ONEFOOD

# Mapping social and human dimensions of One Food to integrate into the One Food Wheel

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## Executive summary

Transformation of food systems to achieve social, economic, and environmental sustainability is constrained by biological, chemical, physical, human and socioeconomic hazards. This report focuses on human and socioeconomic hazards in food systems. It examines the human and socioeconomic aspects of food systems hazards, recognising the pivotal role of human behaviours and social dynamics in shaping food system resilience. It explores the critical intersections of food systems hazards using a human and social sciences lens. It acknowledges the importance of human and socioeconomic factors as both contributors to, and solutions for, hazards in food systems.

The report categorises the food systems hazards that arise due to people's behaviours at an individual, group, community, national or global level. It further used a food value chain approach to map where these human and socioeconomic hazards threaten and disrupt sustainability of food systems. The mapping of these hazards is guided by the One Food framework. Socioeconomic hazards can be incorporated in One Food through the One Food Wheel, a visualisation of the One Food approach to conduct multi-hazard risk analysis in food systems.

The One Food approach, visualised through the One Food Wheel, aims to mitigate various hazards across food value chains, from production/harvesting to consumption as well as waste management. It emphasises multi-hazard risk analysis and advocates for environmentally friendly diets and sustainable food production practices. This model categorises hazards into natural, human-made, and socioeconomic types, each posing unique problems to food security, safety and attainment of sustainable food systems. As an example, this report identifies hazards like the misuse of agrochemicals, hydrological and meteorological risks, food contamination, and waste mismanagement as central issues that persist across various points of food production and distribution.

Further, the report underscores the importance of socioeconomic dynamics in shaping food systems hazards. Human behaviour, whether individual, group-based, or institutional significantly impacts the emergence, spread, and severity of food systems hazards. It provides examples and case studies of how human and socioeconomic issues like poverty, insufficient knowledge and inadequate education are hazards that intensify vulnerabilities within food systems.

The report emphasises the potential of the One Food Risk Tool for assessing the impact of hazards to inform policy and practice. The tool can be used to evaluate multiple hazards and inform policy on how to prevent i) harmful human and socioeconomic behaviours and activities, ii) worsening climate damage, iii) loss of biodiversity, and iv) economically, environmentally, and socially unsustainable food systems. This approach has potential provide to solutions that promote protection of vulnerable populations from unstainable food systems while safeguarding biodiversity, human health, and mitigating environmental harm caused by food systems activities. Integrating this model within food systems could lead to a balanced ecosystem where economic, social, and environmental sustainability coexist.

The report serves as a call to action, encouraging stakeholders to adopt the One Food framework as a viable solution to the complex challenges facing global food systems today. It ends with recommended questions on further research that could help reduce or remove the human and socioeconomic impediments delaying attainment of sustainability in food systems.

## 1. Introduction

The processes through which societies satisfy their food and nutrition requirements, commonly known as food systems, are often not structured in ways that bring about economic, social or environmental sustainability. Instead, as food is produced, processed, traded, distributed and consumed, not all categories of food systems actors benefit from the economic value-added created during these activities. Some sections of society are marginalised and excluded. For example, smallholder famers and marginalised communities are often excluded from economic opportunities within food systems due to inadequate resources, limited access to markets as well as unfair pricing. In addition, most of the present-day food systems activities are damaging to the environment, and contribute to climate change, loss in biodiversity, and poor plant and animal health. This ultimately causes poor human health and negatively affects people's overall well-being. Furthermore, threats to food systems and the extent to which they are affected by natural disruptive elements and events of the physical environment significantly depend on human factors. How well a society is equipped to prevent such disruptive aspects in food systems or mitigate their impacts is influenced by the decisions, behaviours and actions of people. These human and natural factors are hazards to the food systems as they can disrupt and damage their functioning. Key questions that must be answered include:

- If not addressed, how would the disruptions to food systems affect the environmental health, ecosystems, plant, and animal health, and people's health and their livelihoods?
- How damaging would be the feedback effects from the natural environment to food systems, and is it reversible?

The operationalisation of One Health which brings together the wellbeing of people, and the health of the environment and animals, through the One Food concept offers a pathway toward transformation of food systems to make them sustainable. The One Food idea is centred on the importance of identifying food systems hazards and controlling them to attain a food systems that are sustainable in socioeconomic and environmental terms. In order for the identification and control of food systems hazards to be comprehensive, it is important to address all hazards, including biological, chemical, physical, and human and socioeconomic hazards.

This report specifically examines human and socioeconomic aspects of food systems hazards. It characterises the pivotal role of human behaviours and economic and social dynamics in shaping food systems activities. The *One Food Social Sciences Advisory Report*[1] recommended that integration of human and social aspects of food systems hazards into the One Food Wheel requires a deeper awareness of human and socioeconomic dynamics. In an endeavour to understand the hazards that arise in relation to food systems activities - from the production, through value addition or processing, trade, distribution and to consumption - crucial questions ought to be addressed. These include:

- What specific hazards that arise due to people's behaviours at an individual, group, community, national or global level?
- In which phases do these human and socioeconomic hazards threaten sustainability of food systems?

[1] Mbanda, et al. (2023)

- How do people interact when faced with food systems hazards, and do how they create or worsen food systems hazards?
- Furthermore, how does the way people respond to hazards or their contribution to hazards influence the extent to which societies, ecosystems and the environment are affected by hazards?
- How would people's behaviours determine the severity of hazards and the time it takes to recover from their impact?

