*2,286*
	Consumer Behaviour	2	2	3	2	3	2	2	2	3	2	2	3	3	-	3	3	*2,625*	*2,286*
	Food Environment	1	3	3	2	2	2	2	1	2	3	3	3	3	-	3	2	*2,375*	*2,286*
	Food Supply Chains	1	3	3	3	1	2	1	3	1	3	1	2	1	-	1	3	*1,25*	*2,714*
	Food System Drivers	3	3	3	3	3	3	3	3	2	3	2	3	2	-	2	3	*2,5*	*3*
	HR – Law and Regulations	1	2	2	1	2	3	2	3	2	1	2	2	2	-	3	2	*2*	*2*
	HR – Right to Food/Health	1	1	3	1	3	3	1	2	3	1	1	3	3	-	3	1	*2,25*	*1,714*

*FSS = country statement on UN Food Systems Summit 21; HR = human rights; NDoH = national definition of health, as stated in **Table 1**.*

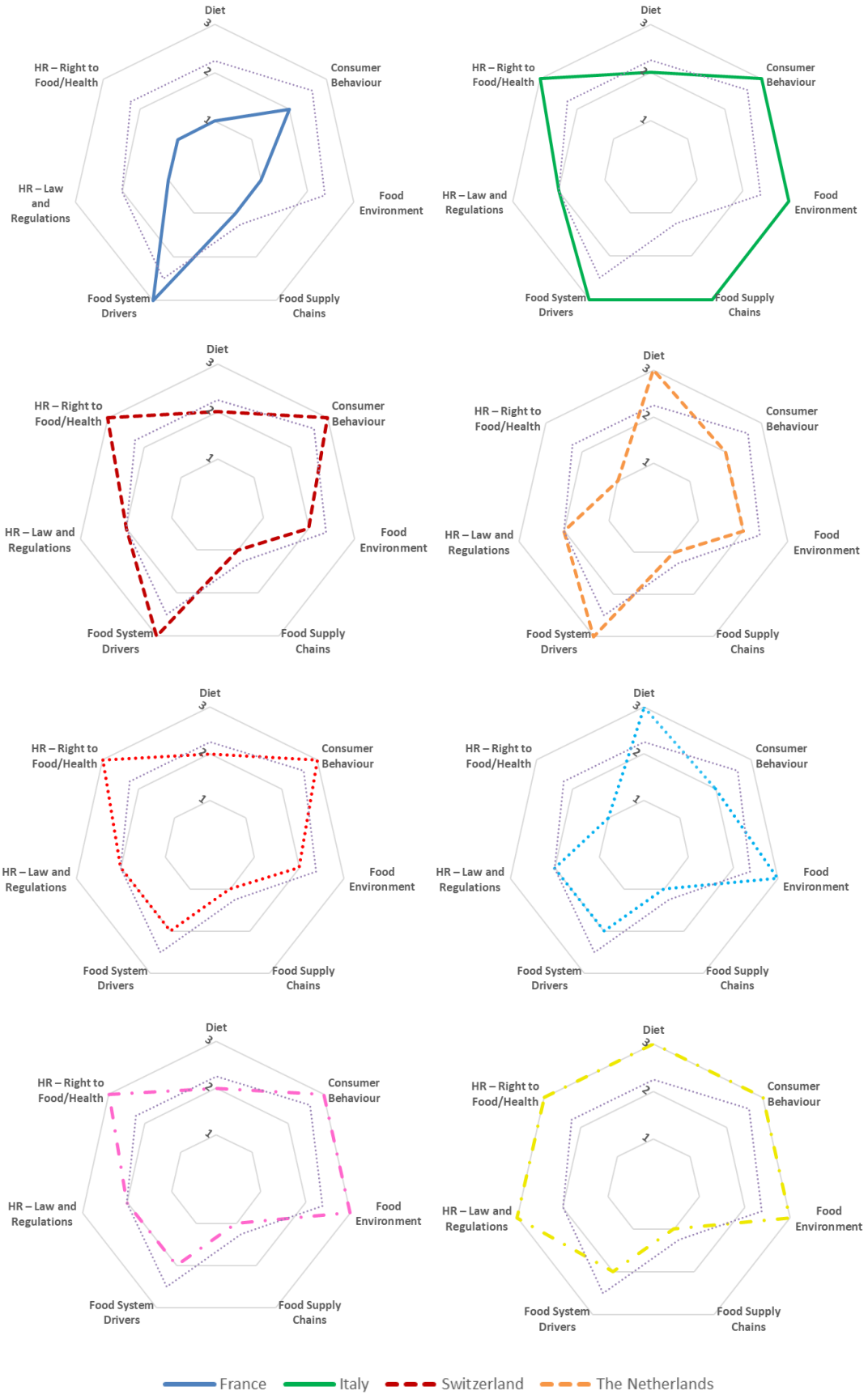


Figure 17. Presence of *Scores for quantifying the presence of the eight food system domains range from 1 to 3: 1 = absent; 2 = partly present; 3 = clearly present.* ***verage of the scores of these countries.***

this by stating that quality of life of the population is secured and promoted by the "constitutionally enshrined protection of health and personal development", and Denmark phrased it as "a prerequisite for all to be able to live the life we want".

These examples took also elements of the broad domain food environment into account, for example affordability, availability, food safety or quality. Italy stated this clearly:

> *"Health is being protected by preventing risks associated with **food safety, food security** and climate change, by preventing diseases and premature deaths, and by promoting healthy habits." (DoH Italy)*

Switzerland and The Netherlands focused in this domain also on socio-economic status or cultural living conditions, and the possible health inequalities that could be the result of differences within these concepts:

> *"Many factors help determine a person's health: genetic predispositions, behaviour and lifestyle, environmental influence as well as **socio-economic and cultural living conditions**. **Unequal health opportunities** can be depending on socioeconomic status, which negatively impacts health." (DoH Switzerland)*

As such, the Italian, Norse, Czech and Latvian DoH addressed the food environment clearly, while it is absent in the French DoH. The overlap between food environment and consumer behaviour was also clearly apparent in the Czech DoH:

> *"Health does not originate in the hospital but **in the family, at school, and the workplace** – in fact at any place where people live, work, rest and grow old." (DoH Czech Republic)*

The aspects related to promoting, advertising or information were less visible in the DoH, although they could be more worked out in subsequent policy plans.

The two domains of human rights were greatly differing between the countries. While France, Norway, The Netherlands showed no reference to the fundamental human right to food or health, the other countries took this up clearly in their national DoH. A difference was apparent, however, between the way this right is approached: Italy focuses on the constitutional basis of the right, but Denmark emphasized the collective responsibility for health in society.

Food system drivers were addressed clearly or partly by all countries, as well as consumer behaviour. For the latter this is mostly apparent as individual health behaviour, preferences and lifestyle habits, as well as the objectives to promote healthy lifestyles on a population level, in all national DoHs. France, Italy and Latvia moreover focused on personalized services or individual capacity-building to improve population health:

> *"The challenges to the health care system and inequalities are related to (…) new demographic, epidemiological and social issues; and the health risks linked to the health system itself. Health actions that increase **capacity-building and decision-making in individuals' own health** are preferred." (DoH France)*

Looking at the different types of drivers (see Figure 8), for political and economic drivers, the Czech DoH showed the clearest recognition of the importance of health for broader economic developments and vice versa:

> *"Health is connected with wealth: what makes societies prosper and flourish also makes people healthy – policies that recognize this have more impact." (DoH Czech Republic)*

However, political drivers were not found. Biophysical and environmental drivers were addressed by mentioning the influence of environment on health status in all national DoHs except Denmark, and disease development in all national DoHs. Italy mentioned uniquely "climate change" as a risk for health. Innovation, technology and infrastructure drivers were apparent in the focus on health care system improvements, treatment options, social health planning, or lifelong health (DoH France, Italy, The Netherlands, Czech Republic, Latvia), for example in the Danish DoH:

*"Quality of life can be improved when patients are active partners in their own disease management or treatment, and **modern technology** can be an outcome here." (DoH Denmark)*

While socio-cultural drivers were partly overlapping with the domain consumer behaviour and food environment, the demographic drivers were absent in all national DoHs except for France (see quote above).

Moreover, all countries did not refer to the domain of food supply chains, except Italy, which mentioned food security and health being the result of a "harmonious and sustainable development of human beings, animals and the environment". This absence of recognition of the importance of the food production side for health shows mostly a focus on health as an outcome of the food system, but not how this comes to be in the first place.

Latvia appeared to have the most holistic DoH regarding the food system domains, as it addressed all domains clearly, except food system drivers (partly) and food supply chains. France appeared to have the most limited DoH regarding the food system domains, as the definition addressed only food system drivers and consumer behaviour explicitly. There was a large overlap in the distributions for Italy, Switzerland, Denmark and Czech Republic, and between Norway and The Netherlands. The European distribution, based on the average of all countries, referred to all domains clearly, except for food supply chains.

In conclusion, while the national DoHs took the different food systems domains divertingly into account, the focus appeared to be on the dimensions impacting the individual level and less on the production side of food as a component to promote health. Moreover, the different food system domains are present in an interwoven manner, since statements in the national DoHs often address multiple dimensions at once.

4.3. National visions on sustainable food systems

Food systems are important to achieve the SDGs by 2030, due to their large potential to make impactful changes in greenhouse gas emission, protecting the planetary boundaries, and realizing HSDs (54,103,112,118). A transformation towards a more sustainable food system, with healthy diets as a starting point, is therefore necessary. Regarding this important role for food systems, the UN secretary General Antonio Guterres initiated a UN Food Systems Summit (UNFSS). The short statements of the seven countries in my selection that were part of this first UNFSS showed a diversity in focus points and presence of food system domains, as described in Table 4 and Figure 18. As such, the national visions on the actions to realize the UNFSS's goal of sustainable food systems appeared to be diverse as well.

Diverging national focus points

*"Promoting a **holistic approach** to environmentally, economically and socially sustainable food systems has long been a Swiss priority." [SW10]*

Some general conclusions can be drawn from the content analysis of the seven statements. First, while the scientific background document on the UNFSS defined four levels of food systems – i.e., global, regional, national or local (134) – none of the statements explicitly made a distinction for these levels when referring to the food system. Denmark's statement appeared to focus on actions and vision on the national level only, but all other statements referred to actions on the global level at least. Including indigenous people and traditional or indigenous food systems in innovating and future-proofing the food system was, however, mentioned by a few countries [IT14; NL14; NW18].

*"With Denmark´s newly agreed strategy for development policy, Denmark will fight to stop climate change and restore balance to the planet. And here, developing **sustainable food systems** is crucial. We need to promote new food systems based on **innovative** approaches like **agro-ecology**." [DK11]*

Second, the importance of action on agro-ecology [FR13; IT14; SW10; NL14;DK11] or agriculture [IT14; LV10] to achieve progress in sustainable food systems was a main theme in all statements except Norway [NW18]. Additionally, international collaboration and innovation, supported by the newest scientific insights, were identified as necessary tools to achieve these goals.

Figure 18. Presence of food system domains in the statements for the UNFSS 2021 of seven European countries, and the average of the scores of these countries. Scores for quantifying the presence of the eight food system domains range from 1 to 3: 1 = absent; 2 = partly present; 3 = clearly present.

"We are currently transitioning towards a more healthy, sustainable, and resilient system. (…) ***Science*** *is essential to any effective action." [NL14]*

Third, safeguarding food security, tackling climate change, and reducing hunger and malnutrition were the main objectives to start action on realizing healthy and sustainable food systems for all countries. Reducing food waste was mentioned several times as an important action in this context [SW10; DK11; NW18], and Denmark referred to SDG12.3[9] in this respect as well. The SDGs were mentioned in general by three countries [SW10; NL14; NW18] and SDG2 "Zero Hunger" was referred to twice [FR13; IT14].

"There is no simple answer to the complexity of food issues. If wrongly managed, they can seriously harm food security, our health, our planet." [LV10]

Fourth, healthy and sustainable diets were introduced in several countries' statements as a means to achieve another goal, e.g. reduction of NCDs [NW18], increasing food sovereignty [FR13] or as a part of a sustainable development strategy [SW10].

"While strengthening our food sovereignty in order to remedy the structural weaknesses brought to light by the pandemic crisis, it is a question of ***reducing our carbon footprint****, avoiding the import of products that are deforestation and to* ***offer healthier food*** *to our citizens. At the same time, we will accelerate the* ***agro-ecological transition****, by ensuring that we support our farmers, who must be able to make a decent living from their work." [FR13]*

Finally, resilience was mentioned as an objective, related to the food system [IT14; NL14], or as a subsequent goal, related to restoring balance to the planet [DK11]. The One Health approach was mentioned only by the Scandinavian countries as a means to realize more healthy, resilient and sustainable food systems [DK11; NW18].

"We will promote food safety as part of One Health. We are still in the middle of a pandemic. ***The One Health approach*** *connecting human, plant and animal health must be at the top of the global agenda." [NW18]*

In conclusion, the statements showed different motives and some general concepts in their national visions on sustainable food systems. However, the differences between countries were still profound.

Diverging presence of food system domains

Several patterns were found in references to the food system domains in the UNFSS 2021 statements, thus in their mapped presence in the national vision (see **Figure 18**). While the domains of food system drivers, consumer behaviour, and food supply chains were clearly or partly present in all countries, there was a large discrepancy apparent between the countries for the domains food environment, diet and the two dimensions of human rights. The dimension not explicitly mentioned in the most statements was the right to food or health [FR13; IT14; DK11; LV10].

The different types of food system drivers (see **Figure 8**) were clearly mentioned by all countries, but not all equally for every country. For example, biophysical and environmental drivers were addressed by mentioning climate change [FR13; IT14; SW10; NL14; DK11; NW18]. Political and economic drivers appeared in a focus on (inter)national cooperation and globalisation [FR13; IT14; SW10; NL14; LV10]. Denmark and Norway were specifically not mentioning global cooperation, and appeared to focus on the national context or their sovereignty in the food system transformation. Referring to innovative techniques, like agroecology, and science as solutions to realize sustainable food systems [FR13; DK11; NL14] showed innovation, technology and infrastructure drivers. Moreover, socio-cultural and demographic drivers were represented, by mentioning indigenous food systems [IT14; NL14; NW18] or changing consumer preferences, as described by Latvia:

[9] SDG12, target 3: "By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses."(63)

"How can we fight hunger and ensure an adequate level of income for our farmers and affordable products for consumers, while preserving and restoring biodiversity? How national policies and multilateral negotiations will deal with organic ***products as people become more aware of environmental and health aspects****?" [LV10]*

However, demographic drivers were addressed to a lesser extent: only tendencies of increased hunger and poverty in society were mentioned, and related national school meals programs to ensure at least one good meal for all children [FR13; IT14; DK11; NW18]. These programs addressed the right to food or health as well, as they tried to acquire the minimal resources for children.

Also the interrelations between these drivers, and emergent effects of these interactions were addressed, for example by France [FR13], Latvia [LV10] (see quote above) or Italy: "The combined effect of health crises, economic instability, and climate change has the potential to undermine our collective efforts to fight hunger globally" [IT14]. The European vision, based on the average scoring of the seven countries, addressed all dimensions clearly, except for the two dimensions of human rights. As such, a diverging pattern on the motives, actions and presence of food system domains, can be identified for the expressed national visions on realizing sustainable food systems.

4.4. Discrepancies and similarities between and within countries

When comparing the representation of food system domains in the national DoHs and the national visions on sustainable food systems, several interesting discrepancies were identified. First, several countries showed opposite scorings on multiple domains. France had no representation of the food environment in the national DoH, while this was clearly present in the UNFSS statement. France, The Netherlands, Denmark, Latvia clearly addressed food supply chains in their national visions on sustainable food systems, but this was absent in the national DoHs. The Netherlands and Latvia clearly included diet in the national DoH, but showed the opposite pattern for the national vision on sustainable food systems. The right to food and health was absent in the UNFSS statements of Italy, Denmark and Latvia, but was clearly represented in the national DoH. The opposite pattern was apparent for Norway. Taken together, Latvia showed the most discrepancies between their national visions on health and sustainable food systems, followed by France, The Netherlands and Denmark. The food systems perspective identified as such different policy gaps between the DoH and vision on sustainability.

There were also many countries expressing a similar degree of representation of food system domains, and thus a consistent vision with the food systems perspective. France, Italy, Switzerland and The Netherlands showed a consistent clear representation of the domain food system drivers. Norway and Switzerland expressed similar importance to food environment, while Norway also showed comparing views for the domains diet and law and regulations. Consumer behaviour was addressed similarly by France and Latvia, and the right to food and health by France and Switzerland. Thus, France, Switzerland and Norway show the most consistent views, followed by Italy. As such, it becomes clear that it depends on the food system domain whether countries are consistent or not, as France and Italy are examples of showing both the most discrepancies and similarities. Looking at the European average, the highest discrepancies was apparent for food supply chains and the right to food and health, while the domains diet, food environment and law and regulations showed very similar representations. This appears to differ a lot from the patterns identified for the individual countries.

CHAPTER 5:
SYNTHESIS

What are discrepancies, alignments, differences, similarities etc. among Chapters 1 to 4, and how can the goals and knowledge in scientific literature and policies be integrated? How do the national DoH and goals for sustainability relate to the food systems perspective?

This chapter serves as a comparative summary and reflective integration of the insights obtained in **CHAPTERS 1-4**. Subsequently, this information is used to reflect critically on the current use of the food systems perspective in the conceptualization of health and on investigating the viability of the DoH in light of the challenges of the 21st century. First, this chapter provides a summary of the different themes and motives for promoting health in the analysed national health policies, sustainability policies, and the national visions on sustainable food systems (**5.1.**). Second, these themes and motives are combined with insights from scientific literature (**CHAPTER 1**) to evaluate four key dimensions of sustainability as used by Biesbroek et al. (67): health, environment, economy and culture (**5.2.**). Third, the food systems perspective is applied to both the scientific as well as the policy analysis, to evaluate its current use in Europe towards effective policy-making (**5.3.**). In these sections I focused on the core insights of the analyses in this report, in order to formulate an answer to the primary research question.

5.1. Summary of motives and themes in national health policies

To provide insights in the current attention for core concepts related to realizing HSDs, I integrated the scientific frameworks to analyse health policies with the policy analyses based on national health policies in Europe and policy goals related to sustainability in different governance levels. This is schematically visualized in **Figure 19**. This figure is an application of the scientific framework identified in **Figure 7** to the European health policy context, and shows the current presence of interrelationships there. Some interrelations which were clearly acknowledged in scientific literature, appeared not to be addressed in current European health policy. Moreover, although there were some references to other policies, the 1948 WHO DoH or specific indicators to

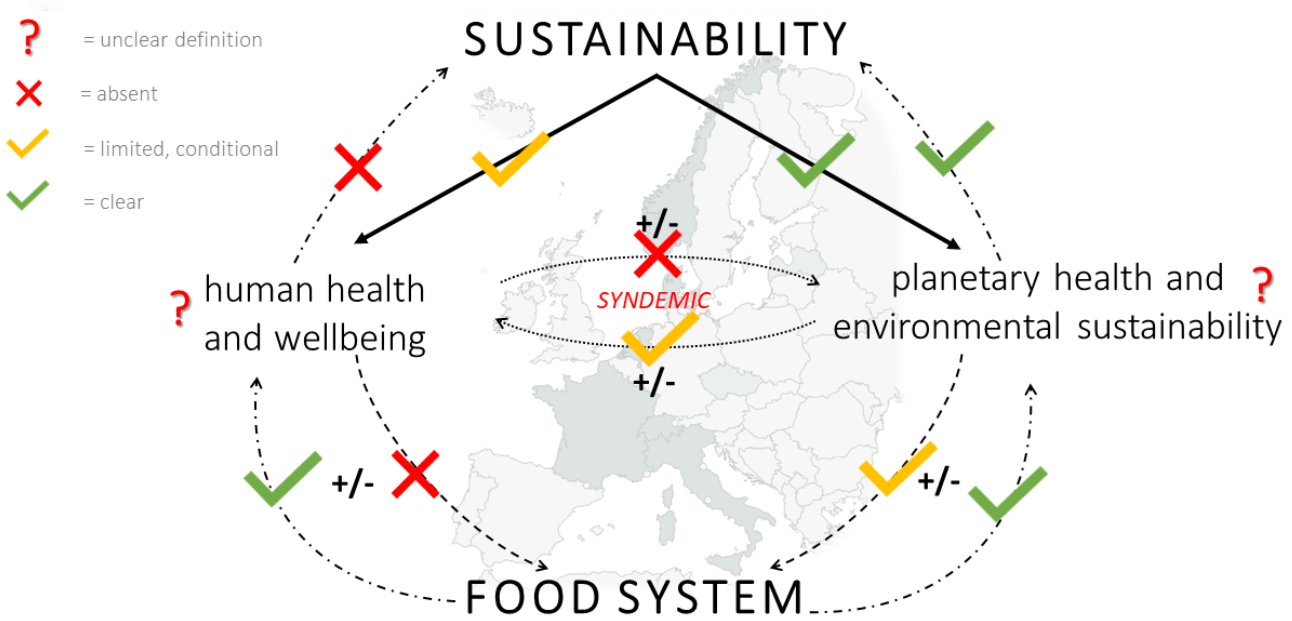


Figure 19. Presence in European health policy of scientifically identified interrelations between relevant concepts, *based on comparative national health policy analysis of eight high-income countries and sustainability policies from different governance levels. While some interrelations were clearly mentioned in the policies, e.g. the influence of planetary health status on sustainability, others were absent in the policies, e.g. the impact of human health status on planetary health or sustainability. Moreover, some interrelations were limitedly present, or even conditionally, e.g. the description of the impact of planetary health as environmental risks factors for human health status. Besides, the deinfitions of all these concepts were not specified in the policies.*

define health or sustainability, a specific definition of these core concepts was lacking in the policies. Examples can be found in the European Health Union and the EGD. Indeed, the syndemic relationship between human health and planetary health was limitedly addressed in European policy. Often there was no clear differentiation made between human health or planetary health in policies, referring to the concept of 'health'. The different motives and themes that led to this integration are elaborated on in the sections below. In conclusion, the lack of acknowledgement in the European DoH of the importance of planetary health and the interrelatedness with human health, can be a major drawback in effectively improving health in European health policies.

Anthropocentric starting and ending point

Based on the policy analysis, the European DoH and approach towards health improvement can be summarized as integrative and increasingly holistic. All in all, there was a presumption identifiable, since human health was often meant when these policies referred to 'health'. This results in an anthropocentric approach in European health policy: people, or human health status more specifically, are both the point of departure as well as of arrival. Unravelling this bias in policy can contribute to making more efficient policies to improve health in the eye of sustainability.

Moreover, in the focus over different governance levels on disease prevention, reducing (early) mortality and increasing life expectancy, there were clear reductionistic tendencies present. The holistic and integrative approach towards defining health was elaborately addressed in scientific literature, which moved towards a pluralistic approach of defining health (23,25,34). Although the broadening of 'health' outside the boundaries of disease was apparent in the 1948 WHO DoH, policies still showed a reductionistic manner of dealing with defining health, because they focused on indicators or meeting certain predetermined requirements. The diversity in these indicators and requirements was large, but policies were breaking down the utopian definition of health into clearly defined and measurable indicators, e.g. those related to the categories diseases, health care, or premature or preventable deaths. Indeed, all these categories implicitly related to human health.

Although this could promote effective policy-making based on predetermined outcome measures, the subsequent indicators need to fit to the holistic and domain-crossing DoH(s) as elaborately identified in scientific literature. Nevertheless, the national health policies showed a clear reductionist tendency by reducing human health to health care and cure in policies about health improvement. This was visible in the policy goals related to strengthening the health care system, digitalization of care, a patient-centred approach in care and disease-management, disease prevention, or decreasing health inequities and inequalities in society. Diseases were therefore seen in policy as direct indicators or markers of health status, instead of a dimension of health which can be modified by resilience or self-management. What these different tendencies had in common, is what in this report is labelled as *divergent reductionism*: health was reduced to smaller sections, but it was still integrative as the subsequent indicators and focus point represented several domains.

