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# Conceptualising healthy and sustainable diets: a policy coherence analysis

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In the last decade, crises and profound changes in the socio-techno-economic systems have questioned the definition and conceptual frameworks of Healthy and Sustainable Diets (HSDs). A growing number of institutional documents, government agencies and high-level organisations are addressing the (re)definition of HSDs, and the multiple factors that favour or hinder the creation of food systems that balance healthy nutritional habits with fair, ecologically correct, and socially acceptable food supply mechanisms. Such work has spotlighted a relevant issue of policy coherence and advocated for a higher level of policy integration in favour of HSDs. Within this streamline, the paper focuses on building up an advanced and improved conceptual framework to orient policies supporting the promotion of HSDs within the context of national food policies. Moving from the theoretical background around HSDs and the most widely recognised common definitions, this study has identified and discussed the major policy domains addressing the implementation of HSDs. To this aim, we have analysed the documents which focus on HSDs at International, European and National (Italian) level and checked the relevance of policy domains that aim to the promotion of HSDs. Our results show that International documentation provides the definitional framework, objectives, and enabling conditions for achieving sustainable food systems, whilst the European institutions and organisations are focused on the trade-offs that arise between the socioeconomic dimensions of food and nutrition within sustainable food systems. At the National level, Italian policies on HSDs are very much anchored to the nutritional and health dimensions and food consumption behaviours. They have elements of connection with food processing but are poorly connected with agricultural components and productive aspects of food systems, as well as those linked to socio-economic aspects.

## KEYWORDS

food policy and governance, healthy and sustainable diet, policy coherence, food environment, food system, policy domain

## 1 Introduction

### 1.1 Scope of the research

Diet is a multidimensional topic that involves many fields and different levels of regulation. Healthy and sustainable diets (HSDs) are in the interests and scope of different disciplines that aim to regulate and enhance them, often overlapping and interfering amongst them, creating sometimes synergies but often trade-offs. Achieving healthy, sustainable, and equitable diets is one of the challenges for 21st-century food systems. Indeed, in Western countries, unhealthy diets dramatically contribute to increase global incidences of non-communicable diseases, whilst causing globally significant increases in GHG emissions and land deforestation ([Costlow](#)

et al., 2025). Consequently, viable solutions to the diet–environment–health trilemma that could offer win-win environmental and public health benefits have been investigated and discussed at the global level (Tilman and Clark, 2014; Clark et al., 2018; Mertens et al., 2017).

The very definition of HSDs is highly debated, as it is influenced by historical periods, political priorities, and the governance contexts in which it is promoted. At the same time, a more comprehensive conceptualization of HSDs is essential for the development of effective and coherent food policies. The first step of studies on HSDs refers to Pedro Escudero (1934) who presented a healthy diet as one that is qualitatively complete, quantitatively sufficient, harmonious in its composition and adequate for its purpose and the individual. Gussow and Clancy (1986) described for the first time the term sustainable diet or sustainable nutrition as a diet made up of foods that are not only healthy, but that also contribute to the sustainability of the whole food system. Afterwards, the World Health Organisation (WHO, 2004) in the Global Strategy on Diet, Physical Activity and Health (DPAS) added to the nutritional quality of food consumed the requirements related to food production and processing. A widely acknowledged definition of HSDs was presented for the first time in a plenary session of the Symposium “Biodiversity and Sustainable Diets: United Against Hunger” organised, jointly by FAO and Bioversity International, in Rome in November 2010: “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, whilst optimising natural and human resources” (FAO, 2012). After that, the landmark EAT - Lancet Commission (2019) report, drawn up by a commission of 37 scientists from 16 countries, set global scientific targets for healthy diets and sustainable food production and integrated these universal scientific targets into a common framework. However, this report did not focus on how to bring about this shift.

More recently, HSDs have been conceived as dietary patterns that promote all dimensions of individuals’ health and wellbeing but at the same time have low environmental pressure and impact, are accessible, affordable, safe and equitable, and are culturally acceptable (FAO and WHO, 2019). A definition of HSDs must be based on the principle that a food can only be considered healthy if it is also economically viable, environmentally sustainable and socially fair, going beyond the nutritional perspective. The sustainability and healthiness of diets is quite challenging since nutritionally adequate food produced with sustainable agricultural and processing techniques may not necessarily be affordable due to higher production costs, although HSDs have been found to be probably the least costly options in most countries in the future (Springmann et al., 2021).

Thus, HSDs encompass several trade-offs that need to be analysed in the effort to construct a conceptual framework that define them. Such trade-offs and conflicting interests are crucial elements to deal with in the construction of a conceptual framework for policy coherence (Dewi et al., 2024; Hales et al., 2024). In fact, the study of policy coherence is critical when addressing HSDs due to the interconnected nature of food systems, health outcomes, and environmental sustainability. Policy coherence refers to the alignment and synergy between different policy areas to achieve a common goal (Parsons and Hawkes, 2019) and their mutual reinforcement across different government levels, so that goals in one area or territorial level do not undermine efforts in another one,

or even create synergies among them (OECD, 2019, 2021; OECD, 2023). In the case of HSDs, aligning policies across sectors such as agriculture, public health, food industry, trade, and environment is essential to mitigate conflicts and promote mutually beneficial outcomes. As a matter of fact, there is a high level of incoherence on food policy in general and in the promotion of HSDs in particular, where the efficient and sustainable achievement of different goals is undermined by the rise of tensions and overlapping governance in the food system (Parsons and Hawkes, 2019; Hales et al., 2024). For instance, public health policies advocating for increased fruit and vegetable consumption may be undermined if agricultural policies incentivise the production of high-calorie, low-nutrient crops (Fanzo and Davis, 2021), whilst incoherent policies can exacerbate negative impacts on both human health and ecosystems (Béné et al., 2019). For example, subsidies for certain animal-based products, intended to support economic growth, can conflict with dietary guidelines that recommend limiting red meat consumption for health and environmental reasons (Springmann et al., 2018). At the same time, the sustainability coherence profiles of diets must take into account multiple dimensions, ranging from environmental to social and economic aspects. This becomes particularly evident when considering that most of the energy used in the food supply chain comes from fossil fuels (Corigliano and Algieri, 2024). By fostering policy coherence, governments can better support transitions to dietary patterns that reduce chronic disease risks whilst decreasing environmental footprints. Analysing policy coherence can also identify leverage points for policy reform, enhancing the efficacy of interventions aimed at sustainable food systems.

This paper stems from the first results of *Integrated National Food Policy* initiative within the OnFoods EU-funded project (Mazzocchi et al., 2024), in the framework of the Italian National Recovery and Resilience Plan. The paper set two goals. The first aimed at grounding the discourse of HSDs into a multidimensional sustainable framework going beyond the health and environmental dominant conceptual approaches. To this end, we analysed the most relevant institutional documents or guidelines produced at the International, European, and National (Italy) level on HSDs topic. Whilst further details on the document selections have been described in the *Methods and Materials* section, we remark that the innovative approach and scientific contribution of this research lie in the articulation of the HSD concept within policy frameworks. Specifically, it examines how the complexity of the relationship between food systems, health, environment, and accessibility is addressed through the instruments available to policymakers. The second goal was to analyse the main policy domains which are relevant to build a common and coherent governance for HSDs, to explore interactions and consider potential consequences across policy domains (Schneider et al., 2025). This goal arises from the relevant and unexplored issue that, given the multidisciplinary involved in the building up of HSDs, coherent actions across all influencing domains are needed (Schneider et al., 2025).

## 2 Conceptual background

### 2.1 Policies for HSDs

Public policies, as well as community and industry actions, are required to achieve HSDs (Lawrence et al., 2015). The narrative review

conducted by [Martinelli and Cavalli \(2017\)](#) emphasises the importance of state intervention in food policies to consolidate a sustainable diet: a diet is therefore healthy and sustainable if the population has access to all stages of the system, i.e., also production, processing, marketing, and consumption. Although the importance of incorporating environmental sustainability themes into Public Health Nutrition (PHN) policy reference standards was recognised at least as far back as 1986 ([Gussow and Clancy, 1986](#)), it is relatively recent that calls for policy responses to redesign food systems to promote HSDs have gained traction and become a focus for food policy ([Intergovernmental Panel on Climate Change \(IPCC\), 2014](#); [Lang and Barling, 2013](#); [Lawrence et al., 2015](#)).

The conceptual framework proposed in [Figure 1](#) includes four integrated dimensions, the first of which is taken from [Lawrence et al., 2015](#), whilst the fourth is our own stylisation based on the Nuffield Intervention Ladder ([Have et al., 2010](#)):