While scholarly definitions, conceptualizations and visions on health – both human health and planetary – have been abundant, explicit definitions were absent on a European level. The national health policies lacked a sound operationalisation of these concepts as well. On a global level, the SDGs had a clear definition of health and sustainability with several subgoals, but were all focused on disease reduction and the physical dimension of health, comparable to the Boorse DoH (33) or the medical approach to health. The TFEU provided a clear DoH, and referred to the 1948 WHO DoH, which was an example of many other references to this definition in policies and programs. It can even be argued that this definition was applied as the only definition of human health, when policies refer to "health". However, for "sustainability" and "planetary health" there was much diversity in scientific literature (1.1.), but a lack of specification in policy. As such, human health was again centralized and prioritized in policies about health.

The centralization of human health and development, depicted in Figure 19, was furthermore apparent in the influence of planetary health status on human health and the food system. Environmental sustainability in terms of planetary health was mostly negatively approached in relation to reducing risks from the environment, e.g. as a result of climate change, pollution, or toxins, ultimately in order to protect human health.

The positive influence of the natural environment or planetary health status was sparsely taken up in European policy: only the Swiss and Norwegian policies referred to their beneficial effects on human health, and showed as such a more positive approach towards the environment. This is labelled here as a *conditional acknowledgment*: a negative and conditional inclusion of the interrelationship between human health and planetary health. This tendency was also apparent in the European policies related to sustainability, as the decentralised agencies – i.e., EMA, EFSA, ECDC and EEA –, the TFEU and the General Food Law, all aimed to improve and protect human health by managing and reducing risk factors (p.47 and p.49). Moreover, the described policies related to sustainability and food specifically (p.53) addressed planetary health improvement as secondary goal. Although the F2F Strategy was an exception, since HSDs were mentioned as a means to improve both human and planetary health, and the "inextricable links between healthy people, healthy societies and a healthy planet" [EC2] were acknowledged, this was not done for the sake of the environment itself, but for human health improvement.

The abovementioned was supported by the ultimate end goal of improving human health and planetary health, i.e. economic growth, which was mentioned on several levels. For the national level (2.1.), a clear example was found in the Czech national health policy: it connected health literally to wealth, and prospering and flourishing societies, and stated that policies have more impact if this is recognized [CZ3]. The Norwegian national health policy also emphasized the importance of a healthy and productive population which can contribute to economic growth and prosperity [NW6]. Looking at the European policies (3.2.), the economic end goal was established on the one hand in the TFEU by ensuring a high level of health protection in order to sustain the EU internal market, and on the other hand in policies the EGD or F2F Strategy, which had a clear production-oriented approach towards creating a more sustainable future. The EU health programme 2014-2020 even titled its regulation 'Health for Growth' [EL3]. On the global level the economic end goal was also apparent, although to a lesser extent. It can be identified in the coherent SDGs ultimately working together towards "sustainable development", which is related to "a new era of economic growth" (1). Sustainable development appeared to be primarily understood as human development.

Lack of intrinsic value of sustainability

The anthropocentric bias unravels a lack of intrinsic value of sustainability in European policy. In both the national health policies and the policies related to sustainability there was a focus improving human health.

If the term "sustainability" or "sustainable" was mentioned on a national level, this was mostly related to the maintainability of the health care system and its design, i.e. designing a viable system that is fit for the future. It was also related to the environmental outcomes of the health system, in terms of reducing pollution and material use in health care. Sustainability in terms of human health was not addressed as such, as it is mostly specified to care and cure related principles. This reiterated the dominance of the Boorse DoH or medical approach, with a focus on disease prevention, and realizing a healthy and contributing workforce. The anthropocentric bias was also clearly apparent in the One Health approach and program, which was reiterated in literature, and on both the national as well as the European policy level. As Figure 12 described, environmental health and animal health were improved in this seemingly holistic program by means of improving human health. The F2F Strategy showed a comparable reasoning by focussing on reduction of environmental hazards to protect human health, while this was not done for the sake of the animals, plants or the environment themselves. Except for the Swiss or Norwegian positive attitude towards natural environments, the European countries appeared to express no inherent value to planetary health, and appeared to protect it merely for an anthropocentric means.

This lack of intrinsic value of sustainability is visualized in Figure 20. Although the different programs and policies had an integrative approach and aimed to improve both planetary health and human health separately, it appeared that planetary health was improved in order to promote human health. The ultimate end goal of economic growth was primarily achieved by a healthy and contributing workforce in a low-risk environment. As such, the argumentation in European health policies showed that health – primarily human health, and conditionally planetary health – was used as a *commodity* for this economic end. Moreover, the

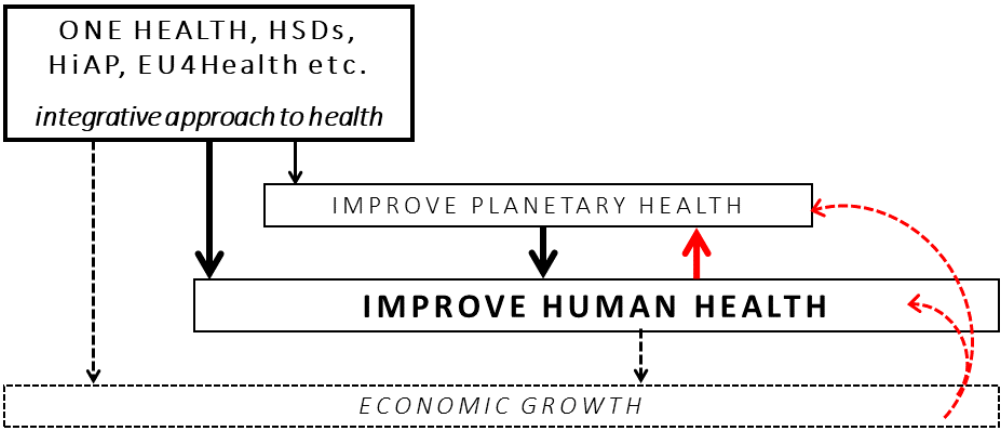


Figure 20. Schematic visualization of the motives in European national health policies to improve human health and planetary health. *Programs with an integrative approach appear to address human health and planetary health to a different extent (thickness of arrow). The ultimate end goal appears to be economic growth.*

feedback loops of economic growth on human or planetary health status were absent in policy, and especially the impact of human health on planetary health was currently not identifiable in Europe (**Figure 11**). This showed a lack of acknowledgement in European policy of interdependent concepts that are clearly identified in literature, leading to an inaccurate DoH.

Similarities per political system

There was a diversity of approaches identifiable in Europe towards conceptualizing and specifying human health, as well as towards taking up HSDs. Several similarities were identified after comparing the outcomes of the European countries to their political system. Besides the three systems based on Esping-Andersen (57) – conservatism, liberalism and socialism – Latvia and Czech Republic were analysed as a separate group of the geographically east- and central-European countries. All in all, it appeared that political systems relate – although divergently – to the operationalization of the higher-level policy DoHs, and the national view on health and HSDs.

Firstly, all countries and political systems explicitly showed an integrative or holistic approach towards health and health improvement. Examples can be found in the HiAP concept, references to cross-domain or interdisciplinary actions, or the different dimensions of health (specified as 'Focus points' in **Figure 11** and **Figure 13**). The implementation of the EGD or F2F Strategy implicitly showed a holistic approach as well, as these programs addressed health improvement via multidimensional innovations or the food system, which intrinsically is a holistic approach. Indeed, by including the social dimension of health and concepts like social inequalities, health inequalities or inequities, the definition of health was directly broadened. However, alongside this broadening, the reduction towards disease prevention and reduction in indicators or specific policies emerged, as described above. A clear example of a holistic approach in the national DoH was the Dutch, which included clear stances from the holistic and cross-domain approach of Positive Health (30,84).

Secondly, the conservatist countries France and Italy showed a comparable approach in the framing of the right to health: their national DoHs defined it as a constitutional right or a right for all, focusing on the all-time availability of health care for every citizen. Moreover, this framing appeared to imply that countries should realize the highest attainable state of health for every citizen, according to the 1948 WHO DoH. The east- and central European countries also focused on this basic right for every citizen, as well as the societal value of health. The northern socialist countries, however, framed health as a collective responsibility, possibly leading towards a more embedded and reluctant approach in making use of health care. The liberalist countries emphasized another realm: while The Netherlands mentioned the importance of the health care system being based on solidarity, Switzerland addressed the commitment of all actors to lead the Health 2030 strategy to success.

Thirdly, regarding the promotion of HSDs, all countries mentioned the healthiness of the food or healthy eating habits as a motive to improve human health status via disease reduction, while the East- and Central European countries explicitly focused more on healthy or safe food to avoid risk factors for health. Only the socialist and liberalist countries emphasized the environmental sustainability of these diets specifically. Moreover, these northern European countries referred to the improvement of the health care system in terms of sustainable resources and design, and the importance of centralizing the individual or patient in managing diseases and treatment actions. The latter trend could also be noticed for the liberalist countries.

Finally, the socialist and liberalist countries showed comparable patterns in the categorization of health among identified dimensions (Figure 14), and together they aligned with the European average categorisation of a combination of the Meikirch, WHO and Nordenfelt DoH resemblance. These countries also had a clear focus on quality of life and years lived in (experienced) good health, while the conservatist, Eastern- and Central European countries relied more on a summary of outcomes of all the different dimensions of health. The latter group showed as such a more fragmented approach.

The limits to European health sovereignty

It can be concluded that the national level is influenced by European and global governance, even though it is explicitly stated that the EU does not define health policies or organise provision of health services or care [EU4]. As laid out in the TFEU, every Member State of the EU is responsible for taking appropriate measures to ensure a high level of health protection for all citizens. However, since the ultimate goal was to improve public health in order to sustain the EU internal market, the EU needs to support Member States to realize the highest level of health possible in terms of projects, policies and stimulating (inter)national cooperation. The health sovereignty of the countries to define their own health policies, was influenced by EU programs and policies, as well as developments and regulations on the global level. The national health policies reflected this, as they often aligned with goals from European sustainability programs and plans, or referred to the SDGs to fit in the global plans, in which health was a subsequent goal.

In more detail, environmental sustainability and planetary health were limitedly present motives in the national health policies, reflected in the anthropocentric bias. An example can be found in Norwegian health policies, which aimed to become the country with the highest life expectancy. While this seems beneficial for human health, as life expectancy is often regarded as an indicator for health, it does not directly result in good quality of life or perceived good health, nor do more life years of resource depletion have a positive effect on planetary health. This interdependency between human health and planetary health was not taken into account, which showed the separation of public health from environmental actions. It was more strictly separated in European policies, which was also apparent in the higher degree of policy integration in the production side of the food system, the field of agro-ecology, food, or environmental sustainability, compared to the field of health. This agro-food production-oriented focus fitted within the EU goals of sustaining the internal market and increasing economic growth on a national and EU level. There were often references to other plans about sustainability, from different governance levels, or to guidance of scientific stance.

The guiding role of the EU in sustainability governance can be improved, by setting clear definitions of sustainability and acknowledging their impact on national health policies. Currently a clear national or European vision towards health – human and planetary – or sustainability in general, was only limitedly present. The most long-term and holistic vision towards sustainability was found in the food systems perspective. Taking the food system as an integrating approach to act on these dimensions together is gaining attention in Europe, which was for example visible in the Food 2030 program and the SFS Partnership. As all SDGs are related to the food system, showing an integral and multi-dimensional approach towards sustainability on a global level, this perspective could be a clear for policy integration between human and planetary health on a European and national level. Together with explicit recognition of the future-proof character of sustainable policies and increased sustainability status, a clear vision could be addressed on a national or European level, based on the broad definition of sustainability used for this report.

What was left unsaid

Although many insights can be obtained by combining information from both scientific and European policy, several gaps were identified in synthesizing all DoHs and perspectives. A first gap is the aforementioned lack of clear definition of human health, planetary health or sustainability in general, along the different governance levels. This was not addressed in the health policy analysis, nor in the policy goals analysis related to sustainability and the food systems perspective. The definitions seemed to be presupposed by policymakers or readers of the plans, or explicated by other organizations that are referred to. However, this reference provided no clear insight in what parts of the, for example, 1948 WHO DoH were applicable in the policy or program it was referred in. Following the scientific development towards a more pluralistic and practice-oriented approach towards health, the explication of (parts of) a clear definition of health or sustainability is of utmost importance to realize effective policy-making, as these definitions can differ between situations and practices.

A second gap is the absence of motives, goals or focus points in the motives for improving human or planetary health. These were visualized as grey boxes in **Figure 11** and **Figure 13**, and as dotted boxes in **Figure 12** and **Figure 20**. The figures showed that the impact of certain policy goals or outcomes on planetary health was not clear or specified, or that feedback loops presented in scientific literature were not addressed in policy. Besides, the reasons to improve planetary health in general, and other reasons than increasing environmental sustainability to reduce environmental hazards that can be a risk factor for human health, were not mentioned in the national health policies. Protection of planetary boundaries were addressed in some programs, but not in all, and this protection resulted in an anthropocentric bias. Moreover, economic growth was sometimes identifiable as an implicit ultimate goal, for example in the national health policies aimed to improve planetary health and on the global level, while this was mentioned explicitly in other policies, for example in the national policies aimed to improve human health and on the European level.

A third gap lies between the food systems perspective and the national DoH for European countries. This was visible in the differences between the presence of food system domains in the national DoH (**4.2.**) and the national vision on realizing sustainable food systems (**4.3.**). While some dimensions were clearly addressed in the national DoH, showing the importance of these dimensions for human health improvement, these were absent in the national visions on sustainable food systems, or vice versa (**4.4.**). The conservatist countries showed both the most similarities as well as the most discrepancies, while Latvia showed the most discrepancies and thus the clearest policy gaps. The European averages of the national DoHs and the visions on sustainable food systems differed a lot from the individual presence, which furthermore emphasized the differences between European countries. Therefore, visions and specified policies clearly differ in the food systems perspective. Since scientific literature identified food systems as a viable and potent approach to make impact on both human and planetary health, an increased and consistent use of this perspective in policy to realize HSDs can potentially align the European vision on sustainability.

5.2. Science-policy integration

This section integrates the insights from the previous chapters in along four dimensions of sustainability: health, environment, economy and culture (67). Since these dimensions are important for realizing sustainable food systems, this analysis contributes to the integration of a food systems perspective in the science-policy integration of this report. The results are visually summarized in **Figure 21**, which shows the interrelations between the different dimensions. The relations between two concepts were numbered and further explained in the following sections.

Health

As described above, the focus in this report lied on human health – on the one hand because national public health policies were analysed, on the other because the main interpretation of "health" appeared to be related to human health instead of planetary health in Europe (**Figure 21**, arrows 1, 2). Thus, it can be concluded that the broader definition of sustainability which combines the syndemic relation between human health and planetary health, was currently partly taken up in European policy. While the European DoH was furthermore

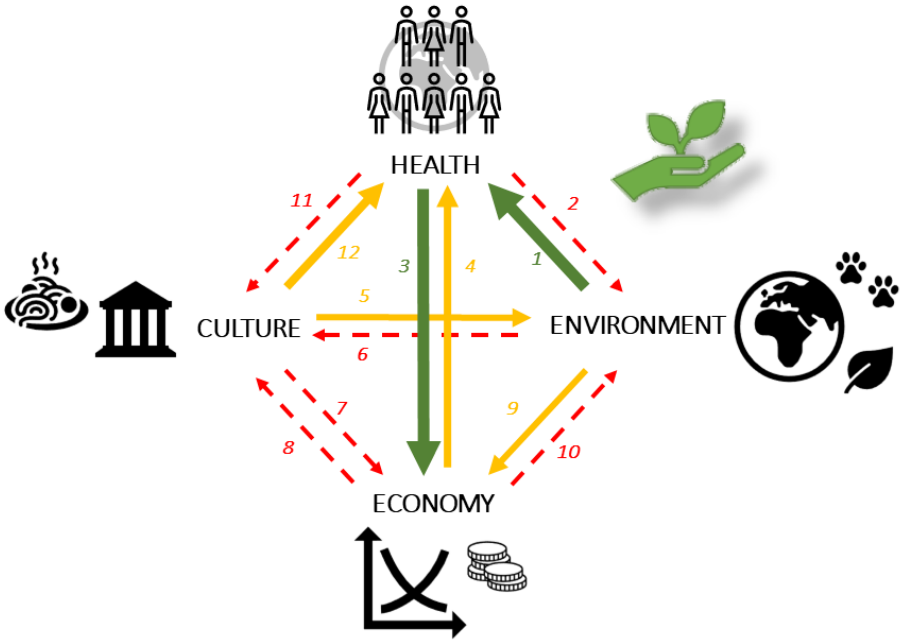


Figure 21. Interrelations between dimensions of sustainability and recognition of these interrelations in European health and sustainability policies. *Direction and thickness of arrows describe the relation between two dimensions of sustainability. Arrows in green show clear representation; arrows in yellow show limited representation; arrows in red show absent representation. The individual relations are elaborated in the text below by reference to the numbers mentioned.*

increasingly integrative and holistic, with an eye for the individual and the right to health, it had an anthropocentric and medical or care-centred approach.

The design and goal of the EU had a great influence on the organization of health care and policy in the different countries. The centralization of sovereignty for health (policy) on a national level contributed to the possibility of national differences in vision on and realization of health improvement. Nevertheless, global and EU legislation and programs about sustainability and health had an apparent steering direction in the interpretation of these concepts on a national level. As such, the European DoH was a mixture between global and EU vision with some national redirections and specifications.

Moreover, the European countries acknowledged a broader DoH than the definition of national health only. This was visible in some policy documents, for example from France or Norway, which addressed global or international health policies from the countries, although the focus was put on the national health policies. These policies were mostly directed at African countries or former colonies, with whom the countries still had relations for developmental reasons. While these policies were not analysed in-depth, there was a difference of tone and focus identifiable compared to the national policies: food systems were addressed more, and the focus on disease prevention and appropriate care services and provision was even more present than in the national motives.

On the one hand, the broader DoH in Europe was identified in the subsequent policy goal of realizing HSDs to improve human health status. This interdisciplinary goal inherently integrated different food system domains and dimensions of sustainability, and necessitated a systems approach to health. This shows that improving health can be understood as a complex problem, since a combination of different dimensions and approaches is necessary to realize beneficial outcomes, which can be seen as a proxy of a broader definition of health. On the other hand, there was a clear reduction visible of the concept of health: in order to say something about health status, it was reduced to certain indicators, appropriate health care provision and sustainable health care systems. A clear example can be found for the specification HSDs, which were mostly composed based on disease-preventing categories, as both scientific literature (p.21) as well as European health policy (p.30) showed. Fulfilling the minimal or maximal demands of separate puzzle pieces could as such contribute towards the overall puzzle of national health improvement.

A paradigm shift and a systemic transformation seem necessary when the focus is shifted to resilience. This vision aligns with the definition of sustainability, and can contribute as such towards future-proof health policy-making. Meeting the criterium or stimulating resilience was mentioned in national and EU policy as a puzzle piece or goal for health improvement. Scientific literature also built on the concept of resilience in relation to planetary health and human health (p.16 and p.18), referring to the importance of safeguarding the planetary boundaries and sustainable development. Centralizing resilience emphasizes the underlying processes more, both on the level of the individual or patient, and the health care system or national governance. It appears that stimulating resilience reduces the possibility to sustain economic growth as ultimate end goal, since the focus will be redirected towards balance instead of growth.

Environment

The distinction between health and environment in the eye of sustainability was made in both science and European policy, but the interrelation between the two is currently more emphasized in the first. This was visible in the conceptual framework of the syndemic, as well as in the broad definition of sustainability based on the literature review. As mentioned before, in policy the environment and environmental sustainability was mostly included as a risk factor for human health (Figure 21, arrow 1). This was apparent on all governance levels (Figure 21, arrow 5). While there were separate policies available for improvement of environmental (risk) factors and improving health indicators specifically, these two were mostly separated. If the environment was included in health policy, this was on conditional grounds as it serves reduction of risk factors for human health. Thus, public health in Europe was currently not encompassing planetary health or environmental sustainability, other than regarding it as creating possible risk factors.

This anthropocentric bias was also apparent in the seemingly holistic conceptualization of One Health. Although this approach aimed to integrate human, environment and animal health, the main incentive was to decrease risk factors for human health like zoonoses, antimicrobial resistance or infectious diseases. The influence of the Brundtland definition of sustainable development was clearly visible in this dimension: while the importance of the environment, in terms of ecosystems and resilience of the biosphere, to deal with the effects of human activities is recognized, the ultimate goal is to enable human development in a future-proof manner. Thus, the anthropocentric bias was also clearly apparent in both science and policy for the environmental dimension.

Economy

Economic motives were apparent in two dimensions of HSDs, as well as food and nutrition security as described by Biesalski et al. (98): affordability and accessibility. Although many more aspects relate to the economic realm of HSDs, these dimensions were also recognized in the national health policies related to diet or lifestyle, as well as in policies related to health and sustainability on a European and global level. Moreover, economy is of great importance in the production side of realizing HSDs and health in a country, which emphasizes certain domains of the food system. This agri-production emphasis was apparent in national and European policies, as well as a large degree of integration between these policies coming from larger projects. Thus, the economy of a healthy diet and population was well-described in literature and policy, although in a specific direction (Figure 21, arrows 3, 4, 9, 10).

As the policy analysis showed, the economic dimension of sustainability had a large impact on the design of European health policy as well as the motives for health improvement. This was apparent on both the national as well as the European level, and on the global level to a lesser extend (p.70). However, while economy was explicitly mentioned as the end goal for improving health, and implicitly for improving planetary health, this referred only to increases in GDP or reduction of national or health care costs. Environmental costs or the impact of increased economies on the environment or planetary health status were not addressed or taken into account in policy. This argumentation ending in economy showed no ideologic goal of public health or intrinsic

value of human or planetary health: policy referred mostly to reduction of *negative externalities*[10] to support their actions.

The clearest example of this economic driver can be found in the question that appears to dominate health policy: "How health/development/economy be maximised?". When the end goal is of economic nature, national or European policies will aim to gain as much as possible, without spending too much (both monetary as well as natural resources). As a result, tension can occur between planetary boundaries and increasing economic growth, reflected in the concept of sustainable development. This was apparent in the Norwegian health goal of maximizing life expectancy to the fullest extent: increased life expectancy does not automatically lead to increased quality of life or experienced good health, nor does a national increase in life expectancy have beneficial effects on resource depletion. This contrasted with other goals of Norway which emphasized protection of planetary health and environmental sustainability. Moreover, a focus on gaining much while spending little could likely result in satisfaction with accounting for the minimum, and not the optimum. While this could be acceptable for some goals, e.g. minimal health care services for all citizens, they could be less sustainable for long-term goals, e.g. minimal contribution to fighting the effects of climate change. Trade-offs have increasing importance here, as is identified in scientific literature in relation to the food system (45,102–109), and the drivers are currently of economic nature. If the concept of resilience would be integrated in this dominating question, the possibility to maximise is decreased or is made less important. As such, the dominant question guiding human health policies could be: "What are the minimal needs to enable individual and systemic resilience and to live a sustainable life?". This change in perspective necessitates a change in our economic system, and aligns with the Doughnut Model (49).

Culture

Culture of health and food was not a primary concept in this report, although it is an important yet highly complex topic in the domain of implementing sustainability (67). Addressing culture here is therefore insightful, and some explicit (**Figure 21**, arrows 5,12) and implicit relations in my analyses can be identified (**Figure 21**, arrows 6,7,8,11). Based on the literature analysis, culture was put forward as an essential aspect for sustainability or the content of HSDs, for example in the criterium that sustainable diets need to be culturally appropriate (44,98,100). The importance of culture was also recognized in the food systems perspective in the socio-cultural drivers and in the food environment.