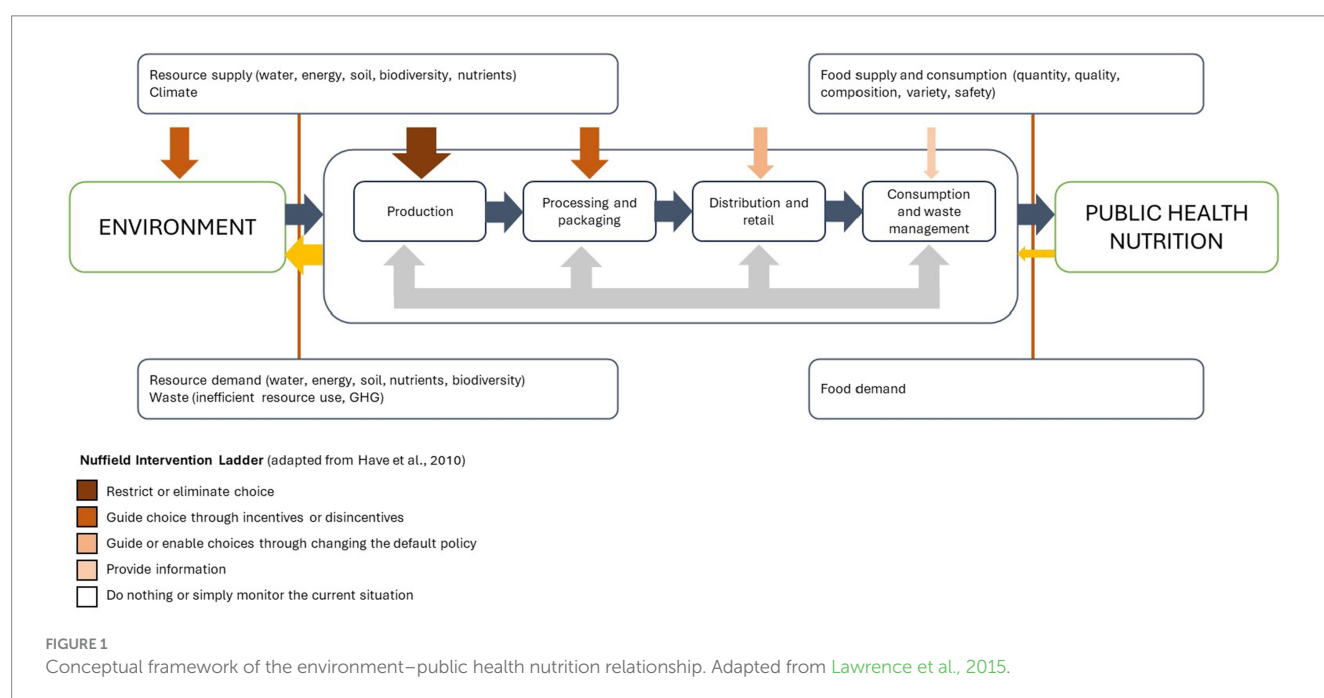
- Bidirectional relationship between Environment and PHN via food system. In one direction (blue arrows), the environment supplies resources like water, energy, soil, nutrients and biodiversity, as well as the climate that influence the quantity, quality, composition, variety and safety of the food supply. In the other direction (yellow arrows), PHN has a modest influence (thinner arrow) on food demand, particularly the type and amount of food selected which also impacts resource demand (water, energy, soil, nutrients and biodiversity).
- Internal mechanisms through system dynamics. The food system incorporates food production, processing and packaging, distribution and retail, and consumption. The application of food systems thinking to strategically plan, develop, and evaluate food and nutrition policy consists of four interlinked subcomponents (grey arrows). A sustainable food system ensures food security and nutrition (FSN) without compromising future generations' ability to maintain FSN, covering food availability, access,

utilisation, and stability ([HLPE, 2014](#); [Ingram and Brklacich, 2006](#)).

- External interactions. These interactions shape the framework within ecological parameters, influencing how the food system functions.
- Policy influences. Policies (orange arrows) act largely on food production, mainly in form of (dis)incentives, but less on processing and packaging and distribution in form of traceability and labelling, and even less on consumption in form of education and information. Whilst agri-environmental policies are more and more relevant, actions to improve healthy diets show strong evidence on pricing strategies and school public food procurement policies ([Martinelli and Cavalli, 2017](#)). However, mass media campaigns show limited effectiveness in altering Food Environments (FE). To improve adoption of HSDs, a social marketing approach could enhance mass media campaigns.

## 2.2 Policy domains for HSDs

Consensus on global actions and policies to move the entire food system forward still lacks. A recent study addressed the issue of incoherent plans for HSDs in Europe based on examining perspectives and generating consensus in a multidisciplinary arena engaging nutrition, health, environmental science experts, and policymakers for discussing about the obstacles, actions, and tools required to make diets and food systems healthier and more sustainable ([Bach-Faig et al., 2022](#)). This approach allowed to better understand the sustainable healthy diet components in terms of needs and challenges, and potential solutions. According to the experts, three main contexts and relative actors deal with HSDs: food supply chains (storage, distribution, processing, and packaging), consumer behaviour with preferences and decisions, and the in-between food environment, which refers to the physical, economic, political, and sociocultural



context in which consumers interact with the food supply chains actors to make decisions about acquiring, preparing, and consuming food. To change this complex system, it is necessary to identify leverage points for a system-based approach. The discussion focused on specific food groups whose choice and intake need to be remodulated, as supported by scientific evidence. Specifically, greenhouse gas emissions are generally higher in the production of red meat than in that of any plant food (Strapasson et al., 2016). Moreover, excessive red meat intake has a negative impact on public health (EAT - Lancet Commission, 2019; Poux and Aubert, 2018). Accordingly, to lessen the environmental impact of dietary patterns, the need for a shift to plant-based diets, without necessarily eliminating meat entirely, was emphasised by experts. However, plant-based diets could bring to issues in terms of food acceptability and the risk of nutritional deficiencies (Alcorta et al., 2021; Bakaloudi et al., 2021). In this respect, experts concluded that additional research is needed on alternative protein sources suitable for preventing micronutrient deficiencies keeping low the environmental impact. A reduction of ultra-processed food intake also was stressed, given the evidence of associations with adverse health outcomes, due to the significant content of added sugars, salt and/or fat, and often containing little or no whole foods. Dietary patterns respecting sustainability are in favour of moderate portion sizes, promote local products, and foster biodiversity, as well. A major concern for the experts was about public health recommendations and environmental considerations that should be adapted to the traditions, culture, and gastronomy of every region in Europe. As for the target of interventions, Bach-Faig et al. (2022) reported that existing policies, primarily target producers and consumers, whereas evidence suggests that efforts should be shifted to target food processing and retail stages.

Although food sustainability is a widely used concept, institutionalised in their discourses by a variety of institutions and communities, the current debate highlighted that it is often based on a rather narrow definition focusing barely on the environmental impact of food production rather than embracing a more comprehensive definition that acknowledges the multidimensionality of sustainability: nutritional, social, economic, and environmental (European Commission, 2020).

The discussion led the experts to define the main tools and pathways for actions to implement HSDs, (Bach-Faig et al., 2022). Policy framework leading to HSDs include appropriate tools, from legal to technological, and strategic guidelines to formulate proper pathways regarding food waste management, food reformulation, and so on. This process leads to the definition of a set of policy domains within which one could refer to systematise the policy measures, and the actors involved in the construction and implementation of HSDs (Bach-Faig et al., 2022). Following this approach, policy domains have been identified by these authors as follows:

- *Food price regulation.* Food pricing strategies including taxation and subsidies could be effective and trigger positive and appropriate market dynamics for influencing food choice. Hence, taxing unsustainable unhealthy foods and subsidising sustainable healthy foods have been reported as effective tools.
- *Food trade and marketing regulation.* Putting into place rules to protect consumers, preventing false or misleading advertisements, and information. Monitoring and regulating marketing of unsustainable and unhealthy foods have been considered as relevant measures.

- *Public awareness campaign.* Consumer education and providing information on HSDs are considered as necessary but not sufficient policy interventions to increase public awareness and hence to shape behaviour. The experts agreed that providing information is unlikely to bring about change if not accompanied by stricter measures, (legislation and taxation), considered critical over education, as shown by scientific evidence (SAPEA - Science Advice for Policy by European Academies, 2020). Moreover, food choice is influenced by additional factors such as preferences, advertising and marketing pressure, and pricing. However, effective measures in favour to HSDs are early-stage educational projects to shape eating patterns of young generations.
- *Public food provision.* Research into public procurement in respect to sustainability suggests that public food catering services influence the food sector decisions and trends. Public food procurement is considered relevant to widespread practises based on sustainability criteria from public procurement schemes within food service. Specifically, the green public procurement aims to decrease environmental impact rather than just apply compensatory measures.
- *Food waste reduction.* The reduction in food waste was also highlighted as a relevant, component, but not in isolation, in favour of sustainable healthier nutrition, even though policy specific solutions related to this topic did not emerge.
- *Food labelling.* The Front-of-pack labels (FoPL) including food ecological footprints have been proposed also as another important tool to increase food literacy. However, their underlying metrics are controversial, due to the assessment of only a subset of food-derived environmental effects. Moreover, understanding sustainable healthy nutrition needs improvement.
- *Food composition.* The experts considered also the key aspect of food composition to improve nutritional content of plant-based substitute product, reduce salt, sugars or saturated fat in processed-food.
- *Behaviour change.* The major perceived barrier is the need for changes in behaviour across FEs, not only by consumers but also by all actors of food value chain. It may imply the necessity to address socio-cultural norms and practises and facilitating food availability and accessibility by ease and affordability for all the actors concerned about HSDs. In this respect, nudging has been proposed, as an effective way to influence citizens' behaviour without further restricting freedom of choice, such as mandatory obligations, or introducing new taxations.

### 3 Materials and methods

The study has been carried out in three methodological steps. First, we carried out a document research methodology to detect and review the main institutional documentation that explicitly refers to the conceptualization and implementation of HSDs; then, a conceptual framework of the main policy domains to promote HSDs has been identified to gain insights into the relevance of each domain in the documentation collected; finally, a textual analysis has been carried

out to measure the extent to which the set of policy domains selected were being addressed in each of the documents considered.

### 3.1 Selection of documents and review

We conducted a structured search and selection process to identify institutional documents explicitly referring to HSDs. The procedure consisted of multiple stages. First, we defined a set of core search terms - namely “diet(s),” “healthy,” and “sustainable” - which we considered to capture the essential dimensions of HSDs. These terms were used to query the websites and publication repositories of key institutional actors at the international (e.g., FAO, WHO, UN), European (e.g., European Commission, Joint Research Centre), and national levels (specifically, Italian ministries and agencies). To ensure the relevance and institutional authority of the sources, we included only official documents (e.g., policy papers, strategic plans, guidelines, and technical reports) issued or endorsed by governmental or intergovernmental bodies. We deliberately excluded scientific literature, such as peer-reviewed journal articles and academic reports, as the aim of our analysis was not to synthesise the research evidence on HSDs, but rather to understand how HSDs are framed and operationalised within policy and strategic guidance produced by institutional actors. Documents were selected based on the presence of the core keywords in their titles or executive summaries, and their explicit reference to diet-related policy objectives, recommendations, or frameworks. We excluded documents that mentioned the keywords only tangentially or used them in unrelated contexts (e.g., environmental sustainability unrelated to food systems). The initial pool of documents was reviewed by the research team to ensure

thematic consistency and coverage across governance levels. This process led to the identification of 18 institutional documents that substantively address healthy and sustainable diets, as detailed in Table 1.