Nevertheless, culture was limitedly emphasized in the national health policies in relation to HSDs or sustainability. Besides, food environment as a food system domain was divergently included in the national vision on sustainable food systems. The social dimension of health and eating, like family, habits and environment, was identified for some countries, but not for all (**Figure 21**, arrows 11, 12). The DoHs also addressed culture limitedly: only Switzerland and The Netherlands mentioned it explicitly as being important for health, mostly in terms of socio-cultural drivers that are of influence on human health status. The person-centred approach which was identified for several countries could be defined as a proxy for recognition of cultural differences in health care or vision on health for individuals. This was visible in the focus on right to health (care) for all citizens and having a say in treatment plans, e.g. in Italy and Latvia, aimed at improving population health. In contrast, the focus on realizing this approach in the broader health care system identified for other countries, e.g. Denmark and Switzerland, aimed at systemically improving individual care. Differences between cultures in the DoH within or between countries, or in the vision on health and health care, were not identifiable in scientific literature nor in health or sustainability policies.

Although not explicitly analysed in this manner, the different political systems of the selected European countries could show influences of national culture on the definition and vision on health (**p.71**). First, cultural

[10] Negative externalities occur when there is a negative effect on a third party when a certain product is produced or consumed. For example, the negative influence on planetary health status of increased economic growth with subsequent increased resource depletion by aiming to maximize human health status in national policies, or the negative effect on human health status by centralizing human development and protection of the internal market in EU sustainability policies, as these policies take planetary health too little into account.

and political differences were of influence on the development of European welfare states (135). Together with the economic motives, political systems can therefore be seen as an expression of culture as such. Since differences in the vision on health and sustainability were identified in this report between countries and political systems, these can most likely be expanded to differences in culture: either as an explanatory concept, or as a changing outcome. Second, the manner and degree of taking up the SDGs in national policy identified differences in culture related to health and sustainability. Food choice-based culture is here, however, not specifically taken into account. Third, the influence of culture or the political systems on national economy or sustainable development was not addressed in the national health policies, and limitedly in the policies on sustainability in Europe (Figure 21, arrows 7, 8). Fourth, the national differences between the degree of anthropocentric bias and the approach towards the utopian character of the 1948 WHO DoH can be related to (national) culture (136–139), as they provide insight in the environmental ethical position.

Insight in analytical blind spots on culture or national habits can be substantiated by an analysis along cultural axes, for example by looking into food-based dietary guidelines of the specific countries to provide insight in the impact of culture on the DoH and HSDs to realize effective policy-making. These guidelines are context-specific, i.e. national, recommendations designed to foster healthy eating habits and lifestyles (140). Countries are encouraged to incorporate sustainability considerations into the guidelines, as the guidelines have the potential to impact food systems and diets from production to consumption, by steering a wide range of food and nutrition, health, agriculture and nutrition education policies and programmes (140).

5.3. Food systems perspective

The last part of this synthesis focuses specifically on one of the lenses used to look into health and HSDs: the food systems perspective. This perspective was extensively worked out in scientific literature to address complex problems related to food sustainability in a multi-dimensional manner. Moreover, sustainable food systems were identified to have a large potential in making impact on both human and planetary health improvement. Therefore, several insight in the current use of this perspective in literature and policy can give a new impulse towards realizing effective policy-making towards improving human health and planetary health in the eye of sustainability. Based on the guiding framework for this analysis, described by the HLPE (Figure 8), several insights could be identified in this comparative analysis. It can be concluded that currently in Europe the food systems perspective is limitedly taken into account in the DoH and in the policies towards improving human health, not doing justice to the impactful beneficial potential on European health that implementation of this perspective could have.

Motives for health promotion are food system drivers

A first insight is that the food systems perspective was partly explicitly, but mostly implicitly present in current European health policy. First, related to the integration of the framework with the national health policies, the identified motives for improving human health and planetary health (2.1. and 2.2.) and the building blocks in the cascades (Figure 11 and Figure 13) can be equated with food system drivers themselves. All five different types of drivers – i.e. biophysical and environmental; innovation, technology and infrastructure drivers; political and economic; socio-cultural; and demographic – were recognisable in the national health policies, as well as in the goals for sustainability on a European level. These drivers were present in the argumentation, the reasons or motives for realizing certain policies or policy goals. However, these motives were not explicitly referred to as “drivers” in the policies, nor as “food system drivers” specifically. The most abundant driver was equality and equity in relation to health and health care access, often related to the right to health in national policies. These can be summarized as socio-demographic or socio-cultural drivers.

Second, also other parts of the food system, where the drivers realize their impact, were implicitly mentioned. For example, food supply chains, food environments and consumer behaviour were taken up in national health policies and European programs. However, this was not done consistently for every country, policy or program, which resulted in a diverging picture of taking up the food systems perspective in Europe.

This divergence was also apparent in the presence of food system domains in the DoH (**4.2.**) and the national vision on sustainable food systems (**4.3.**).

Third, 'health' as the outcome of the food system was identifiable in the policies on all governance levels. In the food systems perspective, health was mostly related to human health, and this tendency was also present for Europe. Whenever a transition related to food was mentioned, like the realization of HSDs, improvement or protection of human health was addressed as a necessary goal. Another alignment was found in the focus on the production side of sustainable food and environmental risk reduction, which was present in the food systems framework and the analysed policies. Specifically, this means that the policy focus in Europe was currently on human development. Again, the anthropocentric bias was paramount in all these motives.

Differences between governance levels

A second insight shows that besides the divergence within and between countries on the acknowledgement of food system dimensions, there were also differences between the three governance levels used in this analysis. On the national level, the food systems approach towards improving sustainability, food systems perspective in policy-making or the goal of realizing sustainable food systems were not clearly present. This appeared in the absence of reference to the food system in national health policies of the European countries, with some exceptions for global health policies specifically. The global level also lacked explicit recognition of the potential of food systems transformations in health improvement, although the SDGs are all affected by the outcomes and parts of the food system. However, on the European level, there was more attention for the food system as a policy goal, as well as an approach towards realizing sustainable solutions for both human and planetary health. This was clearly apparent in some programs related to sustainability, like the SFS Partnership or Food 2030.

Nevertheless, in EU programs there was primarily attention for the production side of the food system and improving collaboration and integration to realize effective transformations. Dimensions of nutrition and health and their interrelations with the food system, were not specifically put forward, besides the goal of realizing HSDs. Moreover, a clear description of exact necessary changes in the different parts of the food system to realize HSDs or improve health status lacked in both health policies and European programs. This aligned with the findings of scientific literature, where the importance of these changes in agriculture appeared necessary to obtain sustainability targets in Europe (112,119–121). Thus, the progress in integrating current knowledge that science has been made in the field of sustainable food systems transformations appeared to be limitedly integrated in European health policy, and differences in vision and recognition arose between governance levels.

Policy gaps

A third insight is that multiple policy gaps can be unravelled when all information was combined regarding the food systems perspective. A first policy gap in European health policy is an absence of specification how health, food safety, food security or food production can be realized in sustainable food systems. As such, the gap identified in scientific literature on food systems of covering the dimensions of nutrition and health, as well as their interrelations with the food system (119), can be extended to the policy level. Not on the national level, nor in European policies there was a clear specification of a plan how to realize HSDs.

A second identified policy gap is related to the discrepancy between the national visions on sustainable food systems and the recognition of food system domains in the national DoHs (**4.4.**). While some countries showed clear representation of certain food system domains in their national DoHs, recognizing its importance for health improvement, these dimensions were limitedly or not addressed in the national vision on sustainable food systems, or vice versa. This could mean that there was no clear vision on the national priorities in the food systems perspective towards realizing a more sustainable future, and that the road towards creating this future was still not specific enough.

A third identified policy gap relates to a national vision on sustainable food systems to realize HSDs or health in general. Since these concepts were limitedly or not addressed in national health policies, the national

vision towards realizing this future could not be identified. However, also based on the UNFSS statements no clear vision could be identified, as these concepts were not explicitly covered there. Whether health is an intended outcome of the (sustainable) food system, what is understood by 'health', or how these sustainable food systems are designed, remained unclear for the national level. As such, differences between countries in their vision, and possible synergies or conflicts could not be identified.

A fourth identified policy gap is focused on the lack of focus on economic growth in the food systems perspective, while this was clearly present in health policy on different governance levels. Stimulating the food systems transformation in Europe or in the countries to improve sustainability status had no explicit economic incentive on a national or global level. On a European level this was often not mentioned explicitly, together with the focus on sustaining or increasing production in the face of environmental hazards. However, since the TFEU specified that the internal market must be protected, the European programs focused on increasing sustainability, including sustainable food systems, most likely had an economic end goal. As this bias was not identifiable, policies appear to differ. Moreover, this motive was not put forward in the literature review, which represents another gap between science and policy.

All in all, these gaps can be an explaining factor in predicting potential policy outcomes. Therefore, raising awareness on these explicated policy gaps in both science and European policy can contribute to increasing currently lacking coherence and creating more efficient policies in the realm of health and HSDs, in order to face the challenges of the 21st century.

DISCUSSION

This report aimed to evaluate the viability of the current DoH in European policy to realize HSDs, in order to support effective policy-making. I used a scientifically supported conceptualization of sustainability depicting the interrelations between the dimensions of human health, planetary health and the food system. This conceptualization guided the policy analyses, giving this research a unique character. Moreover, objective identification of current motives for improving human and planetary health was possible, because I included elaborate qualitative and quantitative analysis of 154 recent policy documents related to public health and sustainability from different governance levels.

This report is to my best knowledge the first comparative scientific literature and policy analysis to explore the concept of health in the eye of sustainability, while at the same time explicitly including the food systems perspective. A comparable analysis of policy and governance was recently done by the WHO European Office, where implementation arrangements were also taken into account. However, only four of the selected eight countries for this report were analysed, and the data was obtained from a qualitative self-reported survey by 29 Member States (141). My analysis aligned with their focus on the SDGs and SDG3 in particular, as well as their conclusion that more action is necessary to improve health governance through a holistic lens with specific attention to prevention and resilience. However, my findings diverge from their conclusion that the 2030 Agenda for Sustainable Development was nationally implemented and the SDGs were integrated across sectors to a high degree in policy, since I found limited reference to the SDGs in European health policies. Moreover, economic growth as ultimate goal of health policy is a novel and unique emphasis unravelled here.

The extensive synthesis and interpretation of the results in CHAPTER 5 emphasized furthermore the broad conceptual and multi-dimensional coverage of this research, which was reflected in the character of health itself. All in all, this report provides understanding of the European arguments for health promotion in the 21st century, i.e. the Anthropocene. However, identification of some limitations and interpretation of the results in a broader perspective is necessary to substantiate the insights in this report. The sections below show general highlights and some methodological remarks, although they are not exhaustive.

Conceptualizations of health and sustainability

In scientific literature, the different conceptualizations of health moved towards a holistic but pluralistic and pragmatic approach (16,25,30,33,34,142), or even rejecting a unique DoH (23). The identified holistic, integrative European DoH in this report aligned with these scientific tendencies of the last decade (CHAPTER 1), although it differed on three points. The first difference was the primary focus on human health and preventing or curing disease as operationalisation. The second was the lack of attention for the potential of the food system to make a positive impact on human and planetary health (CHAPTERS 2-4). The third was that the task to define "the" national or European DoH still had a monistic character. As described by Jessica Duncan, consensus could reinforce the *status quo* and enhances inequality, and is therefore not always preferable (143). Nevertheless, disagreement could open the discussion again and makes room for transformation, especially towards sustainable food systems. Opening the concept of health again is necessary, especially now in the face of urgent challenges in sustainability (37). Although consensus on the DoH appears not possible (yet), accepting plurality could be a step forward.

European policies recognized the integral, multidimensional and domain-crossing character of health and sustainability. The social domain, health equality and equity, and the health care system were particularly emphasized as important influences on the state of health. The expanding role of lifestyle and nutrition in preventing or treatment of diseases was also related to the shift from a solely nutrient-focused to holistic and multidisciplinary area of research (144,145), which was inherently connected to the DoH. This aligns with scientific literature, for example in the integrative character of all SDGs (146). All SDGs are influenced by the

food system, and the food system was identified to have a large potential to make impact on sustainability status. Therefore, trade-offs are necessary to realize sustainable food systems and create effective policies (41). Moreover, a knowledge-governance interface is needed to realize a diversity of knowledge in governing the food system transformation properly (147), unravelling a pluralist approach in food systems thinking.

Implications of anthropocentric bias in sustainability and health

As expected, one of the main outcomes of the policy analysis and the science-policy synthesis, was that the European DoH currently had an anthropocentric bias. The analysed data were mostly national health policies, which inherently focused on improving population health in a country. The anthropocentric bias was also visible in the Doughnut Model (49), which described a rethinking of the economic model to create a "safe and just space *for humanity*", i.e. to serve human development, as well as in the EAT-Lancet Commission paper on HSDs (92). The identified economic end goal of health promotion (CHAPTERS 2-3) aligned here as well, since health was used as a commodity. However, the Doughnut Model differed in taking resilience or balance, rather than growth as the form of this economic end goal. Here, the utopian character of the 1948 WHO DoH cannot stand anymore as it would not strive to the possible maximum, but to the necessary minimum to keep the system in balance. I advise to perform comparable research on planetary health or environmental (sustainability) policies on a national, European or global level, to investigate whether this anthropocentric bias and anthropogenic essence of influential activities is also present in other policy realms.

Van Heerten (86) described that human health will always be the trumping value, as long as we do not shift to a holistic conception of One Health. This anthropocentric conception of the One Health approach was also identified in my policy analyses. Van Heerten critically addressed the ethics of the One Health approach, and proposed a holistic concept of health which supports the idea of health of the system as a whole: resilience. Together with stability and balance, this concept was already emphasized in the 'Limits to Growth' report from 1972, as a state of global equilibrium to satisfy the basic material needs of individuals (89). Reference to resilience or dynamic equilibrium was found in several policies, as well as in literature on human health, One Health and food systems (26,30,32,83,84,119,148,149). As such, my findings for European health policy are in line with increased scientific popularity for the concept of resilience.

The paradigm shift that is necessary to realize a focus on resilience is described in environmental philosophical literature, amongst other by Glenn Albrecht (150). He introduced the Symbiocene as the following epoch to the current Anthropocene, where mutualism and symbiosis with nature are centralized. Aligned with the Symbiocene vision, a recent social-ecological approach concluded that regenerative food systems can enhance the ability of living things to co-evolve, and thus have the potential to move humanity beyond the boundaries of sustainability (152). The implications of these transformations in systems and goals for policy-making regarding sustainability and realizing HSDs, should be explored in subsequent research on nutrition, human health, planetary health, and political philosophy.

The European policies already showed value of integrative approaches towards health, patient-centred care and including the social dimension of health systems and health inequality in their policies. Therefore, the concept of Positive Health (30,84,85) could be particularly of interest for future health policies in Europe, since it is holistic, domain-crossing and centralizing resilience, while simultaneously being practical and well-worked out for primary care.

Economy as an end goal

Although the starting point of this research was not intentionally economic, and DoHs were in scientific literature not directly linked to economy, it is surprising that economic growth was identified as the ultimate goal in Europe of health policies for both human and planetary health (CHAPTERS 2-3). Lepeley (153) already identified the integration of the value of people and planet as currently absent in the GDP, which is an important

measure for economic growth. In this report, the selection criterium of welfare states was inherently linked to necessitating economic growth, to improve certain provisions. The post-war European thought that physical and mental health of its people was the responsibility of the state, resulted in one way or the other in provisions or financing of social services (e.g. medical care, education) and social security (e.g. insurance in the case of illness or unemployment) (135).

Moreover, the TFEU laid out explicitly that Member States work to their fullest capacities on creating high standards of population health, emphasizing sovereignty and solidarity, but this necessitates sufficient economic means. Since political systems could be identified as expressions of national economy and culture as such, future research can look more into the differences between these political systems and health care designs (154). Then, insight in current blind spots and matters of course can be obtained to specify European motives and underlying causalities for health promotion. Besides, a comparison of policy styles between and within the countries could be of use to explain stability and change of policymaking patterns across countries and sectors, as well as over time (155).

Identified policy gaps

The identified policy gaps between science and health policies emphasized that the link between human and planetary health was currently not addressed (enough) in Europe. Furthermore, they showed that recognition of feedback loops is lacking, and that sustainability is at odds with economic growth as the main goal of human health. However, scientific literature clearly addressed the ecological and physical limits of the current anthropocentric bias in health policy (49,90,92,150). Moreover, the goals for improved sustainability are already agreed upon on a higher level, e.g. in the Paris Agreement (156), or the Decade of Action on the SDGs (73). Although the SDGs are referred to in general by many European countries, the lack of intrinsic value of planetary health and the lack of clear action on sustainability on a national level showed there is currently a lot to gain in health policy. To support national health policies that addressed the Global Syndemic, it was argued by Swinburn et al. (50) that global intergovernmental organisations and large philanthropic foundations and regional platforms should play an increased role.

There is a world to win on closing the science-policy gap, as Poiesz, Cars and Lapré stated, since “policies can never be more consistent and clear than the concepts they are using” (22). Interpreting policy as specifications of science to time and place, the core concepts in scientific literature in national policies can be unravelled, which was done in this report. European policy did not recognize the broad dependence of human health on planetary health and vice versa as substantiated in literature, while human health was often implemented as preventing or treating diseases instead of a holistic DoH. This means that health policy emphasized medicine, innovation, pharma and health care systems to increase population health. However, the direction of evidence-based medicine is being influenced by the source of funding and corporate interests, as well as failed regulation and commercialisation of academia (157). Therefore, the influence on innovation and research of business, philanthropists, investors, and corporations, and thus on the direction of public health, should be clarified to make transparent policies to realize sustainability transformations (158).

Especially since the population above 60 years is expected to be doubled by 2050 (159), and the most NCDs and health care expenses are currently from this group, appropriate action on sustainability in health must be taken. Yet, an anthropocentric focus on the highest life expectancy appeared not viable for planet or health care systems. Although increasing sustainable health care (systems) was already indicated as a challenge in European policy, more attention can be paid to trade-offs between environmental health and human health.

Implications of focus on the selected European high-income countries

Although geographical diversity was an initial aim of this report, the use of the welfare state classification of Esping-Andersen resulted in a representation of western and central European countries. Esping-Andersen’s

typology is somewhat outdated, and changes in the number of welfare states are likely to have occurred since, since GDP has increased (160). Despite many critiques since its categorization of welfare regimes and their effects on economy, Buhr and Stoy (161) concluded that alternative categorizations confirm the validity of Esping-Andersen's typology. Moreover, welfare states are inherently connected to caring for the people, and therefore most likely have a policy infrastructure available that focuses on improving health. As welfare states developed differently from post-war to modern-day Europe (135), taking a sample of this diverse set of welfare states was assumed to give insight in the European differences.

Although I investigated this diverse set of welfare states in modern-day Europe, the lower income levels and many European countries were not taken into account (58). This mitigates the generalisability of the results to a complete European or global context, as there are worldwide more low- and middle-income countries (n=137) than high-income (n=79). While this focus on high-income countries can be seen as a limitation, it reduced the possibility to lead diversity in the national DoHs directly back to differences in per capita income level.

To get more insight in the reason for national differences, and to place the economic end goal into perspective, health expenditure can be explored. Combining this with the national DoHs shows the interaction between how people view and prioritise health, and the economic position to realize its improvement. The WHO moreover states that health expenditure is reflective of SDG3, since it is a critical component of health systems and health indicators (162). Although all selected countries were identified as high-income countries, recent health expenditure or the changes over the past 20 years range from 6% to 12% of GDP (Appendix VI), showing that there are considerable differences in resources channelled to health, relative to a country's wealth (160). This means that national differences in goals or motives for health improvement and realizing HSDs can be partly traced back to differences in health expenditure. As prioritization and design of health expenditure indicators are strongly related to the type of health care systems (162), it is important to compare systems between countries to get structural insight in (underlying) differences. Future research can elaborate more on these differences by comparing policy goals with policy actions and realizations on a national level with the health expenditure.

Availability and use of national health policies

Some methodological remarks can be made about the assessment of the data, i.e. the policy documents. First, not all national health policies were available in the designated language of the author. Using translating tools gives rise to translation errors, either as incorrect translations or on a delicate level of culturally differing interpretations. Deviant interpretations of tone or exact meaning could therefore have occurred.

Second, for the national level of sustainability policies (CHAPTER 3) the analysis was less extensive than aimed at for pragmatic reasons. Here, only action plans towards health promotion were included if they were mentioned in the national health policies. However, these action plans can in reality be separated from national health strategies, which could have resulted in missing registered national action plans. Also the European level cannot be identified as exhaustive, since a clear overview of the current policies on EU level was lacking. Lack of cooperation between Member States was earlier identified as a major challenge for the impact of the F2F Strategy (163), which could mean that overview and cooperation are larger policy problems in the EU.

Third, the online availability of policy documents was not comprehensive. On the one hand, it is possible not all documents were digitalized and therefore were inaccessible for this research. On the other hand there were differences visible between websites in the original language or in English, for example for Norway. Thus, the policy analysis of this report cannot be marked as exhaustive. However, since there were many documents analysed in total and for every country respectively, it is assumed that the included policies at least are sufficient to get insight in the diversity in policy goals and motives for health improvement in Europe.

Fourth, policies or goals related to COVID-19 were not taken into account in this analysis, since not all policy documents were published after 2020. Therefore, national strategies to mitigate COVID-19 effects on health status and health care systems could not be compared for the selected countries. However, the pandemic likely had a large influence on both economic and natural resources, as well as the social dimension (3,79,164), that need to be taken into account in future health policies.

In following research, these four aspects can be further elaborated upon. Additionally, other instruments can be used to get insight in the policy actions and related infrastructures in the countries, e.g. the European Observatory for Health Systems and Policies' documents per country (165), the European Core Health Indicators (ECHI) (166), the global INFORMAS network (167), the Human Rights Guide to the Sustainable Development Goals (168) and other documents describing the monitoring of national health status (74,169). Finally, quality of the policy analyses can be improved by coding the motives and arguments towards health improvement, by duplicating these extraction processes, or by taking the realisation and outcomes of policy plans into account.

CONCLUSION

My analyses of European and national policy documents show that the operationalized DoHs were not aligned with the 1948 WHO DoH. Vastly holistic definitions of sustainability were currently absent in European policy, leaving the DoHs not viable to effectively face the 21st-century societal and planetary challenges. This conclusion arises from the three main lines of research and their synthesis in this report.

First, the European DoH primarily focused on human health, prevention and treatment of diseases. This aligns partially with available scientific conceptualizations of health, where health equality and equity have a comparable importance. I identified this approach to health in Europe as divergent reductionism. In contrast to scientific literate, health policies make no or very limited reference to the syndemic relationship between human and planetary health. The conditional recognition of these relations emphasizes they are subordinate to the influence of planetary health on human health. For example, absence of clear definitions and holistic operationalizations of health, showed science-policy gaps which emphasized current definitions of human health did not well cover planetary health and sustainability. Moreover, I found that HSDs are not a health goal on their own, but that they are primarily promoted to prevent diseases within national health policies. This contributes to economic growth as the final goal, mediated by a healthy society and reduced health care costs.

Second, sustainability currently has no intrinsic value in European health and sustainability policy. Reducing (environmental) risk factors for human health are the primary reason to focus on planetary health improvement. Subsequently, health is identified as a commodity, which could contribute to realizing economic growth. Transitioning from the current growth-focussed economic system focused on growth, towards a focus on resilience benefits the global sustainability status, as proposed in the Doughnut Model. Moreover, the human-centred focus of the Anthropocene has no beneficial impact on planetary health and sustainability status. This can be improved by acknowledging the transition to the Symbiocene epoch, where balance and mutualism with nature are centralized. This transition could be reflected in the current DoH, since many conceptualizations available in literature propose resilience as the core of a state of health. Along these lines, the resilience-focussed concept of Positive Health is proposed as a viable DoH for future European policy. As such, the anthropocentric bias in current health policies could possibly be overcome.

Third, the potential of the food system to benefit *both* human and planetary health is currently not acknowledged in national health policies in Europe. Transforming to healthy and sustainable food system designs, taking HSDs either as driver or outcome, has sound scientific support but is not addressed in the current national health policies. Moreover, several policy gaps were identified for the food systems perspective, such as lack of alignment in national and European policy and absence of specification how to realize sustainable food systems. The European motives for improving human health were furthermore identified as drivers of the food system. Integration of these concepts therefore appears a necessary step for making impact on human and planetary health. Indeed, as the food system is related to all SDGs, and many European policies adopt the UN SDG framework, this approach can be the necessary unifying concept for both health and sustainable food system policies to achieve the goals by 2030.

Synthesizing these conclusions, the food systems perspective in policy can effectuate its potential to realize HSDs and to improve both human and planetary health status, while acknowledging the interrelations between all concepts in the eye of sustainability. The insights provided in this report can be used for future policy-making on either of these concepts, especially in the European context, on both EU and national level. Indeed, European policy could benefit from the implementation of a focus on resilience in policy, e.g. by using Positive Health as a national DoH, combined with recognition of pluralism and pragmatism in the concepts of health. Together with the transformation to sustainable food systems in the Symbiocene, this gives ample opportunities for both scientific as well as policy-related research in order to be able to face the challenges of the 21st century.

ACKNOWLEDGEMENTS

This MSc thesis is the first crown to my specialized academic career, but I could not have transformed all my efforts and contemplations into this report if it was not for some very important people. First, I want to thank my wonderful supervisors Pieter van ’t Veer and Anneleen Kuijsten. I am so grateful you were able to support me in setting up my own research from scratch, trusting me and my process, as well as sharing your experiences in academia and policy. Our tripartite discussions were always interesting, and time was often too short, even though we mostly met online. Both academically and personally I feel enriched and strengthened by your supervision during this project. My study advisor Rosalie Dhonukshe-Rutten also deserves a warm thanks for staying in touch with me and thinking along with all my plannings resulting from combining two master programs. You truly know how to give personal and touching support, even in the hardest of times. Furthermore, my gratitude goes to Mirjana Gurinovic, Sander Biesbroek, Jeroen Candel and Alie de Boer for contributing on a content level to my proposal and thought processes in trying to find my way in literature and EU policies. Finally, I want to thank my parents for giving me the opportunity to develop myself academically and supporting me personally; Jules for all the joint thesis-emotional-support days on the university where this academic adventure began; Lina for giving the best feedback on my presentation and planning; and Yke for looking at my oral or written drafts, always talking to me, believing in me and encouraging me to shine my light.

LITERATURE

1. WCED. Report of the World Commission on Environment and Development: Our Common Future [Brundtland report]. 1987.
2. NCD Countdown 2030 Collaborators. NCD Countdown 2030: pathways to achieving Sustainable Development Goal target 3.4. Vol. 396, The Lancet. Elsevier; 2020. p. 918–34.
3. Fulzele R, Fulzele V, Dharwal M. Mapping the impact of COVID-19 crisis on the progress of sustainable Development Goals (SDGs) - a focus on global environment and energy efficiencies. Mater Today Proc. 2021 Oct 12;
4. Dora C, Haines A, Balbus J, Fletcher E, Adair-Rohani H, Alabaster G, et al. Indicators linking health and sustainability in the post-2015 development agenda. Vol. 385, The Lancet. Elsevier; 2015. p. 380–91.
5. Temme EHM, Vellinga RE, de Ruiter H, Kugelberg S, van de Kamp M, Milford A, et al. Demand-Side Food Policies for Public and Planetary Health. Sustainability (Switzerland). 2020 Jul 23;12(15):5924.
6. van de Kamp ME, van Dooren C, Hollander A, Geurts M, Brink EJ, van Rossum C, et al. Healthy diets with reduced environmental impact? – The greenhouse gas emissions of various diets adhering to the Dutch food based dietary guidelines. Food Research International [Internet]. 2018 Feb [cited 2018 Sep 19];104:14–24. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0963996917302594
7. Prescott S, Logan A, Albrecht G, Campbell D, Crane J, Cunsolo A, et al. The Canmore Declaration: Statement of Principles for Planetary Health. Challenges. 2018 Jul 26;9(2):31.
8. Rawe T, Antonelli M, Chatrchyan A, Clayton T, Fanzo J, Gonsalves J, et al. Transforming food systems under climate change: Local to global policy as a catalyst for change. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). 2019;1–42.
9. FAO. Sustainable food systems: Concept and framework. Food and Agriculture Organization of the United Nations. 2018. p. 1–8.
10. WHO. Saving lives , spending less: The case for investing in NCDs. World Health Organization. Geneva; 2021.
11. The Lancet. Syndemics: health in context. Vol. 389, The Lancet. Elsevier; 2017. p. 881.
12. Singer M, Bulled N, Ostrach B, Mendenhall E. Syndemics and the biosocial conception of health. The Lancet. 2017 Mar 4;389(10072):941–50.
13. WHO/Europe. Ottawa Charter for Health Promotion. 1986. p. 1–5.
14. Helne T, Hirvilammi T. Wellbeing and Sustainability: A Relational Approach. Sustainable Development. 2015 May 1;23(3):167–75.
15. Bolton D, Gillett G. The Biopsychosocial Model of Health and Disease: New Philosophical and Scientific Developments. The Biopsychosocial Model of Health and Disease: New Philosophical and Scientific Developments. 2019. 1–149 p.
16. Doyle DM, Link BG. On Social Health: Conceptualization, Correlates and Patterning. PsyArXiv [Internet]. 2022 [cited 2022 Mar 28]; Available from: https://doi.org/10.31234/osf.io/m2ypw
17. McClintock MK, Dale W, Laumann EO, Waite L. Empirical redefinition of comprehensive health and well-being in the older adults of the United States. Proc Natl Acad Sci U S A. 2016 May 31;113(22):E3071–80.
18. World Health Organization. Determinants of health. In 2019.
19. Bircher J, Kuruvilla S. Defining health by addressing individual, social, and environmental determinants: New opportunities for health care and public health. J Public Health Policy [Internet]. 2014 Jun 19 [cited 2022 Mar 23];35(3):363–86. Available from: https://link.springer.com/article/10.1057/jphp.2014.19
20. Frenk J, Gómez-Dantés O. Designing a framework for the concept of health. Vol. 35, Journal of Public Health Policy. 2014. p. 401–6.

21. Larsen LT. Not merely the absence of disease: A genealogy of the WHO's positive health definition. Hist Human Sci. 2022;35(1):111–31.

22. Poiesz T, Caris J, Lapré F. Gezondheid: een definitie? Tijdschrift voor gezondheidswetenschappen [Internet]. 2016 Oct 29 [cited 2022 Mar 23];94(7):252–5. Available from: https://link.springer.com/article/10.1007/s12508-016-0091-5

23. Leonardi F. The Definition of Health: Towards New Perspectives. International Journal of Health Services [Internet]. 2018 Oct 1 [cited 2022 Mar 22];48(4):735–48. Available from: https://journals.sagepub.com/doi/10.1177/0020731418782653

24. Hafen M. Of what use (or harm) is a positive health definition? Journal of Public Health (Germany). 2016 Jun 2;24(5):437–41.

25. Lerner H, Berg C. The concept of health in One Health and some practical implications for research and education: what is One Health? Infect Ecol Epidemiol [Internet]. 2015 Jan [cited 2022 Mar 22];5(1):25300. Available from: https://www.tandfonline.com/doi/abs/10.3402/iee.v5.25300

26. Bowling J, Jason K, Krinner LM, Vercruysse CMC, Reichard G. Definition and operationalization of resilience in qualitative health literature: a scoping review. Int J Soc Res Methodol [Internet]. 2021 [cited 2022 Mar 22]; Available from: https://www.tandfonline.com/doi/abs/10.1080/13645579.2021.1903241

27. Fogel SC, Calman L, Magrini & D. Lesbians' and Bisexual Women's Definition of Health.

28. Koplan JP, Bond TC, Merson MH, Reddy KS, Rodriguez MH, Sewankambo NK, et al. Towards a common definition of global health. Vol. 373, The Lancet. Elsevier; 2009. p. 1993–5.

29. Engel GL. The need for a new medical model: A challenge for biomedicine. Psychodyn Psychiatry. 2012;40(3):377–96.

30. Huber M, André Knottnerus J, Green L, van der Horst H, Jadad AR, Kromhout D, et al. How should we define health? BMJ [Internet]. 2011 Jul 26 [cited 2022 Sep 8];343(7817). Available from: https://www.bmj.com/content/343/bmj.d4163

31. Lindau ST, Laumann EO, Levinson W, Waite LJ. Synthesis of scientific disciplines in pursuit of health: The Interactive Biopsychosocial Model. In: Perspectives in Biology and Medicine. NIH Public Access; 2003. p. S74–86.

32. Zautra AJ, Stuart Hall J, Murray KE. Resilience: A New Definition of Health for People and Communities. In: Zautra AJ, Stuart Hall J, Murray KE, editors. Handbook of Adult Resilience. The Guilford Press; 2010. p. 3–29.

33. Haverkamp B, Bovenkerk B, Verweij MF. A Practice-Oriented Review of Health Concepts [Internet]. Vol. 43, Journal of Medicine and Philosophy (United Kingdom). 2018 [cited 2022 Apr 25]. p. 381–401. Available from: https://academic.oup.com/jmp/article/43/4/381/5050578

34. van der Linden R, Schermer M. Health and disease as practical concepts: exploring function in context-specific definitions. Med Health Care Philos [Internet]. 2022 Nov 16 [cited 2022 Apr 25];25(1):131–40. Available from: https://link.springer.com/article/10.1007/s11019-021-10058-9

35. Haverkamp B, Verweij M, Stronks K. 'Gezondheid': voor iedere context een passend begrip? Tijdschrift voor gezondheidswetenschappen [Internet]. 2017 [cited 2022 Mar 14];95(6):258–63. Available from: https://doi.org/10.1007/s12508-017-0070-5

36. Stucki G, Rubinelli S, Bickenbach J. We need an operationalisation, not a definition of health. Disabil Rehabil [Internet]. 2020 Jan 30 [cited 2022 Mar 28];42(3):442–4. Available from: https://www.tandfonline.com/doi/abs/10.1080/09638288.2018.1503730

37. Watts N, Adger WN, Agnolucci P. Health and climate change: Policy responses to protect public health [Internet]. Vol. 386, The Lancet Commissions. John Libbey Eurotext; 2015 [cited 2022 Mar 28]. p. 1861–914. Available from: http://www.thelancet.com/article/S0140673615608546/fulltext

38. Official Records of the World Health Organization. Constitution of the World Health Organisation [Internet]. Geneva; 1946. Available from: https://apps.who.int/gb/bd/PDF/bd47/EN/constitution-en.pdf

39. Nobile M. The WHO Definition of Health: A Critical Reading. Med Law. 2014;33(2):33–40.

40. The Eat-Lancet Commission. Food Planet Health. The Lancet. 2019;32.

41. Herrero M, Thornton PK, Mason-D'Croz D, Palmer J, Bodirsky BL, Pradhan P, et al. Articulating the effect of food systems innovation on the Sustainable Development Goals. Lancet Planet Health. 2021;5(1):e50–62.

42. Tufford AR, Calder PC, Van't Veer P, Feskens EF, Ockhuizen T, Kraneveld AD, et al. Is nutrition science ready for the twenty-first century? Moving towards transdisciplinary impacts in a changing world. Eur J Nutr. 2020 May 1;59(1):1–10.

43. Development Initiatives. 2021 Global Nutrition Report: The state of global nutrition. Global Nutrition Report. Bristol, UK; 2021.

44. FAO, WHO. Sustainable healthy diets - Guiding principles. Fao. 2019. 44 p.

45. Mertens E, Van 't Veer P, Hiddink GJ, Steijns JM, Kuijsten A. Operationalising the health aspects of sustainable diets: A review. Vol. 20, Public Health Nutrition. 2017. p. 739–57.

46. GLOPAN. Future Food Systems: For people, our planet, and prosperity. London, UK; 2020.

47. Brouwer ID, van Liere MJ, de Brauw A, Dominguez-Salas P, Herforth A, Kennedy G, et al. Reverse thinking: taking a healthy diet perspective towards food systems transformations. Food Secur. 2021 Oct 16;13(6):1497–523.

48. Mendenhall E. Syndemics: a new path for global health research. Vol. 389, The Lancet. Elsevier; 2017. p. 889–91.

49. Raworth K. A Doughnut for the Anthropocene: humanity's compass in the 21st century [Internet]. Vol. 1, The Lancet Planetary Health. Elsevier B.V.; 2017 [cited 2022 Apr 26]. p. e48–9. Available from: http://www.thelancet.com/article/S2542519617300281/fulltext

50. Swinburn BA, Kraak VI, Allender S, Atkins VJ, Baker PI, Bogard JR, et al. The Global Syndemic of Obesity, Undernutrition, and Climate Change: The Lancet Commission report [Internet]. Vol. 393, The Lancet. 2019 [cited 2022 Mar 28]. p. 791–846. Available from: http://dx.doi.org/10.1016/

51. Horton R. Offline: COVID-19 is not a pandemic. The Lancet. 2020 Sep 26;396(10255):874.

52. Nugent R. Rethinking systems to reverse the global syndemic. Vol. 393, The Lancet. Elsevier; 2019. p. 726–8.

53. Dietz WH, Pryor S. How Can We Act to Mitigate the Global Syndemic of Obesity, Undernutrition, and Climate Change? Vol. 1, Current Obesity Reports. 2022. p. 3.

54. Rockström J, Edenhofer O, Gaertner J, DeClerck F. Planet-proofing the global food system. Nat Food [Internet]. 2020 Jan 13 [cited 2022 May 4];1(1):3–5. Available from: https://www.nature.com/articles/s43016-019-0010-4

55. FAO. Sustainable diets and biodiversity - Directions and solutions for policy research and action [Internet]. Burlingame B, Dernini S, Nutrition and Consumer Protection Division;, FAO, editors. FAO Headquarters. Rome, Italy; 2012 [cited 2021 Jan 26]. Available from: http://www.fao.org/3/i3004e/i3004e.pdf

56. Kennedy GL, Rota Nodari G, Trijsburg L, Talsma E, de Haan S, Evans B, et al. Compendium of Indicators for Food System Assessment. Rome, Italy; 2020.

57. Esping-Andersen G. The Three Worlds of Welfare Capitalism. 2nd ed. Cambridge: Polity Press; 1991.

58. World Bank. WDI - The World by Income and Region [Internet]. The world by income. 2020 [cited 2022 May 18]. Available from: https://datatopics.worldbank.org/world-development-indicators/the-world-by-income-and-region.html

59. Bircher J. Meikirch model: new definition of health as hypothesis to fundamentally improve healthcare delivery. Integrated Healthcare Journal [Internet]. 2020;2(1):e000046. Available from: http://ihj.bmj.com/

60. Bircher J, Hahn EG. Understanding the nature of health: New perspectives for medicine and public health. Improved wellbeing at lower costs. F1000Res. 2016;5:1.

61. Sturmberg JP, Bircher J. Better and fulfilling healthcare at lower costs: The need to manage health systems as complex adaptive systems. F1000Res. 2019;8.

62. Bircher J, Hahn EG. "Multimorbidity" as the manifestation of network disturbances. From nosology to the Meikirch model. Vol. 23, Journal of Evaluation in Clinical Practice. John Wiley & Sons, Ltd; 2017. p. 222–4.

63. Sachs JD, Kroll C, Lafortune G, Fuller G, Woelm F. Sustainable Development Report 2020 [Internet]. Cambridge: Cambridge University Press; 2021 [cited 2022 May 3]. Available from: www.cambridge.org

64. Willen SS, Knipper M, Abadía-Barrero CE, Davidovitch N. Syndemic vulnerability and the right to health. Vol. 389, The Lancet. Elsevier; 2017. p. 964–77.

65. United Nations Food Systems Summit. UNFSS HUMAN RIGHTS LEVER OF CHANGE: Unlocking the transformative potential of a human rights-based based approach. 2021.

66. United Nations. UN Food Systems Summit: Documentation [Internet]. 2021. Available from: https://www.un.org/en/food-systems-summit/documentation

67. Biesbroek S, Kok FJ, Tufford AR, Bloem MW, Darmon N, Rivera J, et al. Towards healthy and sustainable diets for the 21st century: importance of culture and economy. Manuscript submitted for publication. 2022;

68. Rockström J, Steffen W, Noone K, Persson Å, Chapin FS, Lambin EF, et al. A safe operating space for humanity. Nature 2009 461:7263 [Internet]. 2009 Sep 23 [cited 2022 Jul 13];461(7263):472–5. Available from: https://www.nature.com/articles/461472a

69. Steffen W, Richardson K, Rockström J, Cornell SE, Fetzer I, Bennett EM, et al. Planetary boundaries: Guiding human development on a changing planet. Science (1979) [Internet]. 2015 Feb 13 [cited 2022 Aug 30];347(6223). Available from: https://www.science.org/doi/10.1126/science.1259855

70. Persson L, Carney Almroth BM, Collins CD, Cornell S, de Wit CA, Diamond ML, et al. Outside the Safe Operating Space of the Planetary Boundary for Novel Entities. Environ Sci Technol. 2022 Feb 1;56(3):1510–21.

71. Raworth K. Supplementary Appendix - A Doughnut for the Anthropocene: humanity's compass in the 21st century. Vol. 1, The Lancet Planetary Health. Elsevier; 2017. p. e48–9.

72. United Nations. United Nations Millennium Development Goals [Internet]. United Nations; [cited 2022 Oct 17]. Available from: https://www.un.org/millenniumgoals/

73. United Nations | Department of Economic and Social Affairs. A Decade of Action to deliver the SDGs [Internet]. 2020 [cited 2022 May 2]. Available from: https://www.un.org/development/desa/dspd/2020/09/decade-of-action/

74. WHO. World Health Statistics 2021: monitoring health for the SDGs, sustainable development goals. Licence: C. Geneva: World Health Organization; 2021.

75. Abbafati C, Machado DB, Cislaghi B, Salman OM, Karanikolos M, McKee M, et al. Five insights from the Global Burden of Disease Study 2019. The Lancet. 2020 Oct 17;396(10258):1135–59.

76. Marmot M, Friel S, Bell R, Houweling TA, Taylor S. Closing the gap in a generation: health equity through action on the social determinants of health. The Lancet. 2008;372(9650):1661–9.

77. United Nations. The Sustainable Development Goals Report 2021. United Nations Publications. 2021;1–56.

78. Aly E, Elsawah S, Ryan MJ. Aligning the achievement of SDGs with long-term sustainability and resilience: An OOBN modelling approach. Environmental Modelling and Software. 2022 Apr 1;150:105360.

79. Hakovirta M, Denuwara N. How COVID-19 redefines the concept of sustainability [Internet]. Vol. 12, Sustainability (Switzerland). Multidisciplinary Digital Publishing Institute; 2020 [cited 2022 Mar 22]. p. 3727. Available from: https://www.mdpi.com/2071-1050/12/9/3727/htm

80. International Conference on Primary Health Care. Declaration of Alma-Ata, International Conference on Primary Health Care, Alma-Ata, USSR, 6-12 September 1978 [Internet]. 1978. Available from: https://cdn.who.int/media/docs/default-source/documents/almaata-declaration-en.pdf?sfvrsn=7b3c2167_2

81. One Health EJP. About - One Health EJP [Internet]. https://onehealthejp.eu/. 2018 [cited 2022 Sep 15]. Available from: https://onehealthejp.eu/about/

82. RIVM. Nederlandse samenwerking in Europees samenwerkingsprogramma One Health [Internet]. 2017 [cited 2022 Sep 6]. Available from: https://www.rivm.nl/nieuws/nederlandse-samenwerking-in-europees-samenwerkingsprogramma-one-health

83. Lerner H. A critical analysis of definitions of health as balance in a One Health perspective. Med Health Care Philos. 2019 Sep 15;22(3):453–61.

84. Huber M, van Vliet M, Giezenberg M, Winkens B, Heerkens Y, Dagnelie PC, et al. Towards a "patient-centred" operationalisation of the new dynamic concept of health: A mixed methods study. BMJ Open [Internet]. 2016 [cited 2022 Mar 14];6(1). Available from: https://pubmed.ncbi.nlm.nih.gov/26758267/

85. Huber M, Jung HP, van den Brekel-Dijkstra K. Handbook Positive Health in Primary Care [Internet]. Houten: Bohn Stafleu van Loghum; 2022 [cited 2022 Mar 14]. Available from: https://doi.org/10.1007/978-90-368-2729-4

86. van Heerten J. Considerations for an ethic of One Health Towards a socially responsible zoonotic disease control. 2021 [cited 2022 Apr 25]; Available from: https://edepot.wur.nl/555123

87. Johnston P, Everard M, Santillo D, Robèrt KH. Reclaiming the definition of sustainability. Vol. 14, Environmental Science and Pollution Research. 2007. p. 60–6.

88. Pearce D, Atkinson G. The concept of sustainable development: an evaluation of its usefulness ten years after Brundtland. Working Paper - Centre for Social and Economic Research on the Global Environment. 1998;(PA 98-02).

89. Meadows DH., Meadows DL., Randers J, Behrens WW. The Limits to Growth: a Report for The Club of Rome's Project on the Predicament of Mankind [Internet]. Universe Books. New York: Club of Rome; 1972 Jan [cited 2022 Oct 6]. Available from: https://donellameadows.org/wp-content/userfiles/Limits-to-Growth-digital-scan-version.pdf

90. Whitmee S, Haines A, Beyrer C, Boltz F, Capon AG, de Souza Dias BF, et al. Safeguarding human health in the Anthropocene epoch: Report of the Rockefeller Foundation-Lancet Commission on planetary health [Internet]. Vol. 386, The Lancet. 2015 [cited 2022 Sep 8]. p. 1973–2028. Available from: http://dx.doi.org/10.1016/http://www.thelancet.com/infographics/planetary-health

91. Planetary Health Alliance. Planetary Health [Internet]. [cited 2022 Sep 8]. Available from: https://www.planetaryhealthalliance.org/planetary-health

92. Willett W, Rockström J, Loken B, Springmann M, Lang T, Vermeulen S, et al. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems [Internet]. Vol. 393, The Lancet. 2019 [cited 2022 May 9]. p. 447–92. Available from: http://dx.doi.org/10.1016/

93. Peters GP, Andrew RM, Canadell JG, Fuss S, Jackson RB, Korsbakken JI, et al. Key indicators to track current progress and future ambition of the Paris Agreement. Nat Clim Chang [Internet]. 2017 Jan 30 [cited 2022 Apr 1];7(2):118–22. Available from: https://www.nature.com/articles/nclimate3202

94. Hart L, Horton R. Syndemics: committing to a healthier future [Internet]. Vol. 389, The Lancet. Lancet Publishing Group; 2017 [cited 2022 Mar 29]. p. 888–9. Available from: https://doi.org/10.1016/S0140-6736(17)30599-8

95. Tsai AC, Mendenhall E, Trostle JA, Kawachi I. Co-occurring epidemics, syndemics, and population health. Vol. 389, The Lancet. Elsevier; 2017. p. 978–82.

96. Principles G. Sustainable healthy diets. Sustainable healthy diets. 2020.

97. Fanzo J. Healthy and Sustainable Diets and Food Systems: the Key to Achieving Sustainable Development Goal 2? Food Ethics. 2019 Nov 12;4(2):159–74.