At the national level, we focused on the Italian case, given that this research is conducted within the framework of a project funded by Italy’s National Recovery and Resilience Plan. Moreover, Italy exhibits specific characteristics within its food system that make it a particularly compelling case study. Indeed, inaccessibility, non-affordability, unhealthy diet and a lack of information still negatively condition eating habits to the detriment of more sustainable consumption (Scalvedi et al., 2017). Adding to the challenge is the recent data on food consumption and unsustainable dietary patterns in Italy (CREA - Centro di Ricerca Alimenti e Nutrizione, 2024; Mistura et al., 2025).

Based on this body of institutional literature, we have reviewed and identified the main traits, approaches and recommendations provided by the most relevant documents published after the seminal work on HSDs by FAO (2012). We scaled our analysis from the wider international reports, which mainly fix principles of a technical nature about HSDs, to European papers, which work towards a policy framework, enlarging to view also to social and economic issues, to the national (Italian) level, with the aim to locate the process of building an HSDs national policy and governance in a solid international framework.

### 3.2 Reconsidering policy domains

Moving from the policy domains identified by Bach-Faig et al. (2022), after the analysis of the institutional literature we have

TABLE 1 Consulted documents for the review of policies impacting HSDs (Mazzocchi et al., 2024).

| Document                                                                                                    | Territorial scope |
|-------------------------------------------------------------------------------------------------------------|-------------------|
| Sustainable diets and biodiversity (FAO, 2012)                                                              | International     |
| Influencing food environments for healthy diets (FAO, 2016a)                                                | International     |
| Plates, pyramids, planet (FAO and FCRN, 2016)                                                               | International     |
| Voluntary guidelines for mainstreaming biodiversity (FAO, 2016b)                                            | International     |
| Food planet health (EAT – Lancet Commission, 2019)                                                          | International     |
| The state of world’s biodiversity for food and agriculture (FAO, 2019)                                      | International     |
| Sustainable Healthy Diets, guiding principles (FAO and WHO, 2019)                                           | International     |
| OneHealth, un nuovo approccio al cibo (BCFN, 2021a)                                                         | International     |
| BCFN - Un'alimentazione che rispetta la salute del pianeta e delle persone (BCFN, 2021b)                    | International     |
| Healthy and Sustainable Diets for European Countries (EUPHA, 2017)                                          | European          |
| Towards a common food policy for the EU (IPES, 2019)                                                        | European          |
| Farm to Fork Strategy (European Commission, 2020)                                                           | European          |
| Policy Evaluation Network - The Healthy Food Environment Policy Index (JPI-HDHL, 2019)                      | European          |
| Towards sustainable food consumption (SAPEA 2023)                                                           | European          |
| Linee Guida per l'educazione alimentare (MIUR, 2015)                                                        | National          |
| Linee Guida per una sana alimentazione (CREA, 2018)                                                         | National          |
| Linee Guida per una sana alimentazione (CREA, 2019)                                                         | National          |
| Modelli di diete sane e sostenibili a partire dalle diete tradizionali (MDS - Ministero Della Salute, 2019) | National          |

partially reorganised their policy domains. Firstly, we grouped together *Food trade and marketing* and *Food labelling*, to jointly evaluate the issues of the communication from the food environment to the consumer. Moreover, two other domains (*Agri-food production* and *Socio-economic system*) have been included in the research, based on the assumption that the sustainability principles included in HSDs should also involve agricultural approaches, methods, and techniques. The impact of food systems on the health of people and the planet is, in fact, scientifically proven, and some agricultural models are blamed for various distortions related to greenhouse gas emissions, the use of chemical inputs, and the impairment of nitrogen cycles. On the other hand, we face an imposing challenge: producing food for a growing world population whilst reducing the footprint of this activity, reformulating norms, policies, relationships, and conditions. Indeed, it is the ways and mechanisms that regulate food systems that generate greater or lesser impacts on ecosystems and the socio-economic conditions of access to food. In view of this last aspect, we have also chosen to consider a domain devoted to the socio-economic system that determines the conditions of access to food. In the sustainability of diets, it is key to consider the social implications and physical access to food (FAO, 2012). It should be noted that this broadening of the conceptual framework was also motivated by insights from the cross-reading of documents. The results of this reorganisation of the policy domains are displayed in Table 2, which shows also the selected keywords associated with each policy domain, as adapted from the set considered by Bach-Faig et al. (2022). The keyword selection process was carried out in three steps: (i) in the first phase, keywords were selected based on their direct reference to the terms included in the policy domains; (ii) in the second phase, the keyword list was reviewed by the research team to ensure an appropriate balance in terms of scope and term frequency. For instance, words such as ‘food’ or ‘nutrition’ were deliberately excluded as keywords due to their excessive generality and potential to bias the results, given their high occurrence in the reviewed texts; (iii) in the third phase, the identification of policy domains and corresponding keywords was presented, discussed, and refined with the involvement of a panel of experts during a dedicated seminar held on February 20th, 2024. From this reconsidered list of policy domains, a textual analysis was carried

out to understand the extent to which the set of policy domains valued as primarily promoting HSDs were covered in the documentation analysed in the research.

### 3.3 The textual analysis: building an occurrence index

The textual analysis was carried out by identifying, for each policy domain, a set of keywords, as in Table 2. Consequently, the frequency keywords were processed in the selected documents. Some semantic expedients were used to refine the search and avoid bias in frequency counting. To compare the frequencies across documents with different size, the number of pages of the document was considered, as the total number of words was not accessible. Hence, the number of times the keywords occurred has been divided by the number of pages in each document, net of index and bibliography, providing an Occurrence Index (OI) to assess the extent to which HSDs-related policy domains are considered and addressed in the considered documents (see Equations 1 and 2). The reference to the number of pages of the documents considered to calculate the OI can slightly influence the results, depending on the dimension and the “density” of each page of the written versions of the documents. However, it is an easy and necessary way to balance the occurrence of the keywords for the total number of pages of each document.

Specifically, the OI, Total-Domain Occ<sub>i</sub> for each of nine domains *i* has been calculated as follows:

$$\text{Total - Domain Occ}_i = \frac{\sum_j^3 n_{i,j}}{\sum_j^3 p_j} \quad (1)$$

Where:

- *i* = 1,2,...,9 (domain).
- *j* = 1,2,3 (territorial level).

TABLE 2 Policy domains and selected keywords utilised for the textual analysis (Mazzocchi et al., 2024).

| Policy domains                     | Selected keywords (in English)        | Selected keywords (in Italian)                        |
|------------------------------------|---------------------------------------|-------------------------------------------------------|
| Food price regulation              | Price; fiscal; tax                    | Prezzo; fiscale; sussidi                              |
| Food marketing and labelling       | Label; marketing; advertising         | Etichettatura; informazioni nutrizionali; pubblicità; |
| Food composition and reformulation | Processing/processed; nutrient        | Trasformazione; nutrizionale                          |
| Public awareness campaign          | Education/educative; campaign; school | Educazione; campagna; scuola/scolastico               |
| Public food provision              | Procurement; canteen                  | Acquisti pubblici; mense                              |
| Food waste reduction               | Waste; food loss                      | Sprechi; perdite                                      |
| Behaviour change                   | Consumer; behaviour; habit            | Consumatore/i; comportamento; abitudini               |
| Agri-food production               | Agriculture; rural; farm              | Agricoltura; rurale; azienda/e agricola/e             |
| Socio-economic system              | Governance; socio/social; access      | Governance; socio/sociale; accesso                    |

- $n_{ij}$  = number of occurrences of keywords found in the documents considered for the domain  $i$  and at the territorial level  $j$ .
- $p_j$  = number of total pages of the documents considered at the territorial level  $j$ .

Going in depth also with respect to each of the three territorial levels, the following index was also calculated:

$$\text{Territorial – Domain Occi,j} = \frac{n_{i,j}}{p_j} \quad (2)$$

Where:

- $n_{ij}$  = number of occurrences of keywords found in the documents considered for the domain  $i$  and at the territorial level  $j$ .
- $p_j$  = number of total pages of the documents considered at the territorial level  $j$ .

## 4 Results

### 4.1 Analysis of the selected documents

At the international level, many of the findings are recommendations and guiding principles which do not imply binding commitments on behalf of single countries. The main targets of this body of documents are in most cases national governments, to a minor extent the private sector and food companies, or academic scholars. In very few cases they are designed to directly target citizens and consumers. Most technical papers derive from comparative studies between different countries or data provided by them. In other cases, they are global in nature, providing guidance and direction based on a wide range of knowledge about the state of nutrition in the world and the environmental impacts of food systems. As a matter of fact, social and economic aspects are considered only to a lesser extent.

A key paper is the work by Willett et al. (2019), which highlights that to stay within the safe operating space for food systems requires a combination of substantial shifts towards mostly plant-based dietary patterns, dramatic reductions in food losses and waste, and major improvements in food production practises.

In the nexus between environmental/ecological sustainability and human health, a high-impact communication model is that based on the idea of the Double Pyramid, developed by Barilla Foundation (2016) and Barilla Center for Food and Nutrition - BCFN (2021c) as a guideline for daily food choices that are healthy for humans and more sustainable for the planet.

Many publications, especially those published after 2016, focus on FEs (PEN - Policy Evaluation Network, 2021), intended as “links” between food systems and diets. A key commonality amongst the existing definitions of FEs (Brug et al., 2008; Rao et al., 2007; Glanz et al., 2007; Herforth and Ahmed, 2015) is the conceptualization of the FEs in terms of the spaces within which food acquisition occurs, and the series of market-based opportunities and constraints that influence people’s food acquisition and consumption (Turner et al., 2018).

The European literature primarily investigates technical aspects, offering at the same time a wide spectrum of policy recommendations: from consumer information and education (soft regulation) to

guidelines and all the way up to regulation policies (hard regulation). Most reports identify sustainable food policies with healthy food and the spread of healthy diets. The food system is mostly seen as in a constant state of change and evolution tied to consumer preferences and production systems.