98. Biesalski HK, Drewnowski A, Dwyer JT, Strain JJ, Weber P, Eggersdorfer M. Chapter 2: Sustainable, Healthy Diets: Models and Measures. Sustainable Nutrition in a Changing World. Springer; 2017. 1–406 p.

99. Steenson S, Buttriss JL. The challenges of defining a healthy and 'sustainable' diet. Nutr Bull. 2020 Jun 1;45(2):206–22.

100. WHO. Healthy diet [Internet]. 2020 [cited 2022 May 5]. Available from: https://www.who.int/news-room/fact-sheets/detail/healthy-diet

101. Afshin A, Sur PJ, Fay KA, Cornaby L, Ferrara G, Salama JS, et al. Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet. 2019 May 11;393(10184):1958–72.

102. Herforth A, Bai Y, Venkat A, Mahrt K, Ebel A, Masters WA. Cost and affordability of healthy diets across and within countries. Background paper for The State of Food Security and Nutrition in the World 2020. FAO Agricultural Development Economics Technical Study No. 9. Rome, Italy; 2020.

103. van Selm B, Frehner A, de Boer IJM, van Hal O, Hijbeek R, van Ittersum MK, et al. Circularity in animal production requires a change in the EAT-Lancet diet in Europe. Nat Food. 2022 Jan 6;3(1):66–73.

104. Hebinck A, Zurek M, Achterbosch T, Forkman B, Kuijsten A, Kuiper M, et al. A Sustainability Compass for policy navigation to sustainable food systems. Vol. 29, Global Food Security. Elsevier; 2021. p. 100546.

105. Drewnowski A. Obesity and the food environment: Dietary energy density and diet costs. Vol. 27, American Journal of Preventive Medicine. Elsevier; 2004. p. 154–62.

106. Alves R, Lopes C, Perelman J. Healthy eating: a privilege for the better-off? Eur J Clin Nutr [Internet]. 2022 May 13 [cited 2022 Mar 29];76(1):134–42. Available from: https://www.nature.com/articles/s41430-021-00926-1

107. Berry EM, Dernini S, Burlingame B, Meybeck A, Conforti P. Food security and sustainability: Can one exist without the other? [Internet]. Vol. 18, Public Health Nutrition. Cambridge University Press; 2015 [cited 2022 Mar 28]. p. 2293–302. Available from: https://www.cambridge.org/core/journals/public-health-nutrition/article/food-security-and-sustainability-can-one-exist-without-the-other/1C15B76BB9CF86952228242F3694694B

108. Seconda L, Baudry J, Allès B, Boizot-Szantai C, Soler LG, Galan P, et al. Comparing nutritional, economic, and environmental performances of diets according to their levels of greenhouse gas emissions. Clim Change [Internet]. 2018 May 1 [cited 2022 Mar 29];148(1–2):155–72. Available from: https://link.springer.com/article/10.1007/s10584-018-2195-1

109. Zurek M, Hebinck A, Leip A, Vervoort J, Kuiper M, Garrone M, et al. Assessing sustainable food and nutrition security of the EU food system-an integrated approach. Sustainability (Switzerland). 2018 Nov 19;10(11):4271.

110. HLPE. Nutrition and food systems. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security [Internet]. Rome; 2017 [cited 2022 Mar 14]. Available from: www.fao.org/cfs/cfs-hlpe

111. van de Kamp ME, van Dooren C, Hollander A, Geurts M, Brink EJ, van Rossum C, et al. Healthy diets with reduced environmental impact? – The greenhouse gas emissions of various diets adhering to the Dutch food based dietary guidelines. Food Research International. 2018 Feb 1;104:14–24.

112. Röös E, Mayer A, Muller A, Kalt G, Ferguson S, Erb KH, et al. Agroecological practices in combination with healthy diets can help meet EU food system policy targets. Science of the Total Environment. 2022 Nov 15;847:157612.

113. Mozaffarian D, Ludwig DS. Dietary Guidelines in the 21st Century—a Time for Food. JAMA. 2010 Aug 11;304(6):681–2.

114. Wang DD, Li Y, Afshin A, Springmann M, Mozaffarian D, Stampfer MJ, et al. Global Improvement in Dietary Quality Could Lead to Substantial Reduction in Premature Death. Journal of Nutrition. 2019 Jun 1;149(6):1065–74.

115. Marek L, Hobbs M, Wiki J, Kingham S, Campbell M. The good, the bad, and the environment: developing an area-based measure of access to health-promoting and health-constraining environments in New Zealand. Int J Health Geogr [Internet]. 2021 Dec 1 [cited 2022 Mar 29];20(1):1–20. Available from: https://link.springer.com/articles/10.1186/s12942-021-00269-x

116. Turner GM, Larsen KA, Candy S, Ogilvy S, Ananthapavan J, Moodie M, et al. Squandering Australia's food security—The environmental and economic costs of our unhealthy diet and the policy Path We're On. J Clean Prod. 2018 Sep 10;195:1581–99.

117. Rocha C, Spagnuolo D. Sustainable and healthy diets for achieving the SDGs: The role of consumers. In: Achieving the Sustainable Development Goals Through Sustainable Food Systems [Internet]. Springer International Publishing; 2019 [cited 2022 Nov 25]. p. 143–55. Available from: https://link.springer.com/chapter/10.1007/978-3-030-23969-5_8

118. Frehner A, De Boer IJM, Muller A, Van Zanten HHE, Schader C. Consumer strategies towards a more sustainable food system: Insights from Switzerland. American Journal of Clinical Nutrition. 2022 Apr 1;115(4):1039–47.

119. Brouwer ID, McDermott J, Ruben R. Food systems everywhere: Improving relevance in practice. Glob Food Sec [Internet]. 2020;26(March):100398. Available from: https://doi.org/10.1016/j.gfs.2020.100398

120. Van Selm B, Frehner A, Van Hal O, Hijbeek R, Lesschen JP, Hendriks C, et al. The compatibility of animal-sourced food and circularity in healthy European diets. 2021;

121. Campbell BM, Beare DJ, Bennett EM, Hall-Spencer JM, Ingram JSI, Jaramillo F, et al. Agriculture production as a major driver of the earth system exceeding planetary boundaries. Ecology and Society. 2017;22(4).

122. Kuiper M (WECR), Kalter J (WU), Mertens E (WU), Latka C (UBO), Havlik P (IIASA), Achterbosch T (WECR). The SUSFANS toolbox for assessing EU Sustainable food and nutrition security. WECR; 2018.

123. Wecr TA, Oudendag D, Wecr MV, Leip A, Uoxf MZ, Uoxf H, et al. The SUSFANS visualizer tool for assessing the sustainability performance of EU food systems and diets : Methods and explanation. 2020;(633692).

124. Frank S, Latka C, Havlík P, Kuiper M, Dijk M Van, Achterbosch T, et al. Foresight of EU sustainable food and nutrition security : the interplay between major challenges and policy responses at different spatiotemporal scales SUSFANS Deliverable document information. 2020;(633692):1–75.

125. Ruben R. Searching effective incentives for global food system transformation - Farewell address. Wageningen Economic Research. Wageningen Economic Research; 2020.

126. Béné C, Oosterveer P, Lamotte L, Brouwer ID, de Haan S, Prager SD, et al. When food systems meet sustainability – Current narratives and implications for actions. Vol. 113, World Development. Pergamon; 2019. p. 116–30.

127. World Health Organization. Food systems for health: information brief [Internet]. Geneva; 2021. Available from: https://www.who.int/publications/i/item/9789240035263

128. World Health Organization. Food systems delivering better health: executive summary [Internet]. Genevsa; 2021. Available from: https://www.who.int/publications/i/item/9789240031814

129. Kromhout D, de Goede J, Weggemans RM. The 2015 Dutch food-based dietary guidelines. Eur J Clin Nutr [Internet]. 2016 [cited 2022 Jul 7];70:869–78. Available from: www.gr.nl

130. United Nations. Universal Declaration of Human Rights [Internet]. 1948 [cited 2022 Oct 28]. Available from: https://www.un.org/en/about-us/universal-declaration-of-human-rights

131. McCormick J. European Union Politics. London: Palgrave Macmillan UK; 2015.

132. FAO, IFAD, UNICEF, WFP, WHO. The State of Food Security and Nutrition in the World 2019: Safeguarding against economic slowdowns and downturns. FAO. Rome: FAO; 2020.

133. World Health Organization. Basic Documentss: forty-ninth edition (including amendments adopted up to 31 May 2019). Licence: C. Geneva; 2020. 1–20 p.

134. Scientific Group for the UN Food Systems Summit 2021. Science and Innovations for Food Systems Transformation and Summit Actions. von Braun J, Afsana K, Fresco LO., Hassan M, editors. 2021.

135. Judt T. Postwar: A history of Europe since 1945. London: Vintage Books; 2005.

136. Droz L. Anthropocentrism as the scapegoat of the environmental crisis: a review. Ethics Sci Environ Polit [Internet]. 2022 May 5 [cited 2022 Nov 30];22:25–49. Available from: https://www.int-res.com/abstracts/esep/v22/p25-49/

137. Soyez K. How national cultural values affect pro-environmental consumer behavior. International Marketing Review [Internet]. 2012 [cited 2022 Nov 30];29(6):623–46. Available from: www.emeraldinsight.com/0265-1335.htm

138. Harrison R. Beyond "natural" and "cultural" heritage: Toward an ontological politics of heritage in the age of anthropocene. Heritage and Society [Internet]. 2015 [cited 2022 Nov 30];8(1):24–42. Available from: https://www.tandfonline.com/doi/abs/10.1179/2159032X15Z.00000000036

139. Goralnik L, Nelson MP. Anthropocentrism. In: Encyclopedia of Applied Ethics. Elsevier Inc.; 2012. p. 145–55.

140. FAO. Food-based dietary guidelines [Internet]. FAO. 2017 [cited 2022 Apr 25]. Available from: https://www.fao.org/nutrition/education/food-dietary-guidelines/background/en/

141. WHO Regional Office for Europe. Health and well-being and the 2030 agenda for sustainable development in the WHO European region: an analysis of policy development and implementation. Report of the first survey to assess Member States' activities in relation to the WHO European Region R [Internet]. Copenhagen; 2021 [cited 2022 Nov 25]. Available from: https://www.who.int/europe/publications/i/item/WHO-EURO-2021-1878-41629-56873

142. Card AJ. Moving Beyond the WHO Definition of Health: A New Perspective for an Aging World and the Emerging Era of Value-Based Care [Internet]. Vol. 9, World Medical and Health Policy. John Wiley & Sons, Ltd; 2017 [cited 2022 Mar 22]. p. 127–37. Available from: https://onlinelibrary.wiley.com/doi/full/10.1002/wmh3.221

143. Duncan J, Claeys P. Politicizing food security governance through participation: opportunities and opposition. Food Secur [Internet]. 2018 Dec 1 [cited 2022 Nov 25];10(6):1411–24. Available from: https://link.springer.com/article/10.1007/s12571-018-0852-x

144. Witkamp RF, van Norren K. Let thy food be thy medicine….when possible. Eur J Pharmacol. 2018 Oct 5;836:102–14.

145. Georgiou NA, Garssen J, Witkamp RF. Pharma-nutrition interface: The gap is narrowing. Vol. 651, European Journal of Pharmacology. Elsevier; 2011. p. 1–8.

146. Leal Filho W, Tripathi SK, Andrade Guerra JBSOD, Giné-Garriga R, Orlovic Lovren V, Willats J. Using the sustainable development goals towards a better understanding of sustainability challenges. International Journal of Sustainable Development and World Ecology [Internet]. 2019 Feb 17 [cited 2022 Nov 25];26(2):179–90. Available from: https://www.tandfonline.com/doi/abs/10.1080/13504509.2018.1505674

147. Turnhout E, Duncan J, Candel J, Maas TY, Roodhof AM, DeClerck F, et al. Do we need a new science-policy interface for food systems? Science (1979) [Internet]. 2021 Sep 3 [cited 2022 Nov 25];373(6559):1093–5. Available from: https://www.science.org/doi/10.1126/science.abj5263

148. López-Otín C, Kroemer G. Hallmarks of Health. Cell. 2021 Jan 7;184(1):33–63.

149. Witkamp RF. Nutrition to Optimise Human Health—How to Obtain Physiological Substantiation? Nutrients 2021, Vol 13, Page 2155 [Internet]. 2021 Jun 23 [cited 2022 May 30];13(7):2155. Available from: https://www.mdpi.com/2072-6643/13/7/2155/htm

150. Albrecht GA. Negating solastalgia: An emotional revolution from the anthropocene to the symbiocene [Internet]. Vol. 77, American Imago. 2020 [cited 2022 Nov 26]. p. 9–30. Available from: https://doi.org/10.1353/aim.2020.0001https://muse.jhu.edu/article/753059

151. Prescott S, Logan A. Down to Earth: Planetary Health and Biophilosophy in the Symbiocene Epoch. Challenges [Internet]. 2017 Aug 15 [cited 2022 Nov 26];8(2):19. Available from: https://www.mdpi.com/2078-1547/8/2/19/htm

152. Duncan J, Carolan M, Wiskerke JSC. Regenerating food systems. In: Routledge Handbook of Sustainable and Regenerative Food Systems [Internet]. Routledge; 2020 [cited 2022 Nov 25]. p. 1–11. Available from:

https://www.taylorfrancis.com/chapters/edit/10.4324/9780429466823-1/regenerating-food-systems-jessica-duncan-michael-carolan-johannes-wiskerke

153. Lepeley MT. Bhutan's Gross National Happiness: An Approach to Human Centred Sustainable Development. https://doi.org/101177/2322093717731634 [Internet]. 2017 Nov 8 [cited 2022 Nov 25];4(2):174–84. Available from: https://journals.sagepub.com/doi/full/10.1177/2322093717731634?casa_token=5QHQf5sJngMAAAAA%3AOR3wUsPjqY8-Q_PkvaZr5UBVXmED0OM7-pP3Q4seeiRJXYZ5WVnrQyOEcLL1A5B6_03QihTcXQ

154. Marks L, Hunter DJ, Alderslade R. Strengthening Public Health Capacity and Services in Europe - A Concept Paper [Internet]. Durham University and WHO Regional Office for Europe. 2011 [cited 2022 Nov 25]. Available from: https://www.euro.who.int/__data/assets/pdf_file/0007/152683/e95877.pdf

155. Candel J, Parsons K, Barling D, Loudiyi S. The relationship between Europeanisation and policy styles: a study of agricultural and public health policymaking in three EU Member States. J Eur Public Policy [Internet]. 2021 [cited 2022 Nov 13];28(11):1748–69. Available from: https://www.tandfonline.com/doi/abs/10.1080/13501763.2020.1800064

156. UNFCC. Adoption of the Paris Agreement [Internet]. Vol. 21932, Conference of the Parties on its twenty-first session. 2015 [cited 2022 Nov 24]. Available from: http://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf

157. Jureidini J, McHenry LB. The illusion of evidence based medicine [Internet]. Vol. 376, The BMJ. British Medical Journal Publishing Group; 2022 [cited 2022 Nov 25]. Available from: https://www.bmj.com/content/376/bmj.o702

158. Schlaile MP, Urmetzer S, Blok V, Andersen AD, Timmermans J, Mueller M, et al. Innovation systems for transformations towards sustainability? Taking the normative dimension seriously. Sustainability (Switzerland) [Internet]. 2017 Dec 6 [cited 2022 Nov 25];9(12):2253. Available from: https://www.mdpi.com/2071-1050/9/12/2253/htm

159. World Health Organization. WHO: Number of People Over 60 Years Set To Double By 2050; Major Societal Changes Required [Internet]. 2015 [cited 2022 Nov 26]. Available from: https://www.who.int/news/item/30-09-2015-who-number-of-people-over-60-years-set-to-double-by-2050-major-societal-changes-required

160. The World Bank. Current health expenditure (% of GDP) - Netherlands, France, Italy, Switzerland, Norway, Denmark, Czechia, Latvia | Data [Internet]. 2019 [cited 2022 Nov 22]. Available from: https://data.worldbank.org/indicator/SH.XPD.CHEX.GD.ZS?end=2019&locations=NL-FR-IT-CH-NO-DK-CZ-LV&most_recent_year_desc=false&start=2000

161. Buhr D, Stoy V. More than just Welfare Transfers? A Review of the Scope of Esping-Andersen's Welfare Regime Typology. Social Policy and Society [Internet]. 2015 Feb 19 [cited 2022 Nov 23];14(2):271–85. Available from: https://www.cambridge.org/core/journals/social-policy-and-society/article/more-than-just-welfare-transfers-a-review-of-the-scope-of-espingandersens-welfare-regime-typology/B1CD5FC4E6B3EA54317136DF9ABE2B9F

162. World Health Organization. Nutrition Landscape Information System (NLiS) - Health expenditure [Internet]. 2022 [cited 2022 Nov 23]. Available from: https://www.who.int/data/nutrition/nlis/info/health-expenditure

163. Schebesta H, Candel JJL. Game-changing potential of the EU's Farm to Fork Strategy [Internet]. Vol. 1, Nature Food. Nature Publishing Group; 2020 [cited 2022 Nov 25]. p. 586–8. Available from: https://www.nature.com/articles/s43016-020-00166-9

164. Hörisch J. The relation of COVID-19 to the UN sustainable development goals: implications for sustainability accounting, management and policy research. Sustainability Accounting, Management and Policy Journal. 2021;12(5):877–88.

165. European Observatory for Health Systems and Policies. Health Systems and Policy Monitor (HSPM) [Internet]. 2021 [cited 2022 May 19]. Available from: https://eurohealthobservatory.who.int/monitors/health-systems-monitor

166. Public Health Evaluation and Impact Assessment, Consortium (PHEIAC). Evaluation of the Use and Impact of the European Community Health Indicators ECHI by Member States [Internet]. 2013 [cited 2022 May 19]. Available

from:
http://ec.europa.eu/health/indicators/docs/echi_report_v20131031.pdf%5Cnhttp://ec.europa.eu/health/indicators/echi/index_en.htm

167. Sacks G, Kwon J, Vandevijvere S, Swinburn B. Benchmarking as a Public Health Strategy for Creating Healthy Food Environments: An Evaluation of the INFORMAS Initiative (2012-2020). In: Annual Review of Public Health [Internet]. 2020 [cited 2022 May 19]. p. 345–62. Available from: https://doi.org/10.1146/annurev-publhealth-

168. The Danish Institute for Human Rights. The Human Rights Guide to the Sustainable Development Goals [Internet]. 2022. Available from: https://sdg.humanrights.dk/en

169. O'Neill K, Viswanathan K, Celades E, Boerma T. Chapter 9. Monitoring, evaluation and review of national health policies, strategies and plans. In: Schmets G, Rajan D, Kadandale S, editors. Strategizing national health in the 21st century: a handbook [Internet]. Geneva: World Health Organization; 2016 [cited 2022 May 19]. Available from: handbookhttp://uhcpartnership.net/wp-content/uploads/2016/09/2_PS.png%0Ahttps://apps.who.int/iris/bitstream/handle/10665/250221/9789241549745-chapter8-eng.pdf?sequence=11&isAllowed=y

170. GAIN, Johns Hopkins University. Food Systems Dashboard - Diets and Nutrition [Internet]. 2021 [cited 2022 May 5]. Available from: https://foodsystemsdashboard.org/about-food-system

171. Porter JR. Lecture 10: Food Systems. In: Our Warming Planet: Climate Change Impacts and Adaptation. 2021. p. 254–75.

172. MapChart. Europe - MapChart [Internet]. 2022 [cited 2022 Sep 23]. Available from: https://www.mapchart.net/europe.html

173. World Health Organization. International Classification of Functioning, Disability and Health (ICF) [Internet]. 2022 [cited 2022 Oct 17]. Available from: https://www.who.int/standards/classifications/international-classification-of-functioning-disability-and-health

APPENDIX I
METHODOLOGY SELECTION OF EUROPEAN COUNTRIES

I.i. Method for selecting welfare states (n=6)

Two European countries were chosen from the level 'strong', or 'medium' if this is not possible, of all three regimes, based on the categorization of Esping-Andersen in *The Three Worlds of Welfare States* (**Figure I.i.**). The selection was primarily based on geographical diversity, while The Netherlands was included because this research was conducted there. The countries in bold are selected; the number in parentheses indicate the cumulated index score.

- Conservatism
  - Strong: Austria/Belgium/**France**/Germany/**Italy** (8)
- Liberalism
  - Strong: **Switzerland** (12)
  - Medium: France/**The Netherlands** (8)
- Socialism
  - Strong: **Denmark**/**Norway**/Sweden (8)
- *Final selection: France – Italy – Switzerland – The Netherlands – Denmark – Norway*

I.ii. Method for selecting Central and Eastern European countries (n=2)

Since the country selection for European welfare states lacks central and/or eastern European countries, an additional categorization is taken up to include representations of these regions. The World Bank categorization of countries by income and region (58) was used to account for diversity in socioeconomic development. From the region "Europe & Central Asia" the countries were selected that belong to the central and eastern parts of Europe, and ordered by income level. Based on a superficial online literature search to investigate the presence of national health (strategy) policy documents in English, the following countries were selected for all the high-income level in the Central and Eastern European region: Czech Republic and Latvia.

TABLE 3.3 The clustering of welfare states according to conservative, liberal and socialist regime attributes (cumulated index scores in parentheses)

	Conservatism		*Degree of Liberalism*		*Socialism*	
Strong	Austria	(8)	Australia	(10)	Denmark	(8)
	Belgium	(8)	Canada	(12)	Finland	(6)
	France	(8)	Japan	(10)	Netherlands	(6)
	Germany	(8)	Switzerland	(12)	Norway	(8)
	Italy	(8)	United States	(12)	Sweden	(8)
Medium	Finland	(6)	Denmark	(6)	Australia	(4)
	Ireland	(4)	France	(8)	Belgium	(4)
	Japan	(4)	Germany	(6)	Canada	(4)
	Netherlands	(4)	Italy	(6)	Germany	(4)
	Norway	(4)	Netherlands	(8)	New Zealand	(4)
			United Kingdom	(6)	Switzerland	(4)
					United Kingdom	(4)
Low	Australia	(0)	Austria	(4)	Austria	(2)
	Canada	(2)	Belgium	(4)	France	(2)
	Denmark	(2)	Finland	(4)	Ireland	(2)
	New Zealand	(2)	Ireland	(2)	Italy	(0)
	Sweden	(0)	New Zealand	(2)	Japan	(2)
	Switzerland	(0)	Norway	(0)	United States	(0)
	United Kingdom	(0)	Sweden	(0)		
	United States	(0)				

Figure I.i. Categorization of welfare states by Gøsta Esping-Andersen (1991) (57)

APPENDIX II
OVERVIEW OF NATIONAL HEALTH POLICY DOCUMENTS

The references of the 96 analysed national health policy documents per country can be found in *Table II.i* below, including the identifier used in the text to refer to the corresponding document.

Table II.i. Analysed national health policies per country. *Per document it is indicated whether it was translated ('yes'), or whether the researcher could read the original language, e.g. Dutch or English ('no').*

Country	Identifier	Reference	Translated
France	**FR1**	VPH Institute (2016). *France National E-Health Strategy 2020*. https://www.vph-institute.org/news/france-national-e-health-strategy-2020.html	no
	FR2	Ministère des Affaires sociales et de la Santé (2016). *Stratégie nationale e-santé 2020.* https://solidarites-sante.gouv.fr/IMG/pdf/strategie_e-sante_2020.pdf	yes
	FR3	Ministère des Affaires sociales et de la Santé (2017). *Stratégie nationale de santé 2018-2022*. https://solidarites-sante.gouv.fr/IMG/pdf/dossier_sns_2017_vdefpost-consult.pdf	yes
	FR4	Dourgnon, P. (2018). "French Government Releases New National Strategy for Health". *The Commonwealth Fund.* https://www.commonwealthfund.org/publications/newsletter-article/2018/apr/french-government-releases-new-national-strategy-health	no
	FR5	Ministère des Affaires sociales et de la Santé (2017). *National Health Strategy 2018-2022 Summary.* https://www.gouvernement.fr/sites/default/files/locale/piece-jointe/2018/10/france-national-health-strategy-2018-2022.pdf	no
	FR6	Ministry for Europe and Foreign Affairs (2022). *French action for sexual, reproductive, maternal, child and adolescent health rights.* https://www.diplomatie.gouv.fr/en/french-foreign-policy/development-assistance/priority-sectors/health/french-action-for-sexual-reproductive-maternal-child-and-adolescent-health/	no
	FR7	Ministry for Europe and Foreign Affairs (2022). *Health.* https://www.diplomatie.gouv.fr/en/french-foreign-policy/development-assistance/priority-sectors/health/	no
	FR8	Ministry for Europe and Foreign Affairs (2022). *France, longtime leader in universal health coverage.* https://www.diplomatie.gouv.fr/en/french-foreign-policy/development-assistance/priority-sectors/health/france-longtime-leader-in-universal-health-coverage/	no
	FR9	Ministry for Europe and Foreign Affairs (2022). *Global Health and Foreign Policy Initiative : informal consultation framework.* https://www.diplomatie.gouv.fr/en/french-foreign-policy/development-assistance/priority-sectors/health/global-health-and-foreign-policy-initiative-informal-consultation-framework/	no
	FR10	Directorate-General for Global Affairs, Culture, Education and International Development (2019). *France's International Strategy For Food Security, Nutrition and Sustainable Agriculture*. https://www.diplomatie.gouv.fr/IMG/pdf/frances_international_strategy_for_food_security_nutrition_and_sustainable_agriculture_cle4f3e1a.pdf	no
	FR11	Ministry for Europe and Foreign Affairs (2021). *France committed to the transition towards sustainable food systems*. https://www.diplomatie.gouv.fr/en/french-foreign-policy/development-assistance/news/2021/article/france-committed-to-the-transition-towards-sustainable-food-systems	no
	FR12	Ministry for Europe and Foreign Affairs (2021). *First meeting of the One Health High-Level Expert Panel (17-18 May 2021).* https://www.diplomatie.gouv.fr/en/french-foreign-policy/development-assistance/priority-sectors/health/france-and-international-health-security/article/first-meeting-of-the-one-health-high-level-expert-panel-17-18-05-21	no
	FR13	Ministry for Europe and Foreign Affairs (2021). *76e Assemblée générale des Nations Unies Sommet du SGNU sur les systèmes alimentaires. Vidéo préenregistrée – diffusion le 23 septembre*. https://www.un.org/sites/un2.un.org/files/2021/10/FSS_statement_France.pdf	yes

Italy	IT1	Ministero della Salute (2020). *Programma Nazionale Esiti Edizione 2020.* https://pne.agenas.it/main/doc/Report_PNE_2021_1sem.pdf	yes
	IT2	Ministero della Salute (2022). *Novità Edizione PNE 2021.* https://pne.agenas.it/novita.php	yes
	IT3	Ministero della Salute (2022). *I princìpi del Servizio sanitario nazionale (SSN).* https://www.salute.gov.it/portale/lea/dettaglioContenutiLea.jsp?lingua=italiano&id=5073&area=Lea&menu=vuoto	yes
	IT4	Azienda Sanitaria Locale Viterbo (2022). *Igiene Alimenti e Nutrizione (SIAN).* https://www.asl.vt.it/Prevenzione/SIAN/sian.php	yes
	IT5	Ministry of Health (2011). *The National eHealth Information Strategy. National context, state of implementation and best practices.* https://www.salute.gov.it/imgs/C_17_pubblicazioni_1653_allegato.pdf	no
	IT6	Ministero della Salute (2020). *Dieta sana = dieta costosa? No. Consigli utili per mangiare sano senza spendere tanto.* https://www.salute.gov.it/imgs/C_17_opuscoliPoster_259_allegato.pdf	yes
	IT7	Ministero della Salute (2022). *Piano Nazionale della Prevenzione 2020 - 2025.* https://www.salute.gov.it/imgs/C_17_notizie_5029_0_file.pdf	yes
	IT8	Ministero della Salute (2022). *Ambiente, Clima e Salute.* https://www.salute.gov.it/portale/prevenzione/dettaglioContenutiPrevenzione.jsp?lingua=italiano&id=5766&area=prevenzione&menu=obiettivi2020	yes
	IT9	Istituto Superiore di Sanità (2019). *Prevention and health promotion*. https://www.iss.it/en/web/guest/prevenzione-e-promozione-della-salute	no
	IT10	Istituto Superiore di Sanità (2019). *Food safety, nutrition and veterinary public health*. https://www.iss.it/en/web/guest/sicurezza-alimentare-nutrizione-e-sanit%C3%A0-pubblica-veterinaria	no
	IT11	Ministero della Salute (2021). *Mangia sano.* https://www.salute.gov.it/portale/nutrizione/dettaglioContenutiNutrizione.jsp?lingua=italiano&id=5566&area=nutrizione&menu=educazione	yes
	IT12	Istituto Superiore di Sanità (2021). *Environment and Health.* https://www.iss.it/en/web/guest/ambiente-e-salute	no
	IT13	Istituto Superiore di Sanità (2022). *Lifestyles.* https://www.iss.it/en/web/guest/stili-di-vita1	no
	IT14	*Food Systems Summit 23 settembre 2021* (2021). https://www.un.org/sites/un2.un.org/files/2021/10/FSS_statement_Italy.pdf	no
Switzerland	SW1	Federal Office of Public Health FOPH (2019). *The Federal Council's health policy strategy 2020–2030.* https://www.bag.admin.ch/dam/bag/en/dokumente/nat-gesundheitsstrategien/gesundheit-2030/strategie-gesundheit2030.pdf.download.pdf/strategie-gesundheit2030.pdf	no
	SW2	Federal Office of Public Health FOPH (2019). *Health2030 – the Federal Council's health policy strategy. Vison, challenges, objectives and lines of action.* https://www.bag.admin.ch/dam/bag/en/dokumente/nat-gesundheitsstrategien/gesundheit-2030/g2030-uebersicht-ziele-stossrichtungen.pdf.download.pdf/G2030_Herausforderungen_Ziele_Stossrichtungen_DF.pdf	no
	SW3	Federal Office of Public Health FOPH (2019). *Strategy Health 2030 – the Federal Council's health policy strategy for the period 2020–2030.* https://www.bag.admin.ch/dam/bag/en/dokumente/nat-gesundheitsstrategien/gesundheit-2030/strategie-gesundheit2030.pdf.download.pdf/strategie-gesundheit2030.pdf	no
	SW4	Federal Office of Public Health FOPH (2013). *Health 2020. The Federal Council's health-policy priorities.* https://www.bag.admin.ch/dam/bag/en/dokumente/nat-gesundheitsstrategien/gesundheit2020/g2020/bericht-gesundheit2020.pdf.download.pdf/report-health2020.pdf	no
	SW5	Federal Office of Public Health FOPH (2022). *National health strategies.* https://www.bag.admin.ch/bag/en/home/strategie-und-politik/nationale-gesundheitsstrategien.html	no
	SW6	Federal Office of Public Health FOPH (2022). *Environment & health.* https://www.bag.admin.ch/bag/en/home/gesund-leben/umwelt-und-gesundheit.html	no

	SW7	Federal Office of Public Health FOPH (2019). *Environmental impact.* https://www.bag.admin.ch/bag/en/home/gesund-leben/umwelt-und-gesundheit/umwelteinfluss.html	no
	SW8	Federal Office of Public Health FOPH (2022). *National Strategy for the Prevention of Non-communicable Diseases (NCD strategy).* https://www.bag.admin.ch/bag/en/home/strategie-und-politik/nationale-gesundheitsstrategien/strategie-nicht-uebertragbare-krankheiten.html	no
	SW9	Federal Office of Public Health FOPH (2020). *Swiss Health Foreign Policy.* https://www.bag.admin.ch/bag/en/home/strategie-und-politik/internationale-beziehungen/schweizer-gesundheitsaussenpolitik.html	no
	SW10	Schweizerische Eidgenossenschaft (2021). *UN Food Systems Summit. 23 September 2021. Virtual.* https://www.un.org/sites/un2.un.org/files/2021/10/FSS_statement_Switzerland.pdf	no
The Netherlands	NL1	Gezondheidsraad (2015). *Richtlijnen goede voeding 2015*. https://www.gezondheidsraad.nl/binaries/gezondheidsraad/documenten/adviezen/2015/11/04/richtlijnen-goede-voeding-2015/201524_Richtlijnen+goede+voeding+2015.pdf	no
	NL2	Gezondheidsraad (2020). *Voeding, gezondheid en duurzaamheid: een blik vooruit.* https://www.gezondheidsraad.nl/binaries/gezondheidsraad/documenten/adviezen/2020/05/20/voeding-gezondheid-en-duurzaamheid-een-blik-vooruit/Advies-Voeding-gezondheid-en-duurzaamheid-een-blik-vooruit.pdf	no
	NL3	Ministerie van Volksgezondheid, Welzijn en Sport (2020). *Landelijke Nota Gezondheidsbeleid (LNG) 2020-2024.* https://www.tweedekamer.nl/downloads/document?id=2020D19908	no
	NL4	Ministerie van Volksgezondheid, Welzijn en en Sport (2018). *Nationaal Preventieakkoord. Naar een gezonder Nederland.* https://open.overheid.nl/repository/ronl-1f7b7558-4628-477d-8542-9508d913ab2c/1/pdf/nationaal-preventieakkoord.pdf	no
	NL5	Rijksoverheid (2022). *Ministerie van Volksgezondheid, Welzijn en Sport.* https://www.rijksoverheid.nl/ministeries/ministerie-van-volksgezondheid-welzijn-en-sport	no
	NL6	Rijksoverheid (2019). *Congres Duurzame Zorg 2019 - Gezonde en duurzame voeding.* https://open.overheid.nl/repository/ronl-e9aa08f1-fcc0-4a59-9560-e29cbca56d64/1/pdf/Presentatie%20RIVM%20EenW%20Gezonde%20en%20Duurzame%20voeding.pdf	no
	NL7	Nationale Jeugdraad (2022). *Jongeren en het zorgen voor hun morgen.* https://www.gezondheidsraad.nl/binaries/gezondheidsraad/documenten/overige/2022/05/23/jongeren-en-het-zorgen-voor-hun-morgen/Jongeren+en+het+zorgen+voor+hun+morgen.pdf	no
	NL8	RIVM (2020). *One Health*. https://www.rivm.nl/one-health	no
	NL9	RIVM (2017). *Nederlandse samenwerking in Europees samenwerkingsprogramma One Health.* https://www.rivm.nl/nieuws/nederlandse-samenwerking-in-europees-samenwerkingsprogramma-one-health	no
	NL10	Ministerie van Volksgezondheid, Welzijn en Sport (2020). *Nationale Dementiestrategie 2021-2030.* https://www.rijksoverheid.nl/documenten/publicaties/2020/11/30/nationale-dementiestrategie-2021-2030	no
	NL11	VVD, D66, CDA en ChristenUnie (2021). *Coalitieakkoord 2021-2025.* https://open.overheid.nl/repository/ronl-f3cb0d9c-878b-4608-9f6a-8a2f6e24a410/1/pdf/coalitieakkoord-2021-2025.pdf	no
	NL12	Tweede Kamer der Staten-Generaal (2022). *Vaststelling van de begrotingsstaten van het Ministerie van Volksgezondheid, Welzijn en Sport (XVI) voor het jaar 2022. Nr. 170.* https://zoek.officielebekendmakingen.nl/kst-35925-XVI-170.pdf	no
	NL13	Ministerie van Volksgezondheid, Welzijn en Sport (2022). *Verslag informele gezondheidsraad 10 februari 2022.* https://open.overheid.nl/repository/ronl-88bb9e07366dfd5a3847a63a015d01ebf2208e6e/1/pdf/informele-gezondheidsraad-10-februari-2022.pdf	no
	NL14	*Speech by the Minister for Foreign Trade and Development Cooperation at the UN Food Systems Summit* (2021). https://www.un.org/sites/un2.un.org/files/2021/10/FSS_statement_Netherlands.pdf	no
Denmark	DK1	Sundhedsministeriet (2022). *Sundhedsreformen - Gør Danmark sundere.* https://sum.dk/Media/637831953766403005/Regeringens%20sundhedsudspil%202022%20(tilg%C3%A6ngelig%20PDF).pdf	yes

	DK2	Sundhedsministeriet (2022). *Sundhedsreformen - Gør Danmark sundere*. https://sum.dk/publikationer/2022/marts/sundhedsreformen-goer-danmark-sundere	yes
	DK3	Sundhedsministeriet (2022). *Sundhedsreformen: Regeringen vil gøre fremtiden nikotinfri og flytte sundhedsvæsenet tættere på borgerne*. https://sum.dk/nyheder/2022/marts/sundhedsreformen-regeringen-vil-goere-fremtiden-nikotinfri-og-flytte-sundhedsvaesenet-taettere-paa-borgerne	yes
	DK4	Sundhedsministeriet (2022). *8 nationale mål for sundhedsvæsenet.* https://sum.dk/temaer/8-nationale-maal-for-sundhedsvaesenet	yes
	DK5	Sundhedsministeriet (2018). *National Goals of the Danish Healthcare System*. https://sum.dk/Media/637643696872604100/National%20goals%20of%20the%20Danish%20Healthcare%20System.pdf	no
	DK6	Danish Ministry of Health (2021). *The Danish Super Hospital Programme 2021*. https://sum.dk/Media/0/2/TheDanishSuperHospitalProgramme2021.pdf	no
	DK7	Sundheds- og Ældreministeriet (2018). *Sundhed i fremtiden*. https://sum.dk/Media/637643700210597296/Sundhed%20i%20fremtiden.pdf	yes
	DK8	Danish Ministry of Health (2021). *Personalised Medicine for the Benefit of the Patients. Clear Diagnosis. Targeted treatment. Enhanced Research. National Strategy for Personalised Medicine 2021-2022.* https://sum.dk/Media/637616833229549022/Danish%20Strategy%20for%20personalised%20medicine%202021%202022.pdf	no
	DK9	Danish Health Authority (2022). *Responsibilities*. https://www.sundhedsstyrelsen.dk/en/English/Responsibilities-and-tasks	no
	DK10	Danish Ministry of Health, Danish Ministry of Finance, Danish Regions & Local Government Denmark (2018). *A Coherent and Trustworthy Health Network for All. Digital Health Strategy 2018-2022.* https://www.healthcaredenmark.dk/media/ljiixkr5/en_the_danish_digitalisation_strategy2018-2022.pdf	no
	DK11	*Denmark's statement at the UN Food Systems Summit* (2021). https://www.un.org/sites/un2.un.org/files/2021/10/FSS_statement_Denmark.pdf	no
Norway	NW1	Regjeringen.no (2022). *Rapportar, planar og strategiar.* https://www.regjeringen.no/no/dokument/rapportar-og-planar/id438817/?topic=917&ownerid=421&term=&page=5	yes
	NW2	Departementenes sikkerhets- og serviceorganisasjon (2017). *Nasjonal handlingsplan for bedre kosthold (2017–2021).* https://www.regjeringen.no/contentassets/fab53cd681b247bfa8c03a3767c75e66/handlingsplan_kosthold_2017-2021.pdf	yes
	NW3	The Ministry of Health and Care Services (2017). *National Plan for a Better Diet 2017-2021 -an outline.* https://www.regjeringen.no/contentassets/fab53cd681b247bfa8c03a3767c75e66/norwegian_national_action_plan_for_a_healthier_diet_an_outline.pdf	no
	NW4	Regjeringen.no (2017). *Konkrete mål for bedre kosthold.* https://www.regjeringen.no/no/dokumentarkiv/regjeringen-solberg/aktuelt-regjeringen-solberg/hod/nyheter/2017ny/konkrete-mal-for-bedre-kosthold/id2541825/	yes
	NW5	Norwegian Ministry of the Environment & Nordic Council of Ministers (2010). *The Nature Experience and Mental Health - Report of the "Outdoor Life and Mental Health" Nordic project.* https://www.regjeringen.no/globalassets/upload/md/vedlegg/rapporter/t-1474e.pdf	no
	NW6	Norwegian Ministry of Health and Care Services (2013). *Meld. St. 34 (2012–2013) Report to the Storting (White Paper) Summary Public Health Report.* https://www.regjeringen.no/contentassets/ce1343f7c56f4e74ab2f631885f9e22e/en-gb/pdfs/stm201220130034000engpdfs.pdf	no
	NW7	Government.no (2022). *Government launches new public health campaign focusing on mental health*. https://www.regjeringen.no/en/aktuelt/government-launches-new-public-health-campaign-focusing-on-mental-health/id2912322/	no
	NW8	Regjieringen.no (2022). *God og riktig mat hele livet*. https://www.regjeringen.no/no/dokumenter/god-og-riktig-mat-hele-livet/id2849251/?ch=1	yes
	NW9	Regjieringen.no (2018). *Nasjonal helseberedskapsplan*. https://www.regjeringen.no/no/dokumenter/a-verne-om-liv-og-helse/id2583172/	yes
	NW10	Ministère de L'Europe et des Affaires Étrangères (2021). *Global Health and Foreign Policy Initiative : informal consultation framework.* https://www.diplomatie.gouv.fr/en/french-foreign-policy/development-assistance/priority-sectors/health/global-health-and-foreign-policy-initiative-informal-consultation-framework/	no

	NW11	Government.no (2022). *Ministry of Health and Care Services*. https://www.regjeringen.no/en/dep/hod/id421/	no
	NW12	Government.no (2022). *The Department of Public Health*. https://www.regjeringen.no/en/dep/hod/organisation-and-management-of-the-ministry-of-health-and-care-services/Departments/The-Department-for-Public-Health/id1405/	no
	NW13	Norwegian Institute of Public Health (2021). *Linking climate change and health: Summarizing stakeholders' interviews in Norway*. https://www.fhi.no/en/news/2021/klimaendringer-og-helse-oppsummering-av-interessentintervjuer-i-norge/	no
	NW14	Helsedirektoratet (2022). *About the Norwegian Directorate of Health*. https://www.helsedirektoratet.no/english/about-the-norwegian-directorate-of-health#visionandvalues	no
	NW15	Helsedirektoratet (2017). *Healthy Life Centres in Norway (English – engelsk).* https://www.helsedirektoratet.no/english/healthy-life-centres	no
	NW16	Helsedirektoratet (2022). *Partnership for a healthier diet*. https://www.helsedirektoratet.no/english/partnership-for-a-healthier-diet	no
	NW17	Helsedirektoratet (2022). *Nordic Nutrition Recommendations 2022*. https://www.helsedirektoratet.no/english/nordic-nutrition-recommendations-2022	no
	NW18	*Statsministerens innlegg - UTKAST. Food Systems Summit* (2021). https://www.un.org/sites/un2.un.org/files/2021/10/FSS_statement_Norway.pdf	no
Czech Republic	CZ1	Ministerstvo Zdravotnictví České Republiky (2020). *Strategický Rámec Rozvoje Péče O Zdraví V České Republice Do Roku 2030*. https://zdravi2030.mzcr.cz/zdravi-2030-strategicky-ramec.pdf	yes
	CZ2	Ministerstvo Zdravotnictví České Republiky (2020). *Vláda schválila Strategický rámec Zdraví 2030*. https://www.mzcr.cz/vlada-schvalila-strategicky-ramec-zdravi-2030-2/	yes
	CZ3	Ministry of Health of the Czech Republic (2014). *Health 2020 – National Strategy for Health Protection and Promotion and Disease Prevention.* https://www.mzcr.cz/wp-content/uploads/wepub/8690/21944/Health%202020%20%E2%80%93%20National%20Strategy%20for%20Health%20Protection%20and%20Promotion%20and%20Disease%20Prevention.pdf	no
	CZ4	Ministerstvo Zdravotnictví České Republiky (2014). *Úvod.* https://www.mzcr.cz/wp-content/uploads/wepub/2461/7180/Zdrav%C3%AD%2021%20-%20Cile%201-9.pdf	yes
	CZ5	Ministry of Health of the Czech Republic (2014). *Czech Strategic Framework Health 2030. Background for guiding the implementation of the Czech National Cancer Control Programme (NCCP).* https://www.europarl.europa.eu/meetdocs/2014_2019/plmrep/COMMITTEES/BECA/DV/2021/06-16/Speaker_06_BECA_Czechia_final_EN.pdf	yes
	CZ6	Ministerstvo Zdravotnictví České Republiky (2014). *CÍL 10: ZDRAVÉ A BEZPEČNÉ ŽIVOTNÍ PROSTŘEDÍ.* https://www.mzcr.cz/wp-content/uploads/wepub/2461/7179/Zdrav%C3%AD%2021%20-%20Cile%2010-21.pdf	yes
Latvia	LV1	European Commission & OECD (2020). *Health at a Glance: Europe 2020. Executive summary*. https://health.ec.europa.eu/system/files/2020-11/2020_healthatglance_sum_en_0.pdf	no
	LV2	Cross-Sectoral Coordination Center Riga (2020). *National Development Plan of Latvia for 2021-2027*. https://pkc.gov.lv/sites/default/files/inline-files/NAP2027__ENG.pdf	no
	LV3	Valsts kanceleja (2022). *Sabiedrības veselības pamatnostādnes 2021.-2027. gadam.* https://tapportals.mk.gov.lv/legal_acts/746a6c77-a9f4-4182-9084-e4ab10484b2e#	yes
	LV4	Veselibas Ministrija (2022). *Sabiedrības veselības pamatnostādnes 2021.-2027.gadam: pieejamāki, kvalitatīvāki pakalpojumi un labāka veselības pratība.* https://www.vm.gov.lv/lv/jaunums/sabiedribas-veselibas-pamatnostadnes-2021-2027gadam-pieejamaki-kvalitativaki-pakalpojumi-un-labaka-veselibas-pratiba?utm_source=https%3A%2F%2Fwww.ecosia.org%2F	yes
	LV5	Health Inspectorate Republic of Latvia (2020). *Regulations of the Health Inspectorate.* https://www.vi.gov.lv/en/node/5	no

	LV6	Health Inspectorate Republic of Latvia (2020). *Public Health.* https://www.vi.gov.lv/en/public-health	no
	LV7	Health Inspectorate Republic of Latvia (2020). *Enviromental Health.* https://www.vi.gov.lv/en/enviromental-health	no
	LV8	National Health Service Republic of Latvia (2020). *Areas of Activity*. https://www.vmnvd.gov.lv/en/areas-activity	no
	LV9	FAO & FAOLEX (2019). *Latvia "One Health" Plan for Containing Antimicrobial Resistance and Prudent Use of Antibiotics for 2019-2020.* https://leap.unep.org/countries/lv/national-legislation/latvia-one-health-plan-containing-antimicrobial-resistance-and	no
	LV10	*Statement of the President of Latvia, Egils Levits, at the UN Food Systems Summit in New York*. https://www.un.org/sites/un2.un.org/files/2021/10/FSS_statement_Latvia.pdf	no

The references of the 58 policy documents related to the goals of sustainability can be found in *Table II.ii* below, including the identifier used in the text to refer to the corresponding document.