In the logic of the review, it is worth distinguishing non-EU independent approaches from the official EU ones. Most of the non-EU reports adopt an “upward stream” approach, focusing on the lower parts of the food system and mostly on the consumer as the main economic agent. Local or traditional healthy diets, like the Mediterranean and Nordic ones, are considered (more) sustainable not only for the balance of nutrients but also for the reduced impact on environment, reduction in transports, less processed food. IPES (2019) highlights how food has been treated as a commodity, rather than as a social-ecological system requiring democratic governance in the collective interest. Accordingly, food should be seen more as a common good rather than a consumer good, changing the perspective of the approach to healthy sustainable food quite substantially, and receiving more attention in socio-economic terms. However, HSDs are approached less effectively from the point of view of the social sciences than the physical sciences (European Commission, 2020).

EU institutional documents focus more on the upstream part of the food system, particularly the primary sector, emphasising socio-economic aspects. They highlight the importance of a territorial approach to integrate health diets and sustainable food strategies, suggesting that all governance levels should contribute to this goal (Candel and Biesbroek, 2018). They also note the growing need for policy coherence across different fields, such as legal, chemical, social, and economic domains. Monticone et al. (2023) point out how the concept of food require specific attention to a coherence across policy domains since it involves different fields and interests: from legal to chemical, to social, to economic fields. Moreover, its governance is also quite articulated, since around food many different institutions are called for regulation, information, education and public awareness. In the same line, Dewi et al. (2024) highlight the challenges in conceptualising and measuring policy coherence in food systems, as they cover multiple sectors like economy, environment, and health. In their scoping review, the same authors highlight how policy coherence has to deal, among the rest, with trade-offs and conflicts, in a way that align and complement different interventions at different levels. FEs are seen as a potential tool for linking decision-making levels and policy domains, helping to balance health and economic goals. The goal is to mainstream sustainable food into EU policies, develop an integrated food strategy, and establish a “European Food Policy Council,” with early steps seen in the new CAP 2023–2027.

The national level is focused on the Italian case, and it shows that there is a strong focus on nutrition and health aspects. Italian food policy efforts to promote HSDs have often focused on raising public awareness of the importance of consuming healthy, safe and locally produced food. Within this framework, references to policies for HSDs are rather nuanced and focused mainly on sectoral or thematic initiatives, lacking, however, an overall vision that indicates ways and means to combine the various dimensions of HSDs.

Nutrition education for consumers, especially those with a low socio-economic profile, as well as children and young people, is considered crucial. However, education on HSDs requires decisive and stringent regulatory actions that are not yet fully rooted in the Italian legal system. Lack of policy coherence for the development of HSDs,

with the multiplication of objectives and instruments derived from sectoral policies that very often do not talk to each other (agriculture, food safety, health, environment, technological development, research, education, social, budget, industry, markets, competition, trade) and undermine their effectiveness.

In its guidelines, *CREA - Centro di Ricerca Alimenti e Nutrizione* (2019) includes dietary recommendations updated over time and supported by a substantial scientific dossier (*CREA - Centro di Ricerca Alimenti e Nutrizione*, 2018), inspired by the Mediterranean Diet (Berry, 2019). The Italian Ministry of Agriculture initiated a process to defining a strategy for the development and valorisation of the Mediterranean Diet. The main outcome (*MDS - Ministero Della Salute*, 2019) incorporates food and dietary recommendations for healthy eating into the broader framework of climate-smart food systems. The goal is to promote an informative and practical approach that helps guide actions to transform agri-food systems towards green and climate-resilient practises, and also to educate young people in favour of HSDs. However, education on HSDs requires decisive and stringent regulatory actions that are not yet rooted in our legal system.

## 4.2 Analysis of policy domains for HSD through the occurrence index

In Table 3, the Occurrence Index by policy domain and territorial reference level analyzed in the previous section is reported. For the analysis at single document level, see Table A1. Considering the total occurrences found in all documents, the domain showing the maximum value of the OI was *Behaviour change* (1.29), followed by *Food production* (1.20), whilst *Public food provision* ranked last (0.13). Looking at the index calculated at the different territorial levels, the aspect that clearly emerges is that the two “extra” policy domains (*Agri-food production* and *Socio-economic dimension*) are among the most recurring. This represents a strong signal, linked to the fact that the dimension of agricultural production is relevant in the strategic orientation documentation at an international and European level. However, at a national level, its weight is greatly reduced in favour of policy domains such as *Behaviour change* and *Food composition and reformulation*. This confirms what emerged from the document analysis, that is, nutritional orientation is closely linked to local eating habits and the composition of diets, when it comes down to a national scale. Interestingly, European documentation stands out also for specific attention on a transparent and clear communication to the consumer (*Food marketing and labelling*) and *price regulation*. An analysis of the values by territorial level shows that, at the international level, *food production* (1.95) and *Socio-economic access* (0.76) have relevant values, reflecting the global strategic importance attributed to these areas in multilateral agendas. At the European level, which is the most comprehensive and cross-cutting, high OI values are recorded in almost all domains, especially *behaviour change* (3.45), *food production* (3.91), and *socio-economic access* (2.28). This confirms the systemic and multi-sectoral nature of European strategies, which are capable of embracing the entire food chain and its interactions with society and ecosystems. In contrast, at the Italian level, there is a strong shift in focus towards *behaviour change* (1.01) and *food composition and reformulation* (0.61), whilst structural domains such as *food production* (0.18) and *socio-economic access* (0.30) are much less valued. This indicates a more targeted approach to nutritional and

behavioural aspects, probably for reasons of competence, resources or socio-cultural context.

The results highlight also multi-target strategic documents encompassing many policy domains (Table A1). At international level, *EAT - Lancet Commission* (2019) report presents five high values of the Index for *food production* (4.205), *food waste reduction* (2.128), *socio-economic dimension* (1.359), *public awareness* (0.821), and *price regulation* (0.538); at European level, *SAPEA - Science Advice for Policy by European Academics* (2023) report stands out for six relevant values: *Behaviour change* (7.215), *public awareness campaign* (0.585), *public food provision* (0.600), *food waste reduction* (0.646), other than *food price regulation* and *food marketing*, as mentioned before; at national level, *behaviour change* (1.391), *food marketing and labelling* (0.432), and *Food composition and reformulation* (0.732), are the most relevant domains emerged in CREA Italian dietary guidelines (2018), whilst *socio-economic access* (1.143), *Food production* (0.750), *Food waste reduction* (0.679), *food marketing and labelling* (0.750), and *food composition and reformulation* and *Behaviour change* (both 0.786), where found to be the most relevant in the work by *MDS - Ministero Della Salute* (2019). It is worth noting that the aggregate results (International, European and National level) are sometimes influenced by particularly “high performing” documents, i.e., those in which the entire set of keywords used for the identification of the OI is highly recurrent (see Table A1). The international level assessment is strongly influenced by *Food in the Anthropocene* (*EAT - Lancet Commission*, 2019) and *Influencing food environments for healthy diets* (FAO, 2016a; FAO, 2016b), since they show the highest values of OI (respectively, 12.15 and 7.83, average value 5.97). The highest performing documents at the European level turned out to be *Towards a common food policy for the EU* (IPES, 2019) (OI = 17.3) and *Towards sustainable food consumption* (SAPEA - Science Advice for Policy by European Academics, 2023, OI = 17.22) followed by *From farm to Fork* (European Commission, 2020, value 16.61; average value 14.47). Finally, at National level, *Linee Guida per l'educazione alimentare* (Guidelines for food education, MIUR - Ministero dell'Istruzione, dell'Università e della Ricerca, 2015) and *Modelli di diete sane e sostenibili a partire dalle diete tradizionali* (Healthy and sustainable diet models based on traditional diets, *MDS - Ministero Della Salute*, 2019) show the highest values (respectively, 8.27 and 5.43, average value 3.09).

## 5 Discussion

### 5.1 Food environments and food policy approach for HSD

The results show that the two supplementary policy domains compared with the theoretical framework of reference of Bach-Faig et al. (2022) (*Food production* and *Socio-economic access*) significantly define HSDs, highlighting their multi-dimensionality. According to the aggregated results (Table 3), the absolute prevalence is scored by *Behaviour change*, understood as a set of personal choices, resources, environments and tools accompanying healthier and more sustainable dietary patterns. Very relevant is *Food composition and formulation* as well, a policy domain that brings into play topics related to the regulation of the food industry, the identification of nutrient guidelines, the introduction of novel or neglected foods, innovations that introduce scenarios with broad agricultural, environmental, and

TABLE 3 The Occurrence Index by policy domain, territorial reference level, and single document.

| Territorial level of analysis | Food price regulation | Food composition and reformulation | Public awareness campaign | Public food provision | Food waste reduction | Food marketing and labelling | Behaviour change | Food production | Socio-economic access | Total |
|-------------------------------|-----------------------|------------------------------------|---------------------------|-----------------------|----------------------|------------------------------|------------------|-----------------|-----------------------|-------|
| Total                         | 0.30                  | 0.78                               | 0.44                      | 0.13                  | 0.23                 | 0.45                         | 1.29             | 1.20            | 0.72                  | 5.54  |
| International level           | 0.16                  | 1.17                               | 0.40                      | 0.03                  | 0.33                 | 0.48                         | 0.70             | 1.95            | 0.76                  | 5.97  |
| European level                | 1.25                  | 0.80                               | 0.47                      | 0.53                  | 0.52                 | 1.26                         | 3.45             | 3.91            | 2.28                  | 14.47 |
| National level (Italy)        | 0.12                  | 0.61                               | 0.45                      | 0.07                  | 0.11                 | 0.24                         | 1.01             | 0.18            | 0.30                  | 3.09  |

Author's elaborations.

ethical implications. The calculation of the OI, which is not intended to provide an exact measurement but rather to enable a comparative assessment of the relative weight of topics and their associated policy domains, has made it possible to bring out “invisible” policy domains (*agri-food production* and *Socio-economic dimension*). These policy domains have been added to those not previously considered by [Bach-Faig et al. \(2022\)](#) in their framework. In particular, the European level is the one most compliant with the identified policy domains, since the OI values are the highest in almost all domains, whilst the international, and particularly the national show much lower values.