Table II.ii. Analysed programs and policies related to health and sustainability for different governance levels. *Per document it is indicated whether it was translated ('yes'), or whether the researcher could read the original language, e.g. Dutch or English ('no').*

Institution/ Organisation	Identifier	Reference	Translated
OHEJP	OH1	One Health European Joint Programme (2020). Home - Structure. https://onehealthejp.eu/structure/	no
	OH2	One Health European Joint Programme (2020). About. https://onehealthejp.eu/about/	no
	OH3	One Health European Joint Programme (2019). Annual Report 2018. https://onehealthejp.eu/wp-content/uploads/2018/12/One-Health-EJP-Annual-Report-2018.pdf	no
	OH4	One Health European Joint Programme (2022). Annual Report 2021. https://onehealthejp.eu/wp-content/uploads/2022/05/OHEJP_Annual-Report-2021_final_compressed.pdf	no
European Commission	EC1	European Commission (December 11, 2019). COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS. The European Green Deal. COM(2019) 640 final.	no
	EC2	European Commission (May 20, 2020). COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS. A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system. COM(2020) 381 final	no
	EC3	European Commission (September 29, 2021). INCEPTION IMPACT ASSESSMENT. Sustainable food system framework initiative. Ref. Ares(2021)5902055	no
	EC4	European Commission (November 11, 2020). COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS. Building a European Health Union: Reinforcing the EU's resilience for cross-border health threats. COM(2020) 724 final.	no
	EC5	European Commission (November 11, 2020). Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Regulation (EC) No 851/2004 establishing a European Centre for disease prevention and control. COM(2020) 726 final. 2020/0320 (COD).	no
	EC6	European Commission (April 11, 2022). Draft proposal for a European Partnership under Horizon Europe Sustainable Food Systems for People, Planet & Climate.	no

		https://ec.europa.eu/info/sites/default/files/research_and_innovation/funding/documents/ec_rtd_he-partnership-sustainable-food-systems-april_2022.pdf	
	EC7	European Commission (June 29, 2021). Narrative: European Partnership on Safe and Sustainable Food Systems for People, Planet & Climate. SCAR Strategic Working Group Food Systems. https://scar-europe.org/images/FOOD/Main_actions/Food-Systems-Partnership_Narrative-06-2021.pdf	no
	EC8	European Commission (September 18, 2019). Workshop Report: European Partnership "Safe and Sustainable Food Systems for People, Planet and Climate". https://scar-europe.org/images/FOOD/Main_actions/Food_System_Partnership-Workshop_report-18-09-2019.pdf	no
	EC9	European Commission (May 28, 2020). Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the establishment of a Programme for the Union's action in the field of health –for the period 2021-2027 and repealing Regulation (EU) No 282/2014 ("EU4Health Programme"). COM(2020) 405 final. 2020/0102 (COD).	no
	EC10	European Commission (April 4, 2022). ANNEX I to the Commission Implementing Decision amending Commission Implementing Decision C(2021) 4793 final of 24 June 2021 and Commission Implementing Decision C(2022) 317 final of 14 January 2022 on the financing of the Programme for the Union's action in the field of health ('EU4Health Programme') and the adoption of the work programmes for 2021 and 2022 respectively. C(2022) 2470 final.	no
	EC11	European Commission (April 4, 2022). ANNEX II to the Commission Implementing Decision amending Commission Implementing Decision C(2021) 4793 final of 24 June 2021 and Commission Implementing Decision C(2022) 317 final of 14 January 2022 on the financing of the Programme for the Union's action in the field of health ('EU4Health Programme') and the adoption of the work programmes for 2021 and 2022 respectively. C(2022) 2470 final.	no
	EC12	European Commission (2020). EU4Health programme 2021-2027 – a vision for a healthier European Union. https://health.ec.europa.eu/funding/eu4health-programme-2021-2027-vision-healthier-european-union_en	no
	EC13	European Commission (March 26, 2021). REGULATION (EU) 2021/522 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 March 2021 establishing a Programme for the Union's action in the field of health ('EU4Health Programme') for the period 2021-2027, and repealing Regulation (EU) No 282/2014. Official Journal of the European Union, L 107/1.	no
	EC14	European Commission (May 3, 2021). Proposal for a COUNCIL DECISION on the position to be taken on behalf of the European Union in the seventy-fourth session of the World Health Assembly. COM(2021) 233 final 2021/0120 (NLE).	no
	EC15	European Commission (March 21, 2014). REGULATION (EU) No 282/2014 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 March 2014 on the establishment of a third Programme for the Union's action in the field of health (2014-2020) and repealing Decision No 1350/2007/EC. Official Journal of the European Union, L 86/1.	no
	EC16	European Commission (November 6, 2020). REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL. Implementation of the third programme of Union action in the field of health (2018). SWD(2020) 256 final. Brussels. COM(2020) 691 final.	no
	EC17	European Commission (November 5, 2021). REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL Implementation of the third Programme of Union Action in the field of health in 2019. SWD(2021) 311 final. Brussels. COM(2021) 680 final.	no
	EC18	European Commission (November 5, 2021). COMMISSION STAFF WORKING DOCUMENT. Accompanying the document Report from the Commission to the European Parliament and the Council Implementation of the third Programme of Union action in the field of health in 2019. COM(2021) 680 final. Brussels. SWD(2021) 311 final.	no
	EC19	European Commission (2020). Food 2030 pathways for action - Research and innovation policy as a driver for sustainable, healthy and inclusive food systems. Brussels. https://op.europa.eu/en/publication-detail/-/publication/86e31158-2563-11eb-9d7e-01aa75ed71a1	no
	EC20	European Commission (2022). Food 2030. https://research-and-innovation.ec.europa.eu/knowledge-publications-tools-and-data/publications/all	no
	EC21	European Commission (2022). Food information to consumers - legislation. https://food.ec.europa.eu/safety/labelling-and-nutrition/food-information-consumers-legislation_en	no
	EC22	European Commission (2022). Glossary: adverse health effects. https://ec.europa.eu/health/scientific_committees/opinions_layman/en/electromagnetic-fields/glossary/abc/adverse-health-effect-adverse-effect-harmful-health-effect.htm	no

	EC23	COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE European Commission (October 14, 2020). EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS. Chemicals Strategy for Sustainability. Towards a Toxic-Free Environment. Brussels. COM(2020) 667 final. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2020%3A667%3AFIN	no
	EC24	European Commission (2022). Chemicals strategy. https://environment.ec.europa.eu/strategy/chemicals-strategy_en	no
EUR-LEX	EL1	European Commission (October 26, 2012). Consolidated Version of the Treaty on the Functioning of the European Union. C 326/47. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:12012E/TXT&from=EN	no
	EL2	EUR-Lex (2022). Summaries of EU legislation: Public Health. https://eur-lex.europa.eu/summary/chapter/public_health.html?root_default=SUM_1_CODED%3D29&locale=en	no
	EL3	EUR-Lex (2014). Health for Growth: EU health programme (2014-20). https://eur-lex.europa.eu/EN/legal-content/summary/health-for-growth-eu-health-programme-2014-20.html	no
	EL4	EUR-Lex (2014). Promoting health-enhancing physical activity for all. https://eur-lex.europa.eu/EN/legal-content/summary/promoting-health-enhancing-physical-activity-for-all.html	no
	EL5	EUR-Lex (2017). Tackling the epidemic of childhood obesity. https://eur-lex.europa.eu/EN/legal-content/summary/tackling-the-epidemic-of-childhood-obesity.html	no
	EL6	European Union (July 8, 2014). NOTICES FROM EUROPEAN UNION INSTITUTIONS, BODIES, OFFICES AND AGENCIES. COUNCIL. Council conclusions on nutrition and physical activity (2014/C 213/01). C213/1. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014XG0708(01)&from=EN	no
	EL7	European Union (October 25, 2018). REGULATION (EU) No 1169/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the provision of food information to consumers, amending Regulations (EC) No 1924/2006 and (EC) No 1925/2006 of the European Parliament and of the Council, and repealing Commission Directive 87/250/EEC, Council Directive 90/496/EEC, Commission Directive 1999/10/EC, Directive 2000/13/EC of the European Parliament and of the Council, Commission Directives 2002/67/EC and 2008/5/EC and Commission Regulation (EC) No 608/2004. (OJ L 304, 22.11.2011, p. 18). https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02011R1169-20180101&from=EN	no
	EL8	European Union (January 28, 2002). REGULATION (EC) No 178/2002 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food SafetyAuthorityand laying down procedures in matters of food safety. L 31/1. http://data.europa.eu/eli/reg/2002/178/2022-07-01	no
	EL9	European Commission (2022). Food information to consumers - legislation. https://food.ec.europa.eu/safety/labelling-and-nutrition/food-information-consumers-legislation_en	no
	EL10	EUR-Lex (2022). Promoting healthy diet and physical activity across Europe. https://eur-lex.europa.eu/EN/legal-content/summary/promoting-healthy-diet-and-physical-activity-across-europe.html	no
	EL11	European Union (July 8, 2014). NOTICES FROM EUROPEAN UNION INSTITUTIONS, BODIES, OFFICES AND AGENCIES. Council conclusions on nutrition and physical activity. (2014/C 213/01). https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014XG0708(01)&from=EN	no
	EL12	European Union (December 4, 2013). COUNCIL RECOMMENDATION of 26 November 2013 on promoting health-enhancing physical activity across sectors. C 354/1. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013H1204(01)&from=EN	no
European Union	EU1	European Union (2021). European Green Deal. Delivering on Our Targets. 10.2775/595210	no
	EU2	European Union (2021). Delivering the European Green Deal. The Decisive Decade. 10.2775/352471	no
	EU3	European Union (2022). Health. https://european-union.europa.eu/priorities-and-actions/actions-topic/health_en	no
	EU4	EUR-Lex (2022). Summaries of EU legislation: Public Health. https://eur-lex.europa.eu/summary/chapter/public_health.html?root_default=SUM_1_CODED%3D29&locale=en	no

	EU5	European Centre for Disease Prevention and Control (2022). About ECDC. https://www.ecdc.europa.eu/en/about-ecdc	no
	EU6	European Environment Agency (2022). Environment and Health. https://www.eea.europa.eu/themes/human	no
	EU7	European Food Safety Agency (2022). Home. https://www.efsa.europa.eu/en	no
	EU8	European Food Safety Agency (2021). EFSA Strategy 2027: Science, Safe food, Sustainability. https://www.efsa.europa.eu/sites/default/files/2021-07/efsa-strategy-2027.pdf	no
	EU9	European Medicines Agency (2022). What we do. https://www.ema.europa.eu/en/about-us/what-we-do	no
	EU10	European Medicines Agency (2022). Human medicines: regulatory information. https://www.ema.europa.eu/en/human-medicines-regulatory-information	no
	EU11	European Union (2021). State of the Union 2021. Luxembourg: Publications Office of the European Union. 10.2775/20168. https://ec.europa.eu/info/sites/default/files/soteu_2021_full_book_en.pdf	no
United Nations	UN1	United Nations (2022). Health and population. https://sdgs.un.org/topics/health-and-population	no
	UN2	United Nations (2021). Goal 3 | Department of Economic and Social Affairs. https://sdgs.un.org/goals/goal3	no
	UN3	United Nations (2019). Independent Group of Scientists appointed by the Secretary-General. Global Sustainable Development Report 2019: The Future is Now Science for Achieving Sustainable Development. New York. https://sdgs.un.org/sites/default/files/2020-07/24797GSDR_report_2019.pdf	no
	UN4	Sachs, J., Kroll, C., Lafortune, G., Fuller, G., & Woelm, F. (2022). Sustainable Development Report 2022. https://dashboards.sdgindex.org/map	no
World Health Organisation	WHO1	WHO (2021). World Health Statistics 2021: monitoring health for the SDGs, sustainable development goals. Geneva: World Health Organization. License: CC BY-NC-SA 3.0 IGO. https://apps.who.int/iris/handle/10665/342703	no
WHO Regional Office for Europe	WHO-EU1	WHO Regional Office for Europe (2014). European Food and Nutrition Action Plan 2015–2020. Regional Committee for Europe 64th Session. Copenhagen, Denmark, 15–18 September 2014. https://www.euro.who.int/__data/assets/pdf_file/0008/253727/64wd14e_FoodNutAP_140426.pdf	no
	WHO-EU2	WHO Regional Office for Europe (2013). Health 2020: A European policy framework and strategy for the 21st century. https://www.euro.who.int/__data/assets/pdf_file/0011/199532/Health2020-Long.pdf	no

APPENDIX III
CONTEXT-SPECIFIC CATEGORIZATION OF HEALTH CONCEPTS

III.i. Qualitative categorization of health concepts

Table III.i shows six different concepts of health, with seven guiding questions, to categorize the eight national DoHs. These conceptualizations of health are based on already present definitions: the first five, as well as the guiding questions, are described by Haverkamp, Verweij and Stronks (33,35); the sixth concept of the Meikirch Model by Bircher and Kuruvilla (19) is added and categorized by the author based on the categorization of the five health concepts by Haverkamp et al.

Table III.i. *Scientifically identified concepts of health and their corresponding aspects.*
1: Health concepts and classification retrieved from Haverkamp, Verweij, and Stronks (33,35)
2: Classification made by author, based on Bircher and Kuruvilla (19). *PAP = personally acquired potential; BGP = biologically given potential*

	Conceptualizations of health					
Guiding questions [1]	Health as biologically normal functioning (Boorse) [1]	Health as capacity to reach essential goals (Nordenfelt) [1]	Health as capacity to reach 'central capacities' (Venkatapuram) [1]	Health as complete physical, mental and social wellbeing (WHO) [1]	Health as the capacity to adapt and self-manage (Huber, Positive Health) [1]	Health as a state of wellbeing emergent from conducive interactions between individuals' potentials, life's demands, and social and environmental determinants. (Meikirch Model) [2]
Naturalism vs. normativism	Naturalism	Normativism	Normativism	Normativism	Normativism	Normativism
Reductionism vs. Holism	Reductionism	Holism	Holism	Holism	Holism	Holism
Internalism vs. Externalism	Internalism	Internalism	Externalism	Internalism	Internalism	Internalism and Externalism
Universalism vs. Relativism	Universalism	Relativism	Universalism	Universalism	Relativism	Relativism
Objectivism vs. Subjectivism	Objectivism	More subjectivism than objectivism	More objectivism than subjectivism	More objectivism than subjectivism	Subjectivism (based on the spider map)	Subjectivism (PAP) and Objectivism (BGP)
Relation health – wellbeing	No relation between health and wellbeing	Health is a prerequisite for wellbeing; wellbeing as a wish fulfillment	Health as a prerequisite for wellbeing; wellbeing as a humane life	Health is wellbeing; wellbeing is undefined	Wellbeing is an indicator of health; wellbeing if self-managing in the face of social, physical, and emotional challenges	Health is a dynamic state of wellbeing; wellbeing is what results from an interaction between PAP and BGP
Relation health – disease	Health is the absence of disease	Disease decreases health	Disease decreases health	Absence of disease is the minimal requirement for health	Health and disease are compatible	State of health is possible next to biomedical problems (disease)

The seven guiding questions to determine the best suitable DoH for a specific context are retrieved from Haverkamp, Verweij, and Stronks (33,35):

1. Should it be possible to describe health by the (natural) sciences, or should it be seen as a condition important for individuals? *(naturalism vs. normativism)*
2. Should we understand the object of health as a collection of organs and separate functions, or as the individual as a whole? *(reductionism vs. holism)*
3. Should 'health' refer only to the individual itself, or also to the circumstances/environment in which he/she is? *(internalism vs. externalism)*
4. Should we see health as an equal standard for all people, or as a standard that can differ per society or even per individual? *(universalism vs. relativism)*
5. What weight should we give to the experience of the individual himself/herself when we judge someone's health? *(objectivism vs subjectivism)*
6. How should we understand the *relation between health and wellbeing*?
7. How should we understand the *relation between health and disease*?

III.ii. Quantitative categorization of health concepts

Table III.ii shows the rubric for the quantitative classification of national DoHs, based on the categorizations depicted in Table III.i. The scoring levels are ranging from 1 to 5. The specifications of every level are determined by the author, by considering the different answers on the seven guiding questions for the six concepts of health from Table III.i. These answers were ranked in a logical order, which showed different levels of comparison between two opposing concepts (questions 1 to 5), or in the relation between two distinct concepts (questions 6 and 7).

Table III.ii. *Quantitative scoring table of answers to guiding questions to classify concepts of health, based on guiding questions and corresponding aspects as depicted in table III.i. NAT = naturalism; NORM = normativism; RED = reductionism; HOL = holism; INT = internalism; EXT = externalism; UNI = universalism; REL = relativism; OBJ = objectivism; SUBJ = subjectivism; H = health; WB = wellbeing; D = disease.*

	Score				
	1	2	3	4	5
NAT/NORM	Naturalism	More naturalism than normativism	Both equally	More normativism than naturalism	Normativism
RED/HOL	Reductionism	More reductionism than holism	Both equally	More holism than reductionism	Holism
INT/EXT	Internalism	More internalism than externalism	Both equally	More externalism than internalism	Externalism
UNI/REL	Universalism	More universalism than relativism	Both equally	More relativism than universalism	Relativism
OBJ/SUB	Objectivism	More objectivism than subjectivism	Both equally	More subjectivism than objectivism	Subjectivism
Relation H and WB	No relation between H and WB	H is indicated by WB	H is prerequisite for WB	H is state of WB	H is WB; WB is H
Relation H and D	No relation between H and D	D and H are compatible	No D is prerequisite for H	D and H are reversely correlated (more D = less H)	H is absence of D

This quantitative categorization will be used to score the national DoHs and show the results in a table and a spider map inspired by Huber et al. (84). The example is already provided for the classification of the six conceptualizations of health (Table III.iii and Figure III.i).

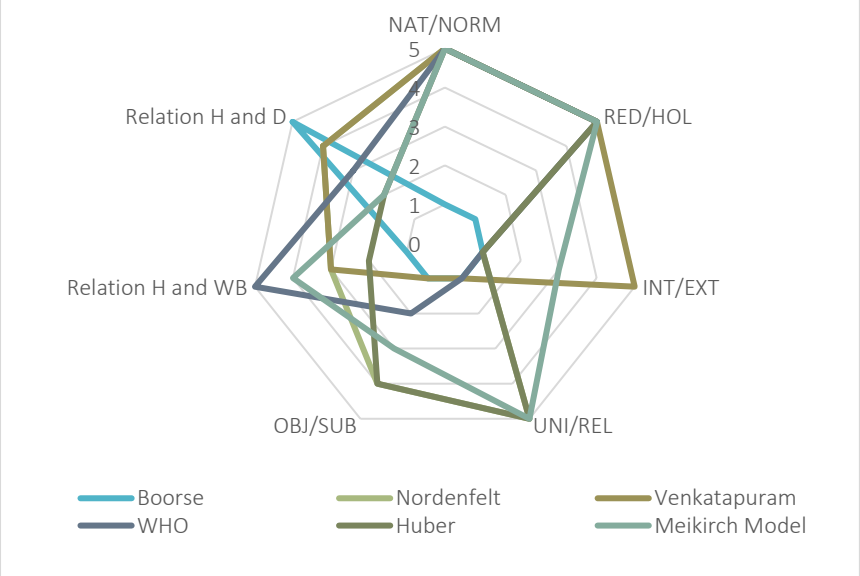
III.iii. Combined qualitative-quantitative visualization of health concepts

The classifications of the national DoHs, based on the defined concepts of health and guiding questions, will be visualized as is depicted for the identified six health concepts in **Table III.iii** and **Figure III.i.**

Table III.iii. *Quantitative classification of conceptualizations of health from* ***Table III.i****., based on scoring table of* ***Table III.ii****. WHO = World Health Organisation; NAT = naturalism; NORM = normativism; RED = reductionism; HOL = holism; INT = internalism; EXT = externalism; UNI = universalism; REL = relativism; OBJ = objectivism; SUBJ = subjectivism; H = health; WB = wellbeing; D = disease.*

	Conceptualization of Health					
	Boorse	Nordenfelt	Venkatapuram	WHO	Huber	Meikirch Model
NAT/NORM	1	5	5	3	5	5
RED/HOL	1	5	5	4	5	5
INT/EXT	1	1	5	1	1	3
UNI/REL	1	5	1	1	5	5
OBJ/SUB	1	4	1	2	4	3
Relation H and WB	1	3	3	5	2	4
Relation H and D	5	4	4	3	2	2

Figure III.i. *Quantitative classification of six concepts of health, based on scoring table III.ii.*



APPENDIX IV
EU REGULATIONS ON HEALTH, SUSTAINABILITY AND FOOD

Below, the articles from the Treaty on Functioning of the European Union (TFEU [EL1]), General Food Law (EL8), Provision of Food Information to Consumers (EL7,9), Council conclusions on nutrition and physical activity (EL10-11) and Recommendation on Promoting Health-Enhancing Physical Activity Across Sectors (EL4, 12) are copied, related to health, sustainability and food. Only the subsections that relate specifically to these topics, were copied and used for further analysis in **European Legislation on Health, Sustainability and Food** (**p. 49**).

IV.i. TFEU Regulations

Article 4

1. The Union shall share competence with the Member States where the Treaties confer on it a competence which does not relate to the areas referred to in Articles 3 and 6.

2. Shared competence between the Union and the Member States applies in the following principal areas:

(a) internal market;
(b) social policy, for the aspects defined in this Treaty;
(c) economic, social and territorial cohesion;
(d) agriculture and fisheries, excluding the conservation of marine biological resources;
(e) environment;
(f) consumer protection;
(g) transport;
(h) trans-European networks;
(i) energy;
(j) area of freedom, security and justice;
(k) common safety concerns in public health matters, for the aspects defined in this Treaty.

Article 6

The Union shall have competence to carry out actions to support, coordinate or supplement the actions of the Member States. The areas of such action shall, at European level, be:

(a) protection and improvement of human health.

Article 9

In defining and implementing its policies and activities, the Union shall take into account requirements linked to the promotion of a high level of employment, the guarantee of adequate social protection, the fight against social exclusion, and a high level of education, training and protection of human health.

Article 11

Environmental protection requirements must be integrated into the definition and implementation of the Union's policies and activities, in particular with a view to promoting sustainable development.

Article 26

1. The Union shall adopt measures with the aim of establishing or ensuring the functioning of the internal market, in accordance with the relevant provisions of the Treaties.

2. The internal market shall comprise an area without internal frontiers in which the free movement of goods, persons, services and capital is ensured in accordance with the provisions of the Treaties.

3. The Council, on a proposal from the Commission, shall determine the guidelines and conditions necessary to ensure balanced progress in all the sectors concerned.

Article 114

1. Save where otherwise provided in the Treaties, the following provisions shall apply for the achievement of the objectives set out in Article 26. The European Parliament and the Council shall, acting in accordance with the ordinary legislative procedure and after consulting the Economic and Social Committee, adopt the measures for the approximation of the provisions laid down by law, regulation or administrative action in Member States which have as their object the establishment and functioning of the internal market.

3. The Commission, in its proposals envisaged in paragraph 1 concerning health, safety, environmental protection and consumer protection, will take as a base a high level of protection, taking account in particular of any new development based on scientific facts.

Article 168

1. A high level of human health protection shall be ensured in the definition and implementation of all Union policies and activities. Union action, which shall complement national policies, shall be directed towards improving public health, preventing physical and mental illness and diseases, and obviating sources of danger to physical and mental health. Such action shall cover the fight against the major health scourges, by promoting research into their causes, their transmission and their prevention, as well as health information and education, and monitoring, early warning of and combating serious cross-border threats to health. The Union shall complement the Member States' action in reducing drugs-related health damage, including information and prevention.

2. The Union shall encourage cooperation between the Member States in the areas referred to in this Article and, if necessary, lend support to their action. It shall in particular encourage cooperation between the Member States to improve the complementarity of their health services in cross-border areas.

3. The Union and the Member States shall foster cooperation with third countries and the competent international organisations in the sphere of public health.

4. By way of derogation from Article 2(5) and Article 6(a) and in accordance with Article 4(2)(k) the European Parliament and the Council, acting in accordance with the ordinary legislative procedure and after consulting the Economic and Social Committee and the Committee of the Regions, shall contribute to the achievement of the objectives referred to in this Article through adopting in order to meet common safety concerns:

(a) measures setting high standards of quality and safety of organs and substances of human origin, blood and blood derivatives; these measures shall not prevent any Member State from maintaining or introducing more stringent protective measures;

(b) measures in the veterinary and phytosanitary fields which have as their direct objective the protection of public health;

(c) measures setting high standards of quality and safety for medicinal products and devices for medical use.