What emerges is a policy framework in which, from the international level down to the national level, the scope and articulation of HSDs narrow and become increasingly focused on food composition and food consumption habits through guidelines and educational campaigns. In other words, the multi-dimensional complexity of sustainability blurs as we move from the highest (international and European) to the lowest (national, in our research Italy) levels. This has profound policy implications, since the lack of national public policies capable of connecting and bringing into dialogue the various aspects related to the sustainability of diets - from agricultural production to waste management - or the incoherence of the same, undermines the ability to achieve the important objectives set by HSDs. It should be acknowledged, however, that the multidimensionality of HSDs is further complicated by the multi-level governance of policies. This complexity is exemplified by the CAP, which significantly influences national decisions regarding agriculture, the environment, agricultural landscapes, and agri-food supply chains. In this context, a significant challenge for policy integration ([Minotti et al., 2022](#); [Monticone and Samoggia, 2023](#)) is the development of an overarching policy framework that achieves broad resonance within the political landscape and promotes integrative action. The establishment of a common approach and motivation requires the presence of a coherent and convincing set of ideas that relevant sectors and levels of government can identify with and support ([Candel and Pereira, 2017](#)). In that sense, national governments should be incentivised to communicate with European counterparts and establish platforms for communication between different levels, with facilitators acting as intermediaries ([Marin-Rojas, 2024](#)), also to explicitly consider potential synergies, tensions and trade-offs across policy domains ([European Environment Agency - EEA, 2022](#)).

Provided that a well-articulated conceptualization of HSDs can define a set of goals for the well-being of the population and for more sustainable food systems ([Meybeck et al., 2014](#); [Willett et al., 2019](#)), a key aspect that emerged strongly in the analysis of European documentation is the capacity of FEs to serve as the connecting link between the definition of sustainability and health goals for diets, and the policies and tools to achieve them. FEs can indeed represent frames and lenses through which to study the physical, economic, political, and socio-cultural environments and contexts in which consumers interact with food supply chain actors and decide what food to purchase, prepare, and consume. Indeed, FEs play an important role in shaping diets because they provide the choices people have when they make decisions about what to eat. A healthy FE is one that creates the conditions that enable and encourage people to access and choose healthy diets. Therefore, to the extent that the HSDs condense the objectives and the FEs provide the lens for observing and understanding food systems, the food policies provide a policy framework that aims to harmonise existing policies

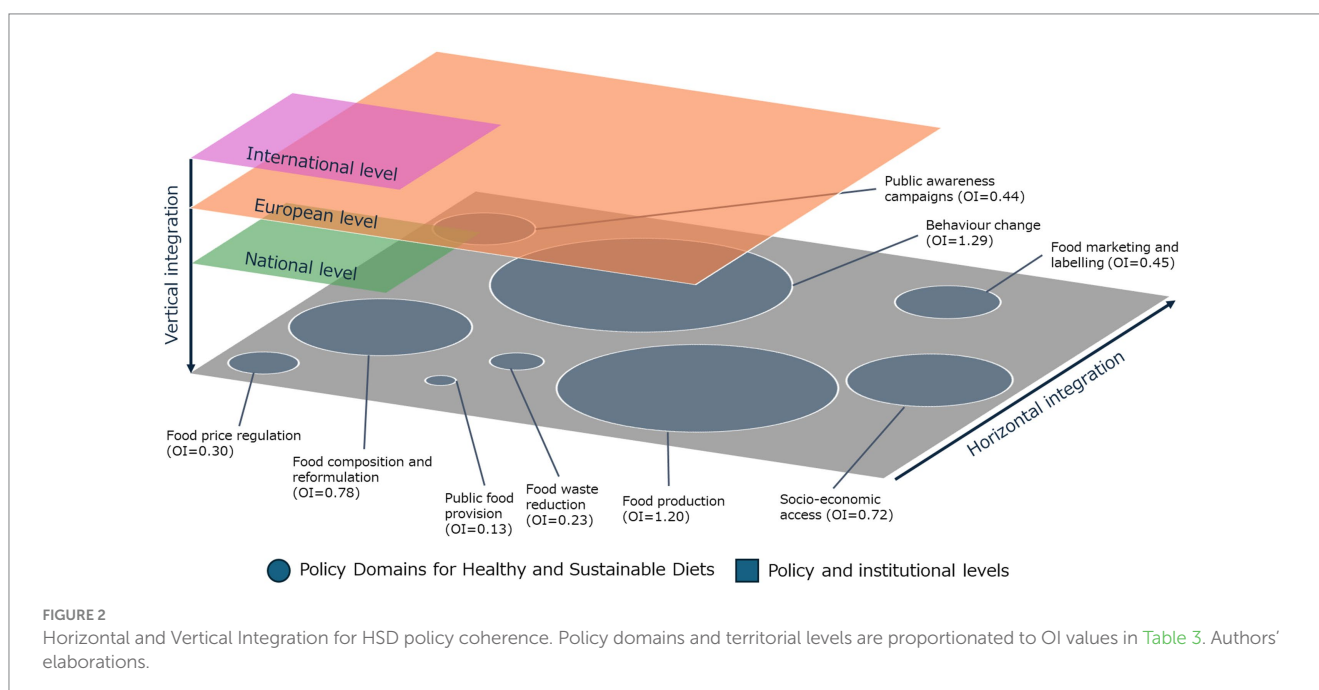
in terms of coherence and ability to guide the food system. The definition of a conceptual framework for HSDs necessarily leads to the wider field of food policies as the ongoing outcome of a long process of rethinking of policies addressing food production, processing, consumption, and access. At the same time, food policies have progressively institutionalised and mainstreamed spontaneous and community grass-root movements that have brought at the centre of the action a sustainable approach to food systems. Food policy seems to take a paradigmatic distance from the dominant economic and technological paradigms embracing ecological issues and more ethical approaches to the construction of a new paradigm (Mardsen, 2013). Having in the background the agricultural production, which is a heavy regulated sector both for its primary products (food and raw products) and for secondary services (public goods and eco-systemic services), together with the seventeen sustainable development goals, food policy seems to pursue a shift of attention to a mix of technical issues (food composition), social issues (food access and cultural approach), health issues (diets); in other words, it sheds light onto the downstream component of the supply chain as well as to the food demand (Mazzocchi et al., 2023). Food policy feeds the growing interest of citizens about how food is processed, transported, kept, sold and so on, with a growing overlapping of security issues, origin of products and environmental issues (Brunori et al., 2013). In this framework, as widely highlighted by the scientific literature (Moragues-Faus and Morgan, 2015; Moragues-Faus, 2021; Felici and Mazzocchi, 2022), the local level needs to be taken into account as an appropriate scale for planning and implementing projects capable of steering the sustainability objectives defined, at higher levels, by the multi-dimensional conceptualisation of the HSD. Torquati et al. (2024) analyse school food policy initiatives at the local level, showing how school canteens can steer healthy menus whilst promoting the local integration between urban and rural areas, providing opportunities for driving local and regional food economies towards a more sustainable food system. This issue has been studied also in other different contexts

with similar results (Sonnino, 2009; Ashe and Sonnino, 2012; Cretella and Buenger, 2016).

## 5.2 Policy coherence for HSD

Moving to the issue of policy coherence, we adapted from European Environment Agency - EEA (2019) the idea of a double direction where to seek a proper consistency among different institutional levels and territories. A shared definition of policy coherence comes from the OECD (2019, 2023): 'the systematic promotion of mutually reinforcing policy actions across government sectors and departments, levels of government, and agencies creating synergies towards achieving an agreed vision or objectives so that efforts in one policy area do not undermine efforts in another and even reinforce those efforts where possible' (quoted in Dewi et al., 2024). According to this definition, policy coherence is considered a process (how to achieve something) rather than a goal (something to achieve). This distinction is relevant because policy coherence is difficult to achieve given the competing interests among actors and the trade-offs within priorities. Policy coherence should rather be seen as a process requiring policies designed to talk to each other, to minimise conflicts and maximise synergies (Dewi et al., 2024). Achieving HSDs requires coherent policymaking at the vertical level, across different levels of governance, including the international frameworks, the EU strategies and policies, and the national policies (Figure 2).

Our analysis clearly highlights how the intermediate (European) level appears to be the most effective in capturing the complex and multi-dimensional nature of HSDs. In contrast, both the international and national levels, whilst addressing the topic of Behaviour Change extensively, do not exhibit the same capacity to engage with a broad range of themes in equal depth. Additionally, even when looking individually at each of the three governance levels, the way in which policy domains are addressed differs substantially. Specifically, the European level, despite recording the highest OI indices, shows a



higher variability across the policy domains compared to the National one (respectively,  $\sigma = 1.30$  and  $0.31$ ). This suggests that the ability to maintain a balance across all the components required to achieve the goals of HSDs is not always ensured. In fact, such balance may be even more challenged when policy priorities push strongly in one direction, potentially overlooking other equally important domains. In [Figure 2](#), the policy domains are shown emerging from a grey base, which represents the “grounding” of policies, with each domain depicted in size proportionate to its overall OI value. The three governance levels considered are represented by coloured frames, also scaled in proportion to their respective territorial OI indices. Such value reflects the extent to which each policy domain is placed on the agenda, articulated, and legislated at each governance level.

In this research, we proved that this coherence is not always realised, especially because of the different level of decision power of the institutions. Challenges intervene also because of the specific involvement in the design of proper policies affecting HSDs, not only at a technical level but also considering economic, social and environmental issues. As shown by the institutional literature analysis, these aspects are generally more and more considered with the scaling down of the governance, from the international to the local level. At the same time, when HSDs are landed to the local territorial level, coherence becomes an issue also along the horizontal dimension, since there is a high level of entropy at the institutional and decisional scale on this specific matter. It is worthwhile reminding, in this case, the high number of local initiatives striving to transform food systems, from local food polices to food councils, food communities and agri-food districts ([Mazzocchi et al., 2023](#); [Tarangioli et al., 2024](#)). HSDs, like many other sustainability objectives, are subject to multi-layered governance, wherein policy coherence among different institutional levels must be sought. From this perspective, FEs encompass an appropriate set of analytical tools and frameworks that enable the harmonisation of Policy Domains associated with HSD, promoting horizontal integration and creating the most appropriate context within which individual choices (including HSDs) can be taken in an informed, transparent, democratic way. Similarly, an approach grounded in food policy, due to its systemic ambition aimed at transcending siloed problem-solving, should foster improved vertical integration. In this context, local authorities have many important roles in transforming food systems to achieve HSD objectives. Ideally, policy initiatives at EU, Member State and local level will reinforce each other and establish a sense of urgency and direction across target groups.

## 6 Conclusion

The goal of this study was twofold. First, we reviewed the main institutional documents at different territorial levels, to frame the subsequent analysis of the policies for HSDs in a conceptual framework of policy coherence. The issue is relevant since the area of food system span from social and environmental fields to cultural and environmental, just to mention the most relevant domains. Moreover, food systems need to change and follow societal changes to meet the economic, social and environmental challenges that contemporary societies are facing ([Dewi et al., 2024](#); [Lawrence et al., 2019](#)). Coherence is a crucial aspect in the construction and implementation of HSDs because of the

well-acknowledged interlinks among the different components of the food system and the creation of policy coherence is a substantial and tangible way of moving from theory to practise in food policy ([Parsons and Hawkes, 2019](#)).

We built a conceptual framework based on such review focused on the implementation of food policy encompassing the promotion of HSDs. Moreover, we also analysed and critically re-conceptualised the main policy domains which are at the base of the enhancement and implementation of HSDs. Following the logic of policy coherence among institutional levels, most documents analysed here set the vision defining high-level scope and purpose and focus especially on physical and technical issues about HSDs, whilst the social and economic aspects of HSDs, in terms of access, trade-offs and social inclusion and equality seem to have been a bit neglected. This is particularly true, and somehow expected, when the international reports are analysed, since the higher is the institutional level, the lower are the practical implications in terms of regulation of the food systems. In this sense, the case of the CAP is significant, although it addresses only a segment of the whole food system, in which the regulative approach prevails. However, it must be stressed how in the recent institutional documents of discussion about the current and future CAP the spotlight is significantly moved on the topic of HSDs and consumers rights to accessing sustainable food at reasonable prices ([European Commission, 2024](#)). This is a significant change of pace coming from the EU institutions, even though an analysis of the trade-offs between production and consumption and of the consequences of the support to HSDs within the whole food-chain and the consumers' demands is all to be investigated yet. One crucial point will be the policy coherence and integration throughout different institutional levels, different beneficiaries of public support and different territorial levels of action.

Furthermore, we analysed the relevant policy domains, highlighting the need to refine the framework including more specific aspects or additional keys. Specifically, we added two policy domains to the relevant ones included in the work of [Bach-Faig et al. \(2022\)](#), related to the sphere of food production and socio-economic aspects, and we showed the relevance (occurrence) of these domains in the analysis of the selected documents, contributing to define HSDs beyond the nutritional and even the ethical (environmental) aspects. The analysis of the policy coherence led to the conclusion that the multidimensional and multi-disciplinary nature of HSDs calls for a proper construction of a specific field of regulations and norms which is the result of a puzzle of interventions in different fields, all aimed at enhancing HSDs.

Our results have two major implications. One is that some policy domains are still “invisible” to the majority of the institutional work on HSDs, so that a whole field of analysis is still missing in the current debate, which seems focused mainly on physical, healthy, and ethical issues, but not so much on economic and social domains. The other issue comes directly from the previous one, that is the analysis of any food system needs to include every aspect of the system itself, acknowledging the multidimensional aspects of the definition and the implementations of HSDs. This moves the level of narrative and the construction of a thorough discourse on HSDs to a different level, from the medical, health-focused and environmental-concerned issue to a truly comprehensive multidimensional sustainable one. This aspect calls for more attention to the issue of policy integration, since public intervention

in favour of HSDs embraces different policy domains and can act at different territorial levels.

Hence, this conceptual framework represents a starting point for a next critical in-depth analysis aimed at designing a theoretical implementation in the Italian food environment. Other components could be introduced in the conceptual framework taking into consideration more in depth current European and national policies, regulations, legislation, and strategic guidelines on agri-food system development, on public health and environmental impacts of food production and consumption. In the background framework of the new CAP and the multidimensional approach to sustainability, national policies for HSDs must adjust themselves to the new challenges, going beyond the outdated and “low cost” food systems based on food models which generate increasing collective costs and heavy and unmanageable environmental consequences.

## Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

## Author contributions

GM: Visualization, Writing – original draft, Formal analysis, Investigation, Methodology, Conceptualization, Supervision, Validation. AA: Conceptualization, Methodology, Investigation, Validation, Visualization, Writing – original draft, Formal analysis. MS: Formal analysis, Methodology, Writing – original draft, Resources, Conceptualization. PB: Supervision, Writing – review & editing, Methodology, Investigation, Conceptualization, Funding acquisition. RH: Supervision, Methodology, Writing – original draft, Conceptualization, Investigation. SG: Methodology, Conceptualization, Writing – review & editing, Validation.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Correction note

A correction has been made to this article. Details can be found at: [10.3389/fsufs.2025.1702963](https://doi.org/10.3389/fsufs.2025.1702963).

## Generative AI statement

The authors declare that no Gen AI was used in the creation of this manuscript.

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## References

- Alcorta, A., Porta, A., Tárrega, A., Alvarez, M. D., and Vaquero, M. P. (2021). Foods for plant-based diets: challenges and innovations. *Foods* 10:293. doi: 10.3390/foods10020293
- Ashe, L. M., and Sonnino, R. (2012). Convergence in diversity: new York City school food and the future of the food movement. *Int. Plan. Stud.* 18, 61–77. doi: 10.1080/13563475.2013.750937
- Bach-Faig, A., Wickramasinghe, K., Panadero, N., Fàbregues, S., Rippin, H., Halloran, A., et al. (2022). Consensus-building around the conceptualisation and implementation of sustainable healthy diets: a foundation for policymakers. *BMC Public Health* 22:1480. doi: 10.1186/s12889-022-13756-y
- Bakaloudi, D. R., Halloran, A., Rippin, H. L., Oikonomidou, A. C., Dardavesi, T. I., Williams, J., et al. (2021). Intake and adequacy of the vegan diet. A systematic review of the evidence. *Clin. Nutr.* 40, 3503–3521. doi: 10.1016/j.clnu.2020.11.035
- Barilla Center for Food and Nutrition - BCFN (2021a). One Health: un nuovo approccio al cibo, la Doppia Piramide per connettere cultura alimentare, salute e clima. CREA, European Commission.
- Barilla Center for Food and Nutrition - BCFN (2021b). Un'alimentazione che rispetta la salute delle persone e quella del Pianeta. CREA, European Commission.
- Barilla Center for Food and Nutrition - BCFN (2021c). Double pyramid 2021. Available online at: [https://www.fondazionebarilla.com/wp-content/uploads/2022/11/totale\\_en.pdf](https://www.fondazionebarilla.com/wp-content/uploads/2022/11/totale_en.pdf) (Accessed August 1, 2025).
- Barilla Foundation (2016). Double pyramid 2016. A more sustainable future depends on us. Available online at: <https://www.fondazionebarilla.com/wp-content/uploads/2016/02/doublepyramid2016-more-sustainable-future-depends-on-us.pdf> (Accessed August 1, 2025).
- Béné, C., Oosterveer, P., Lamotte, L., Brouwer, I. D., de Haan, S., Prager, S. D., et al. (2019). When food systems meet sustainability – current narratives and implications for actions. *World Dev.* 113, 116–130. doi: 10.1016/j.worlddev.2018.08.011
- Berry, E. M. (2019). Sustainable food systems and the Mediterranean diet. *Nutrients* 11:2229. doi: 10.3390/nu11092229
- EUPHA - European Public Health Association. (2017). Healthy and Sustainable Diets for European Countries. Utrecht, Netherlands: European Public Health Association.
- Brug, J., Kremers, S. P., VAN Lenthe, F., Ball, K., and Crawford, D. (2008). Environmental determinants of healthy eating: in need of theory and evidence. *Proc. Nutr. Soc.* 67, 307–316. doi: 10.1017/S0029665108008616
- Brunori, G., Malandrini, V., and Rossi, A. (2013). Trade-off or convergence? The role of food security in the evolution of food discourse in Italy. *J. Rural. Stud.* 29, 19–29. doi: 10.1016/j.jrurstud.2012.01.013