5. The European Parliament and the Council, acting in accordance with the ordinary legislative procedure and after consulting the Economic and Social Committee and the Committee of the Regions, may also adopt incentive measures designed to protect and improve human health and in particular to combat the major cross-border health scourges, measures concerning monitoring, early warning of and combating serious cross-border threats to health, and measures which have as their direct objective the protection of public health regarding tobacco and the abuse of alcohol, excluding any harmonisation of the laws and regulations of the Member States.

6. The Council, on a proposal from the Commission, may also adopt recommendations for the purposes set out in this Article.

7. 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.

Article 169

1. In order to promote the interests of consumers and to ensure a high level of consumer protection, the Union shall contribute to protecting the health, safety and economic interests of consumers, as well as to promoting their right to information, education and to organise themselves in order to safeguard their interests.

Article 191

1. Union policy on the environment shall contribute to pursuit of the following objectives: — preserving, protecting and improving the quality of the environment, — protecting human health, — prudent and rational utilisation of natural resources, — promoting measures at international level to deal with regional or worldwide environmental problems, and in particular combating climate change.

2. Union policy on the environment shall aim at a high level of protection taking into account the diversity of situations in the various regions of the Union. It shall be based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source and that the polluter should pay.
In this context, harmonisation measures answering environmental protection requirements shall include, where appropriate, a safeguard clause allowing Member States to take provisional measures, for non-economic environmental reasons, subject to a procedure of inspection by the Union.

3. In preparing its policy on the environment, the Union shall take account of:
- available scientific and technical data,
- environmental conditions in the various regions of the Union,
- the potential benefits and costs of action or lack of action,
- the economic and social development of the Union as a whole and the balanced development of its regions.

4. Within their respective spheres of competence, the Union and the Member States shall cooperate with third countries and with the competent international organisations. The arrangements for Union cooperation may be the subject of agreements between the Union and the third parties concerned.
The previous subparagraph shall be without prejudice to Member States' competence to negotiate in international bodies and to conclude international agreements.

Declarations concerning provisions of the treaties

32. Declaration on Article 168(4)(c) of the Treaty on the Functioning of the European Union

The Conference declares that the measures to be adopted pursuant to Article 168(4)(c) must meet common safety concerns and aim to set high standards of quality and safety where national standards affecting the internal market would otherwise prevent a high level of human health protection being achieved.

IV.ii. General Food Law

Provisions:

(1) The free movement of safe and wholesome food is an essential aspect of the internal market and contributes significantly to the health and well-being of citizens, and to their social and economic interests.

(2) A high level of protection of human life and health should be assured in the pursuit of Community policies.

(3) The free movement of food and feed within the Community can be achieved only if food and feed safety requirements do not differ significantly from Member State to Member State.

(4) There are important differences in relation to concepts, principles and procedures between the food laws of the Member States. When Member States adopt measures governing food, these differences may impede the free movement of food, create unequal conditions of competition, and may thereby directly affect the functioning of the internal market.

(5) Accordingly, it is necessary to approximate these concepts, principles and procedures so as to form a common basis for measures governing food and feed taken in the Member States and at Community level. It is however necessary to provide for sufficient time for the adaptation of any conflicting provisions in existing legislation, both at national and Community

level, and to provide that, pending such adaptation, the relevant legislation be applied in the light of the principles set out in the present Regulation.

(33) The scientific and technical issues in relation to food and feed safety are becoming increasingly important and complex. The establishment of a European Food Safety Authority, hereinafter referred to as 'the Authority', should reinforce the present system of scientific and technical support which is no longer able to respond to increasing demands on it.

(36) The Authority should provide a comprehensive independent scientific view of the safety and other aspects of the whole food and feed supply chains, which implies wide-ranging responsibilities for the Authority. These should include issues having a direct or indirect impact on the safety of the food and feed supply chains, animal health and welfare, and plant health. However, it is necessary to ensure that the Authority focuses on food safety, so its mission in relation to animal health, animal welfare and plant health issues that are not linked to the safety of the food supply chain should be limited to the provision of scientific opinions. The Authority's mission should also cover scientific advice and scientific and technical support on human nutrition in relation to Community legislation and assistance to the Commission at its request on communication linked to Community health programmes.

Article 2

Definition of 'food' For the purposes of this Regulation, 'food' (or 'foodstuff') means any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans. 'Food' includes drink, chewing gum and any substance, including water, intentionally incorporated into the food during its manufacture, preparation or treatment. It includes water after the point of compliance as defined in Article 6 of Directive 98/83/EC and without prejudice to the requirements of Directives 80/778/EEC and 98/83/EC.

Article 3

Other definitions

For the purposes of this Regulation:

9. 'risk' means a function of the probability of an adverse health effect and the severity of that effect, consequential to a hazard;

Article 22

Mission of the Authority

1. A European Food Safety Authority, hereinafter referred to as the 'Authority', is hereby established.

2. The Authority shall provide scientific advice and scientific and technical support for the Community's legislation and policies in all fields which have a direct or indirect impact on food and feed safety. It shall provide independent information on all matters within these fields and communicate on risks.

3. The Authority shall contribute to a high level of protection of human life and health, and in this respect take account of animal health and welfare, plant health and the environment, in the context of the operation of the internal market.

4. The Authority shall collect and analyse data to allow the characterisation and monitoring of risks which have a direct or indirect impact on food and feed safety.

IV.iii. Provision of Food Information to Consumers

Article 3

General objectives

1. The provision of food information shall pursue a high level of protection of consumers' health and interests by providing a basis for final consumers to make informed choices and to make safe use of food, with particular regard to health, economic, environmental, social and ethical considerations.

Article 4

Principles governing mandatory food information

1. Where mandatory food information is required by food information law, it shall concern information that falls, in particular, into one of the following categories:

(a) information on the identity and composition, properties or other characteristics of the food;
(b) information on the protection of consumers' health and the safe use of a food. In particular, it shall concern information on:

(i) compositional attributes that may be harmful to the health of certain groups of consumers;
(ii) durability, storage and safe use;
(iii) the health impact, including the risks and consequences related to harmful and hazardous consumption of a food;

(c) information on nutritional characteristics so as to enable consumers, including those with special dietary requirements, to make informed choices.

Article 5

Consultation of the European Food Safety Authority

Any Union measure in the field of food information law which is likely to have an effect on public health shall be adopted after consultation of the European Food Safety Authority ('the Authority').

Article 39

National measures on additional mandatory particulars

1. In addition to the mandatory particulars referred to in Article 9(1) and in Article 10, Member States may, in accordance with the procedure laid down in Article 45, adopt measures requiring additional mandatory particulars for specific types or categories of foods, justified on grounds of at least one of the following:

(a) the protection of public health;
(b) the protection of consumers;
(c) the prevention of fraud;
(d) the protection of industrial and commercial property rights, indications of provenance, registered designations of origin and the prevention of unfair competition.

Amendments to Regulation (EC) No 1924/2006

The first and second paragraphs of Article 7 of Regulation (EC) No 1924/2006 are replaced by the following:

'Nutrition labelling of products on which a nutrition and/or health claim is made shall be mandatory, with the exception of generic advertising. The information to be provided shall consist of that specified in Article 30(1) of Regulation (EU) No 1169/2011 of the European Parliament and of the Council of 25 October 2011 on the provision of food information to consumers (*). Where a nutrition and/or health claim is made for a nutrient referred to in Article 30(2) of Regulation (EU) No 1169/2011 the amount of that nutrient shall be declared in accordance with Articles 31 to 34 of that Regulation.

The amount(s) of the substance(s) to which a nutrition or health claim relates that does not appear in the nutrition labelling shall be stated in the same field of vision as the nutrition labelling and be expressed in accordance with Articles 31, 32 and 33 of Regulation (EU) No 1169/2011. The units of measurement used to express the amount of the substance shall be appropriate for the individual substances concerned.

IV.iv. Council conclusions on nutrition and physical activity

15. The beneficial impact of health promotion and disease prevention on both citizens and health systems and that healthy diets and physical activity significantly reduce the risk of chronic conditions and noncommunicable diseases (NCDs), and contribute substantially to the healthy growth of children, healthy life years (HLY) and good quality of life of children, adolescents and adults.

16. That investing in health, promoting good health and keeping people active for longer can help to enhance productivity and competitiveness and contribute to achieving the objectives laid out in the Europe 2020 Strategy;

20. That obesity and non-communicable diseases related to unhealthy diet and lack of physical activity are caused by many factors; comprehensive prevention strategies and multi-stakeholders approaches provide best results; nutritional problems and physical inactivity need to be addressed in an integrated way and mainstreamed into the agenda of the relevant Council formations;

22. That overall dietary patterns may be more relevant than specific foods in the etiology of diet-related dis eases; healthy dietary patterns are characterised by high consumption of fruits and vegetables, consumption of fish and by giving preference to low-fat dairy, whole grains, lean meat and poultry and using vegetable oils as replacement of solid fats where possible, as in the Mediterranean diet or any other diets, following relevant national dietary guidelines/nutrition recommendations;

INVITES THE MEMBER STATES TO:
29. Continue keeping healthy diet and regular physical activity a top priority for the next years in order to reduce the burden of chronic diseases and conditions, thus contributing to better health and quality of life of EU citizens and the sustainability of the health systems;

IV.v. Recommendation on Promoting Health-Enhancing Physical Activity Across Sectors

(1) The benefits of physical activity, including regular sporting activity and exercise, across the life course are paramount and include lowered risk of cardiovascular disease and of some types of cancers and diabetes, improvements in musculoskeletal health and body weight control, as well as positive effects on mental health development and cognitive processes. Physical activity, as recommended by the World Health Organization (WHO), is important for all age groups, and has particular relevance for children, the working population and the elderly.

(2) Physical activity, being a prerequisite for a healthy lifestyle and a healthy workforce, contributes to the achievement of key objectives defined in the Europe 2020 Strategy notably with regard to growth, productivity and health.

(3) While efforts to promote health-enhancing physical activity (HEPA) have been stepped up by public authorities in some Member States over the past years, rates of physical inactivity in the Union remain unacceptably high. The majority of European citizens do not engage in sufficient physical activity, with 60 % never or seldom playing sport or exercising. The lack of leisure-time physical activity tends to be more common in the lower socio-economic groups. There are currently no indications that those negative trends are being reversed for the Union as a whole.

(4) Physical inactivity has been identified as a leading risk factor for premature mortality and disease in high-income countries world-wide, being responsible for about 1 million deaths per year in the WHO European Region alone. The detriments caused by the lack of physical activity in the Union are well recorded, as are the significant direct and indirect economic costs associated with the lack of physical activity and related health problems, especially in view of the fact that most European societies are ageing rapidly.

(5) Recent research indicates that sedentary behaviour might be a risk factor for health outcomes, independent of the influence of physical activity. In the Union, these findings should be taken into account when considering further actions in this area.

HEREBY RECOMMENDS that Member States:
1. Work towards effective HEPA policies by developing a cross sectoral approach involving policy areas including sport, health, education, environment and transport, taking into account the EU PA GL, as well as other relevant sectors and in accordance with national specificities. This should include:

(a) the progressive development and implementation of national strategies and cross-sectoral policies aimed at HEPA promotion in line with national legislation and practice;

(b) identification of concrete actions for the delivery of those strategies or policies, in an action plan, where considered appropriate.

APPENDIX V
PROPOSAL FOR FOOD SYSTEM DOMAIN-SPECIFIC CATEGORIZATION

V.i. Qualitative categorization

In order to get insight in the influence of scientific domains on the national definitions of health (National DoHs), eight domains are identified which are related to transformation to HSDs from a food systems perspective. The definition of health specific for that domain, which can be focused more on human or planetary health, will be formulated based on a literature review and is shown in Table V.i for all domains. Based on these domain-specific DoHs, the domain-specific core elements (DCEs) of the definitions will be identified for all domains (Table V.ii). The DCEs are concepts, ways of thinking, or explanatory views that are specific to the domain-specific DoH, and which can distinguish it from the other domain-specific DoHs. The formulation of these DCEs will be done qualitatively by the author.

Table V.i. *Overview of identified scientific domains with corresponding disciplinary definitions of health specific for that domain (domain-specific DoHs).*

	Domain-specific DoH	Abbreviation
Diet	…	Domain-specific DoH1
Consumer Behavior	…	Domain-specific DoH2
Food Environment	..	Domain-specific DoH3
Food Supply Chains	..	Domain-specific DoH4
Food System Drivers	…	Domain-specific DoH5
Human Rights – Law and Regulations	…	Domain-specific DoH6
Human Rights – Right to Food and Health	…	Domain-specific DoH7

Table V.ii. *Qualitative scoring table of the core elements of definitions of health for the identified 6 scientific domains, based on scientific literature review.*

Diet	Consumer Behavior	Food Environment	Food Supply Chains	Food System Drivers	Human Rights – Law and Regulations	Human Rights – Right to Food and Health
DCE1.1	DCE2.1	DCE3.1	DCE4.1	DCE5.1	DCE6.1	DCE7.1
DCE1.2	DCE2.2	DCE3.2	DCE4.2	DCE5.2	DCE6.2	DCE7.2
DCE1.3	DCE2.3	DCE3.3	DCE4.3	DCE5.3	DCE6.3	DCE7.3
…	…	…	…	…	…	…

V.ii. Quantitative categorization

To quantify the presence of the DCEs in the different National DoHs, the National DoHs will be evaluated on the number of DCEs that are identified in them. This will be translated to a score between 1 to 10, rounded to one decimal place, depending on the number of DCEs for the corresponding domain. For example, if there are 4 out of 5 DCEs present in National DoH1 for the domain of Diet, this will translate to a score of 8 out of 10; or if there are 2 out of 3 DCEs present in National DoH1 for the domain of Law, this will translate to a score of 6.7.

V.iii. Combined qualitative-quantitative visualization

Eventually, the results will be combined (**Table V.ii**) and will be visualized in a radar map, to show the quantitative presence of disciplinary dimensions in the eight National DoHs.

Table V.ii. *Qualitative classification of National DoHs, based on domain-specific core elements (DCEs) as depicted in table III.i, and quantitative scoring of the National DoHs.*

Scientific domains	Disciplinary Core Elements	National DoH1	National DoH2	National DoH3	National DoH4	National DoH5	National DoH6	National DoH7	National DoH8
Diet	DCE1.1	Score to level of presence	Score to level of presence	Score to level of presence	Score to level of presence	…	…	…	…
	DCE1.2	…	…	…	…	…	…	…	…
	DCE1.3	…	…	…	…	…	…	…	…
	…	…	…	…	…	…	…	…	…
		Total score	***Total score***	***Total score***	***Total score***	**…**	**…**	**…**	**…**
Consumer Behavior	DCE2.1	Score to level of presence	Score to level of presence	Score to level of presence	Score to level of presence	…	…	…	…
	DCE2.2	…	…	…	…	…	…	…	…
	DCE2.3	…	…	…	…	…	…	…	…
	…	…	…	…	…	…	…	…	…
		Total score	***Total score***	***Total score***	***Total score***	**…**	**…**	**…**	**…**
Food Environment	DCE3.1	Score to level of presence	Score to level of presence	Score to level of presence	Score to level of presence	…	…	…	…
	DCE3.2	…	…	…	…	…	…	…	…
	DCE3.3	…	…	…	…	…	…	…	…
	…	…	…	…	…	…	…	…	…
		Total score	***Total score***	***Total score***	***Total score***	**…**	**…**	**…**	**…**
Food Supply Chains	DCE4.1	Score to level of presence	Score to level of presence	Score to level of presence	Score to level of presence	…	…	…	…
	DCE4.2	…	…	…	…	…	…	…	…
	DCE4.3	…	…	…	…	…	…	…	…

	…	…	…	…	…	…	…	…	…
		Total score	***Total score***	***Total score***	***Total score***	**…**	**…**	**…**	**…**
Food System Drivers	DCE5.1	Score to level of presence	Score to level of presence	Score to level of presence	Score to level of presence	…	…	…	…
	DCE5.2	…	…	…	…	…	…	…	…
	DCE5.3	…	…	…	…	…	…	…	…
	…	…	…	…	…	…	…	…	…
		Total score	***Total score***	***Total score***	***Total score***	**…**	**…**	**…**	**…**
Human Rights – Law and Regulation	DCE6.1	Score to level of presence	Score to level of presence	Score to level of presence	Score to level of presence	…	…	…	…
	DCE6.2	…	…	…	…	…	…	…	…
	DCE6.3	…	…	…	…	…	…	…	…
	…	…	…	…	…	…	…	…	…
		Total score	***Total score***	***Total score***	***Total score***	**…**	**…**	**…**	**…**
Human Rights – Right to Food and Health	DCE7.1	Score to level of presence	Score to level of presence	Score to level of presence	Score to level of presence	…	…	…	…
	DCE7.2	…	…	…	…	…	…	…	…
	DCE7.3	…	…	…	…	…	…	…	…
	…	…	…	…	…	…	…	…	…
		Total score	***Total score***	***Total score***	***Total score***	**…**	**…**	**…**	**…**

APPENDIX VI
HEALTH EXPENDITURE

Below, the current health expenditure of the analysed eight countries can be found for 2019 (**Table VI.i.**) and the trajectory between 2000 and 2019 (**Figure VI.i.**) in percentage of GDP. It can be seen that there are considerable differences between the countries, which most likely can be related to the national view on health and their means to realize actions to improve it.

Table VI.i. *Current health expenditure in Europe in 2019, described in percentage of GDP. Retrieved from the World Health Organization Global Health Expenditure database* (160)

Country	Health expenditure (% of GDP)
France	11.06
Italy	8.67
Switzerland	11.29
The Netherlands	10.13
Denmark	9.96
Norway	10.52
Czech Republic	7.83
Latvia	6.58

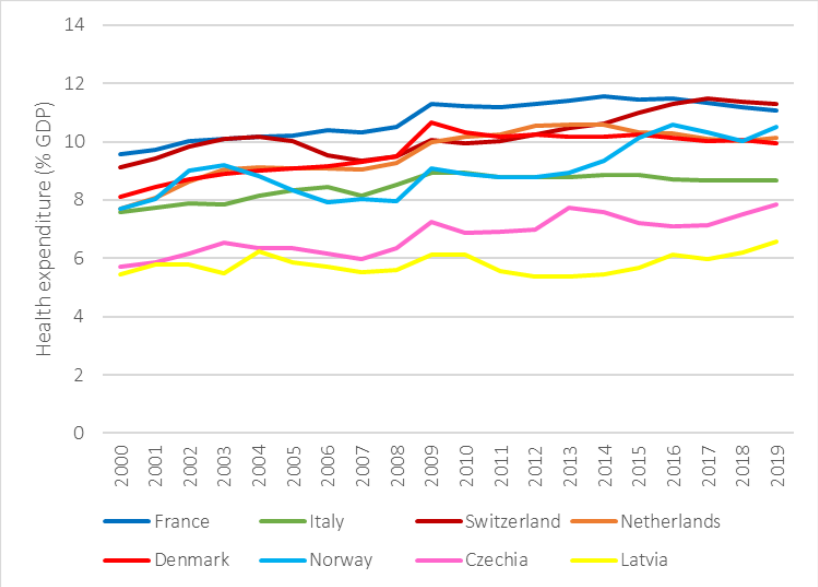


Figure VI.i. *Current health expenditure in Europe between 2000 and 2019, described in percentage of GDP. Retrieved from the World Health Organization Global Health Expenditure database* (160)

APPENDIX VII
GLOSSARY

Anthropocentrism (33)
The view where the human or human activity is centralized, and identified as the most important element of existence.

Externalism (33)
Health should refer also to the circumstances/environment in which the individual is.

Food system – Food Systems Dashboard (170)
All of the people and activities that play a part in growing, transporting, supplying, and, ultimately, eating food. These processes also involve elements that often go unseen, such as food preferences and resource investments. Food systems influence diets by determining what kinds of foods are produced. They also influence what foods people want to eat and are able to access.

Health – WHO (133)
Health is a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity. The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition.

Healthy Diet – WHO (100)
A healthy diet helps to protect against malnutrition in all its forms, as well as noncommunicable diseases (NCDs), including such as diabetes, heart disease, stroke and cancer. Unhealthy diet and lack of physical activity are leading global risks to health. The exact make-up of a diversified, balanced and healthy diet will vary depending on individual characteristics (e.g. age, gender, lifestyle and degree of physical activity), cultural context, locally available foods and dietary customs. However, the basic principles of what constitutes a healthy diet remain the same.

Healthy Diet – Compendium of Indicators for Food System Assessment (56)
A healthy diet helps to prevent or alleviate malnutrition in all its forms: from stunting, wasting, and micronutrient deficiencies to overweight, obesity, and nutrition-related non-communicable diseases (NCD), including diabetes, heart disease, stroke, and cancer. Although there is no universal definition of the concept of a healthy, high-quality diet, there is general agreement that it comprises four main dimensions: 1. Adequacy; 2. Diversity; 3. Moderation; 4. Safety.

Holism (33)
The object of health should be understood as the individual as a whole, and not as a collection of organs and separate functions.

Monism (33)
Health can be conceptualized by one single definition, as the existence of different dimensions or duality is denied; the focus on the "one" instead of a duality or plurality.

Internalism (33)
Health should refer only to the individual itself, and not to the environment.

Naturalism (33)
Health can be described by the (natural) sciences, and the concept of health is as such a given.

Normativism (33)
Health should it be seen as a condition important for individuals. Their experience and views make up the concept of health.

Objectivism (33)
The experience of the individual themselves should not be taken into account when someone's health is judged, because this does not contribute to the concept of health.

Subjectivism (33)
The experience of the individual themselves should be taken into account when someone's health is judged, because it completely relying on it.

Sustainable Development – Brundtland Report (1)
Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs. The concept of sustainable development does imply limits - not absolute limits but limitations imposed by the present state of technology and social organization on environmental resources and by the ability of the biosphere to absorb the effects of human activities. But technology and social organization can be both managed and improved to make way for a new era of economic growth.

(…) Sustainable development can only be pursued if population size and growth are in harmony with the changing productive potential of the ecosystem. Yet in the end, sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs. We do not pretend that the process is easy or straightforward. Painful choices have to be made. Thus, in the final analysis, sustainable development must rest on political will.

Sustainable Diet – FAO (55)
Sustainable diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources.

Sustainable Food System – FAO (9)
A sustainable food system is one that delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generation is not compromised. This means that it is profitable throughout, ensuring economic sustainability, it has broad-based benefits for society, securing social sustainability, and that it has a positive or neutral impact on the natural resource environment, safeguarding the sustainability of the environment.

Sustainable Food System – Hebinck et al. (104)
Sustainable food systems are systems that have positive and equitable outcomes on all aspects of its environmental, social, and economic dimensions. What this entails for each of the dimensions is captured in societal goals.

Sustainable, Healthy Diet – FAO & WHO (44)
Sustainable Healthy Diets are dietary patterns that promote all dimensions of individuals' health and wellbeing; have low environmental pressure and impact; are accessible, affordable, safe and equitable; and are culturally acceptable. The aims of Sustainable Healthy Diets are to achieve optimal growth and development of all individuals and support functioning and physical, mental, and social wellbeing at all life stages for present and future generations; contribute to preventing all forms of malnutrition (i.e. undernutrition, micronutrient deficiency, overweight and obesity); reduce the risk of diet-related NCDs; and support the preservation of

biodiversity and planetary health. Sustainable healthy diets must combine all the dimensions of sustainability to avoid unintended consequences.

Reductionism (33)
The object of health should be understood as a collection of organs and separate functions solely, and not as the individual as a whole.

Relativism (33)
Health should be seen as a standard that can differ per society or even per individual.

Universalism (33)
Health should be seen as an equal standard for all people.