- Candel, J. J. L., and Biesbroek, R. (2018). Policy integration in the EU governance of global food security. *Food Secur.* 10, 195–209. doi: 10.1007/s12571-017-0752-5
- Candel, J. J. L., and Pereira, L. (2017). Towards integrated food policy: main challenges and steps ahead. *Environ Sci Policy* 73, 89–92. doi: 10.1016/j.envsci.2017.04.010
- Clark, M., Hill, J., and Tilman, D. (2018). The diet, health, and environment trilemma. *Annu. Rev. Environ. Resour.* 43, 109–134. doi: 10.1146/annurev-environ-102017-025957
- Corigliano, O., and Algieri, A. (2024). A comprehensive investigation on energy consumptions, impacts, and challenges of the food industry. *Energy Convers. Manage.* X 23:100661. doi: 10.1016/j.ecmx.2024.100661
- Costlow, L., Herforth, A., Sulser, T. B., Cenacchi, N., and Masters, W. A. (2025). Global analysis reveals persistent shortfalls and regional differences in availability of foods needed for health. *Glob. Food Secur.* 44:100825. doi: 10.1016/j.gfs.2024.100825
- CREA - Centro di Ricerca Alimenti e Nutrizione (2018). Linee guida per una sana alimentazione. Roma: Dossier scientifico.
- CREA - Centro di Ricerca Alimenti e Nutrizione (2019). Linee guida per una sana alimentazione 2018. Roma: CREA.
- CREA - Centro di Ricerca Alimenti e Nutrizione. (2024). Proceedings of the Sixth Conference “Giornata della Nutrizione”, Comprendere i consumi alimentari degli italiani. CREA, European Commission.
- Cretella, A., and Buenger, M. S. (2016). Food as creative city politics in the city of Rotterdam. *Cities* 51, 1–10. doi: 10.1016/j.cities.2015.12.001
- Dewi, D., Aytikin, D., Schneider, K. R., Covic, N., Fanzo, J., Nordhagen, S., et al. (2024). Defining and measuring policy coherence for food system transformation: a scoping review. *Glob. Food Sec.* 43:100803. doi: 10.1016/j.gfs.2024.100803
- EAT - Lancet Commission (2019). Food planet health. Healthy diets from sustainable food systems. Available online at: <https://eatforum.org/eat-%20lancet-%20commission/eat-%20lancet-%20commission-%20summary-%20report/> (Accessed August 1, 2025).
- Escudero, P. (1934). Alimentación. Buenos Aires: Hachette.
- European Commission (2020). Directorate-General for Research and Innovation, Group of Chief Scientific Advisors. Towards a sustainable food system - Moving from food as a commodity to food as more of a common good - Independent expert report. Bruxelles, Belgium: Publications Office.
- European Commission (2024). Strategic dialogue of the future of EU agriculture. A shared prospect for farming and food in Europe. CREA, European Commission.
- European Environment Agency - EEA (2019). Sustainability transitions: policy and practice. EEA Report No 9/2019. CREA, European Commission.
- European Environment Agency - EEA (2022). Transforming Europe's food system - assessing the EU policy mix. EEA report n.14/2022. CREA, European Commission.
- European Union (2020). Farm to fork strategy. For a fair, healthy and environmentally-friendly food system. CREA, European Commission.
- Fanzo, J., and Davis, C. (2021). Global food systems, diets, and nutrition. Linking science, economics, and policy. London, UK: Springer Nature.
- FAO (2012). Sustainable diets and biodiversity. Directions and solutions for policy, research and action. Rome: CREA.
- FAO (2016a). Influencing food environments for healthy diets. CREA, European Commission.
- FAO (2016b). Voluntary Guidelines for Mainstreaming Biodiversity into Policies, Programmes and National and Regional Plans of Action on Nutrition. Rome: FAO Commission on Genetic Resources for Food and Agri-culture.
- FAO (2019). “The state of the world's biodiversity for food and agriculture” in FAO Commission on Genetic Resources for Food and Agriculture Assessments. eds. J. Bélanger and D. Pilling (Rome: CREA), 572.
- FAO and FCRN (2016). Plates, pyramids, planet. CREA, European Commission.
- FAO and WHO (2019). Sustainable healthy diets - Guiding principles. Rome: CREA.
- Felici, F. B., and Mazzocchi, G. (2022). Territory matters: a methodology for understanding the role of territorial factors in transforming local food systems. *Land* 11:1046. doi: 10.3390/land11071046
- Glanz, K., Sallis, J. F., Saelens, B. E., and Frank, L. D. (2007). Nutrition environment measures survey in stores (NEMS-S): development and evaluation. *Am. J. Prev. Med.* 32, 282–289. doi: 10.1016/j.amepre.2006.12.019
- Gussow, J. D., and Clancy, K. L. (1986). Dietary guidelines for sustainability. *J. Nutr. Educ.* 18, 1–5. doi: 10.1016/S0022-3182(86)80255-2
- Hales, J., Kemper, J., White, S. K., and Veer, E. (2024). Reflections on food policy in the context of healthy and sustainable diets. *Food Policy* 128:102708. doi: 10.1016/j.foodpol.2024.102708
- Have, M. T., de Beaufort, I. D., Mackenbach, J. P., and van der Heide, A. (2010). An overview of ethical frameworks in public health: can they be supportive in the evaluation of programs to prevent overweight? *BMC Public Health* 10:638. doi: 10.1186/1471-2458-10-638
- Herforth, A., and Ahmed, S. (2015). The food environment, its effects on dietary consumption, and potential for measurement within agriculture-nutrition interventions. *Food Sec.* 7, 505–520. doi: 10.1007/s12571-015-0455-8
- HLPE (2014). Report on food losses and waste in the context of sustainable food systems extract from the report: summary and recommendations. Available online at: <https://openknowledge.fao.org/server/api/core/bitstreams/b1949fae-23d4-473c-8b87-8c4359b74d6c/content> (Accessed August 1, 2025).
- Ingram, J., and Brklacich, M. (2006). “Global environmental change and food systems GECAFS: a new interdisciplinary research project” in Earth system science in the Anthropocene. eds. E. Ehlers and T. Krafft (Berlin, Heidelberg: Springer).
- Intergovernmental Panel on Climate Change (IPCC) (2014). “Food security and food production systems” in Climate change 2014: Impacts, adaptation, and vulnerability. Part a: Global and sectoral aspects. Contribution of working group II to the fifth assessment report of the intergovernmental panel on climate change. eds. C. B. Field, V. R. Barros and D. J. Dokken (Cambridge: Cambridge University Press), 485–534.
- IPES (2019). Towards a common food policy for the European Union. Bruxelles, Belgium: IPES Food.
- JPI-HDHL (2021). Policy evaluation network. The healthy food environment policy index (food-EPI): European Union. An assessment of EU-level policies influencing food environments and priority actions to create healthy food environments in the EU. Utrecht, The Netherlands: Utrecht University.
- Lang, T., and Barling, D. (2013). Nutrition and sustainability: an emerging food policy discourse. *Proc. Nutr. Soc.* 72, 1–12. doi: 10.1017/S002966511200290X
- Lawrence, M. A., Baker, P. I., Pulker, C. E., and Pollard, C. M. (2019). Sustainable, resilient food systems for healthy diets: the transformation agenda. *Public Health Nutr.* 22, 2916–2920. doi: 10.1017/S1368980019003112
- Lawrence, M. A., Friel, S., Wingrove, K., James, S. W., and Candy, S. (2015). Formulating policy activities to promote healthy and sustainable diets. *Public Health Nutr.* 18, 2333–2340. doi: 10.1017/S1368980015002529
- Mardsen, T. (2013). From post-productionism to reflexive governance: contested transitions in securing more sustainable food futures. *J. Rural. Stud.* 29, 123–134. doi: 10.1016/j.jrurstud.2011.10.001
- Marin-Rojas, C. (2024). The (im)possible coherence? Science-Policy, Blockages and Transformation. Summary Report of the Workshop on Science Advice to Policy Coherence for Sustainable Food Systems, Bruxelles. HDHL and FACCE-JPI.
- Martinielli, S. S., and Cavalli, S. B. (2017). Healthy and sustainable diet: a narrative review of the challenges and perspectives. *Ciênc. Saúde Colet.* 24, 4251–4262. doi: 10.1590/1413-812320182411.30572017
- Mazzocchi, G., Angeloni, A., Henke, R., Scalvedi, M.L., Giuca, S., and Borsotto, P. (2024). Policies for healthy and sustainable diets. A review of International, European, and National documentation, ONFOODS, CREA
- Mazzocchi, G., Giarè, F., Sardone, R., Manetti, I., Henke, R., Giuca, S., et al. (2023). Food (di)lemmas: disentangling the Italian local food policy narratives. *Italian Rev Agric Econ* 78, 19–34. doi: 10.36253/rea-14511
- MDS - Ministero Della Salute. (2019). Modelli di diete sane e sostenibili a partire dalle diete tradizionali. Progetto CCM. Available online at: [https://www.salute.gov.it/imgs/C\\_17\\_pageAree\\_4968\\_11\\_file.pdf](https://www.salute.gov.it/imgs/C_17_pageAree_4968_11_file.pdf). (Accessed 16 January, 2024).
- Mertens, E., van't Veer, P., Hiddink, G. J., Steijns, J. M., and Kuijsten, A. (2017). Operationalising the health aspects of sustainable diets: a review. *Public Health Nutr.* 20, 739–757. doi: 10.1017/S1368980016002664
- Meybeck, A., Redfern, S., Paoletti, F., and Strassner, C. (2014). Assessing sustainable diets within the sustainability of food systems. Mediterranean diet, organic food: new challenges. Proceedings of the international workshop, 15–16 September 2014, Research Centre for Food and Nutrition. Rome: CREA.
- Minotti, B., Cimini, A., D'Amico, G., Marino, D., Mazzocchi, G., and Tarra, S. (2022). Food policy processes in the city of Rome: a perspective on policy integration and governance innovation. *Front. Sustain. Food Syst.* 5:786799. doi: 10.3389/fsufs.2021.786799
- Mistura, L., Le Donne, C., D'Addezio, L., Ferrari, M., Comendador, F. J., Piccinelli, R., et al. (2025). The Italian IV SCAI dietary survey: main results on food consumption. *Nutr. Metab. Cardiovasc. Dis.* 35. doi: 10.1016/j.numecd.2025.103863
- MIUR - Ministero dell'Istruzione, dell'Università e della Ricerca (2015). Linee Guida per l'educazione alimentare. HDHL and FACCE-JPI.
- Monticone, F., Barling, D., Parsons, K., and Samoggia, A. (2023). Identifying food policy coherence in Italian regional policies: the case of Emilia-Romagna. *Food Policy* 119:102519. doi: 10.1016/j.foodpol.2023.102519
- Monticone, F., and Samoggia, A. (2023). Food policy coherence and integration: a review of adopted methodologies. *Ital. Rev. Agric. Econ.* 78, 35–49. doi: 10.36253/rea-14439
- Moragues-Faus, A. (2021). The emergence of city food networks: rescaling the impact of urban food policies. *Food Policy* 103:102107. doi: 10.1016/j.foodpol.2021.102107
- Moragues-Faus, A., and Morgan, K. (2015). Reframing the foodscape: the emergent world of urban food policy. *Environ. Plan. A Econ. Space* 47, 1558–1573. doi: 10.1177/0308518X15595754
- OECD (2019). Policy coherence for sustainable development 2019: Empowering people and ensuring inclusiveness and equality. Paris: OECD Publishing.
- OECD (2021). Making better policies for food systems. Paris: OECD.
- OECD (2023). Policy coherence: vital for global development. Paris: OECD.

- Parsons, K., and Hawkes, C. (2019). "Brief 5: policy coherence in food systems" in *Rethinking food policy: A fresh approach to policy and practice* (City University, London: Centre for Food Policy).
- PEN - Policy Evaluation Network (2021). The healthy food environment policy index (food-EPI). the Netherlands: European Union, Utrecht University.
- Poux, X., and Aubert, P.M. (2018). An agroecological Europe in 2050: multifunctional agriculture for healthy eating - findings from the ten years for agro-ecology (TYFA) modelling exercise. Available online at: <https://www.iddri.org/en/publications-and-events/study/agroecological-europe-2050-multifunctional-agriculture-healthy-eating> (Accessed August 1, 2025).
- Rao, M., Prasad, S., Adshead, F., and Tissera, H. (2007). The built environment and health. *Lancet* 370, 1111–1113. doi: 10.1016/S0140-6736(07)61260-4
- SAPEA - Science Advice for Policy by European Academics (2023). Towards sustainable food consumption. Evidence Review Report n. 17, Brussels, Belgium. Available online at: <https://sapea.info/topic/food-consumption/> (Accessed August 1, 2025).
- SAPEA - Science Advice for Policy by European Academies (2020). A sustainable food system for the European Union. *Sci Adv Policy Eur Acad* 2020. doi: 10.26356/sustainablefood (Accessed August 1, 2025).
- Scalvedi, M. L., Turrini, A., and Saba, A. (2017). Which dietary patterns are more likely to be associated with aspects of eco-sustainable food behaviours in Italy? *Int. J. Food Sci. Nutr.* 69, 660–675. doi: 10.1080/09637486.2017.1408058
- Schneider, K. R., Remans, R., Bekele, T. H., Aytekin, D., Conforti, P., Dasgupta, S., et al. (2025). Governance and resilience as entry points for transforming food systems in the countdown to 2030. *Nat Food* 6, 105–116. doi: 10.1038/s43016-024-01109-4
- Sonnino, R. (2009). Feeding the City: towards a new research and planning agenda. *Int. Plan. Stud.* 14, 425–435. doi: 10.1080/13563471003642795
- Springmann, M., Clark, M., and Mason-D'Croz, D. (2018). Options for keeping the food system within environmental limits. *Nature* 562, 519–525. doi: 10.1038/s41586-018-0594-0
- Springmann, M., Clark, M. A., Rayner, M., Scarborough, P., and Webb, P. (2021). The global and regional costs of healthy and sustainable dietary patterns: a modelling study. *Lancet Planet Health* 5, e797–e807. doi: 10.1016/S2542-5196(21)00251-5
- Strapasson, A., Woods, J., and Mbuk, K. (2016). Land use futures in Europe. How changes in diet, agricultural practices and forestlands could help reduce greenhouse gas emissions. Available online at: <https://www.imperial.ac.uk/media/imperial-college/grantham-institute/public/publications/briefingpapers/Land-Use-Futures-in-Europe--web-version-v3.pdf> (Accessed August 1, 2025).
- Tarangioli, S., Henke, R., Mazzocchi, G., Cisilino, F., and Licciardo, F. (2024). From needs to policy action: Italian Agri-food districts as a case of territorial cooperation. *J. Infrast. Policy Dev.* 8:5914. doi: 10.24294/jipd.v8i10.5914
- Tilman, D., and Clark, M. (2014). Global diets link environmental sustainability and human health. *Nature* 515, 518–522. doi: 10.1038/nature13959
- Torquati, B., Loce-Mandes, F., and Martino, G. (2024). School food policy through a project financing. *Ital. Rev. Agric. Econ.* 78, 93–109. doi: 10.36253/rea-14983
- Turner, C., Aggarwal, A., Walls, H., Herforth, A., Drewnowski, A., Coates, J., et al. (2018). Concepts and critical perspectives for food environment research: a global framework with implications for action in low- and middle-income countries. *Glob. Food Sec.* 18, 93–101. doi: 10.1016/j.gfs.2018.08.003
- WHO. (2004). Global strategy on diet, physical activity and health. Available online at: <https://www.who.int/publications/i/item/9241592222> (Accessed August 1, 2025).
- Willett, W., Rockström, J., and Loken, B. (2019). Food in the Anthropocene: the EAT-lancet commission on healthy diets from sustainable food systems. *Lancet* 393, 447–492. doi: 10.1016/S0140-6736(18)31788-4

Annex A1

TABLE A1 The Occurrence Index by policy domain, territorial reference level, and single document.

| Document (per territorial scope of analysis)                                             | Food price regulation | Food composition and reformulation | Public awareness campaign | Public food provision | Food waste reduction | Food marketing and labelling | Behaviour change | Food production | Socio-economic access | TOTAL |
|------------------------------------------------------------------------------------------|-----------------------|------------------------------------|---------------------------|-----------------------|----------------------|------------------------------|------------------|-----------------|-----------------------|-------|
| <b>TOTAL</b>                                                                             | <b>0.30</b>           | <b>0.78</b>                        | <b>0.44</b>               | <b>0.13</b>           | <b>0.23</b>          | <b>0.45</b>                  | <b>1.29</b>      | <b>1.20</b>     | <b>0.72</b>           |       |
| <b>International level</b>                                                               | 0.160                 | 1.170                              | 0.400                     | 0.030                 | 0.330                | 0.480                        | 0.700            | 1.950           | 0.760                 | 5.97  |
| Sustainable diets and biodiversity (FAO, 2012)                                           | 0.119                 | 1.169                              | 0.367                     | 0.007                 | 0.108                | 0.112                        | 0.536            | 2.673           | 0.755                 | 5.85  |
| Influencing food environments for healthy diets (FAO, 2016a)                             | 0.369                 | 0.424                              | 0.468                     | 0.081                 | 0.036                | 2.072                        | 1.523            | 1.432           | 0.784                 | 7.83  |
| Plates, pyramids, planet (FAO and FCRN, 2016)                                            | 0.033                 | 0.306                              | 0.361                     | 0.066                 | 0.443                | 0.377                        | 0.475            | 0.902           | 0.410                 | 4.46  |
| Voluntary guidelines for mainstreaming biodiversity (FAO, 2016b)                         | 0.000                 | 0.040                              | 1.375                     | 0.000                 | 0.000                | 0.000                        | 0.250            | 4.500           | 0.250                 | 7.75  |
| Food planet health (EAT – Lancet Commission, 2019)                                       | 0.538                 | 0.335                              | 0.821                     | 0.077                 | 2.128                | 0.256                        | 0.385            | 4.205           | 1.359                 | 12.15 |
| The state of world's biodiversity for food and agriculture (FAO, 2019)                   | 0.000                 | 0.047                              | 0.300                     | 0.100                 | 0.100                | 0.000                        | 0.400            | 1.700           | 0.500                 | 4.40  |
| Sustainable Healthy Diets, guiding principles (FAO and WHO, 2019)                        | 0.097                 | 0.162                              | 0.226                     | 0.032                 | 0.226                | 0.129                        | 0.613            | 0.548           | 1.774                 | 5.10  |
| OneHealth, un nuovo approccio al cibo (BCFN, 2021a)                                      | 0.030                 | 0.183                              | 0.328                     | 0.000                 | 0.821                | 0.075                        | 0.731            | 0.597           | 0.642                 | 3.99  |
| BCFN - Un'alimentazione che rispetta la salute del pianeta e delle persone (BCFN, 2021b) | 0.000                 | 0.000                              | 0.032                     | 0.000                 | 0.000                | 0.000                        | 0.258            | 0.258           | 0.194                 | 0.74  |
| <b>European level</b>                                                                    | 1.250                 | 0.800                              | 0.470                     | 0.530                 | 0.520                | 1.260                        | 3.450            | 3.910           | 2.280                 | 14.47 |
| Healthy and Sustainable Diets for European Countries (EUPHA, 2017)                       | 0.683                 | 0.444                              | 0.413                     | 0.492                 | 0.222                | 0.317                        | 2.317            | 1.460           | 1.016                 | 7.37  |

(Continued)

TABLE A1 (Continued)

| Document (per territorial scope of analysis)                                                                | Food price regulation | Food composition and reformulation | Public awareness campaign | Public food provision | Food waste reduction | Food marketing and labelling | Behaviour change | Food production | Socio-economic access | TOTAL |
|-------------------------------------------------------------------------------------------------------------|-----------------------|------------------------------------|---------------------------|-----------------------|----------------------|------------------------------|------------------|-----------------|-----------------------|-------|
| Towards a common food policy for the EU (IPES, 2019)                                                        | 0.902                 | 0.973                              | 0.446                     | 0.607                 | 0.455                | 0.482                        | 1.071            | 8.920           | 3.446                 | 17.30 |
| Farm to Fork Strategy (European Union, 2020)                                                                | 0.659                 | 0.829                              | 0.293                     | 0.341                 | 0.000                | 2.659                        | 0.805            | 0.659           | 1.732                 | 16.61 |
| Policy Evaluation Network - The Healthy Food Environment Policy Index (JPI-HDHL, 2021)                      | 2.154                 | 0.646                              | 0.585                     | 0.600                 | 0.646                | 2.031                        | 7.215            | 1.200           | 2.146                 | 7.98  |
| Towards sustainable food consumption (SAPEA, 2023)                                                          | 0.222                 | 2.000                              | 0.333                     | 0.167                 | 2.278                | 0.722                        | 0.944            | 8.333           | 1.611                 | 17.22 |
| National level (Italy)                                                                                      | 0.120                 | 0.610                              | 0.450                     | 0.070                 | 0.110                | 0.240                        | 1.010            | 0.180           | 0.300                 | 3.09  |
| Linee Guida per l'educazione alimentare (MIUR, 2015)                                                        | 0.000                 | 0.159                              | 5.932                     | 0.000                 | 0.136                | 0.045                        | 0.659            | 0.273           | 1.068                 | 8.27  |
| Linee Guida per una sana alimentazione (CREA, 2018)                                                         | 0.121                 | 0.596                              | 0.258                     | 0.062                 | 0.086                | 0.197                        | 0.960            | 0.184           | 0.248                 | 2.71  |
| Linee Guida per una sana alimentazione (CREA, 2019)                                                         | 0.145                 | 0.732                              | 0.359                     | 0.105                 | 0.136                | 0.432                        | 1.391            | 0.095           | 0.295                 | 3.69  |
| Modelli di diete sane e sostenibili a partire dalle diete tradizionali (MDS – Ministero della Salute, 2019) | 0.036                 | 0.786                              | 0.464                     | 0.036                 | 0.679                | 0.750                        | 0.786            | 0.750           | 1.143                 | 5.43  |

Authors' elaborations.