This study maps societal and human dimensions of hazards in food systems by identifying human and socioeconomic hazards to incorporate in the One Food idea. Socioeconomic hazards can be incorporated in One Food through the One Food Wheel. The Wheel visualises the One Food approach which highlights how multi-hazard risk analysis in food systems can prevent i) harmful human and socioeconomic behaviours and activities; ii) worsening climate damage; iii) loss of biodiversity; and iv) economically, environmentally, and socially unsustainable food systems (Bremner, et al., 2023; Mbanda, et al., 2023). As indicated in the One Food Wheel, controlling for and mitigating food systems hazards could contribute to saved livelihoods, saved resources, saved species, and saved meals and ultimately contribute to improved human health and the improved health of the environment, plants, animals. The study therefore entails plotting the human and social aspects of hazards in food systems by identifying the hazards emanating from human activities and socioeconomic factors, their characteristics, how and where they happen, how they are experienced and how they affect food systems phases as well as the environment. The analysis includes how human and socioeconomic hazards move and/or evolve across food systems, as well as their implications on human lives and livelihoods.

This report is broken down into the following sections. Prior to defining and mapping human dimensions of food systems hazards in Sections 3 and 4 respectively, Section 2 discusses why food systems should be transformed through a One Food approach. It first provides an overview of food systems and related hazards, then discusses the risks of most the current farming methods and how environmentally friendly diets could promote the One Food concept. Section 3 provides food systems hazards from the human and social angle. This section covers how hazards are understood, including the meaning of hazards and how they are prioritised and evaluated. Hazards are defined by explaining how they manifest along food systems based on how people make decisions, behave and interact. In addition, the prioritisation of hazards is discussed. Section 4 gives examples and case studies of human and socioeconomic hazards that happen cross food systems as people produce, process, trade, distribute, and consume and dispose food and non-food waste associated with food value chain activities, for example food packaging. This includes discussions around hazards that arise as food is produced or harvested, processed, traded, distributed and consumed; as well as hazards that straddle multiple phases of food value chains. Section 5 sums up the discussions by presenting how human socioeconomic hazards are to be integrated into the One Food Wheel, while section 6 concludes, followed by recommendations.

## 2. Background: An overview of food systems hazards

Food systems are susceptible to various hazards, including those that are climate and weather-related, mainly caused by atmospheric conditions (drought, temperature extremes, storms), geophysical triggers (landslides), hydrological (floods), biological (outbreaks of diseases and pests, pandemics), and chemical contaminants (Food and Agriculture Organization [FAO], 2021; Sekheta, 2009; Singh et al., 2019). These hazards can be introduced at various food value chain phases, from

production. Consequently, hazards that affect food systems can significantly affect the environment, ecosystems and human health.

According to Garvey (2019), the channels and processes food passes through, from farm to table, is a complex multi-step path, with possibilities for hazards at various stages along the way. The evolution of food systems has also led to new risks, such as the climate crisis, environmental destruction, and inequalities in food access (Dury et al., 2019). These risks are particularly pronounced among countries that have relatively low incomes, with populations experiencing problems like food insecurity, poor limited and unreliable infrastructure services, as well as heightened vulnerability to environmental shocks. Natural hazards, including disruptions that cause poor harvests and food contamination, worsen disruption of food supplies leading to global repercussions (Cutter, 2017). Consequently, the ability to ensure ongoing access to food that not only has adequate nutrition but is also safe will remain a significant concern and problem for nearly every country globally, developed countries included (Chen et al., 2021).

## 2.1 Unsustainable food production

The climate crisis has a detrimental effect on agricultural production, livestock breeding and fishing, especially in countries with low incomes. These effects are expected to become increasingly pronounced in the latter part of this century (Lewis, Monem, & Impiglia, 2018). Climate change effects have a significant negative impact on agricultural yields and rural life, while agricultural production continues to produce significant quantities of greenhouse gases (Spiller, et al., 2023). The effects of climate change, including those associated with unsustainable agriculture, can potentially result in an increase in the use of land and water with a disproportionate effect on poor people and a widening of disparities within and between nations. This has a detrimental effect on nutritional value and availability of food and its affordability (Spiller, et al., 2023). The harmful effect of the climate crises on agriculture production strongly signals a need to use appropriate farming methods to ensure that the world is still able to produce safe and healthy food and preserve the environment for future generations.

Soil quality is declining, and water resources are becoming increasingly scarce due to lack of investment in sustainable agriculture (Lewis, Monem, & Impiglia, 2018). If current food and agricultural practices are not altered, the outlook for the future is likely to be characterised by a continuation of food insecurity and unachievable economic growth and prosperity (Spiller, et al., 2023).

## 2.2 Environmentally friendly diets

The demand for food is driven by population growth, income, as well as the change of dietary preferences (FAO, 2018). More than half of the world population reside in the urban, and this is anticipated to rise to about 66% by the year 2050 (Graziano da Silva & Fan, 2017). Current food systems are largely characterised by numerous markets supplying a wide variety of foods that is processed with high amounts of fat, sugar and salt, all which contribute to health issues such as obesity and cardiovascular disease[2]. In addition, urban environments have an abundance of pre-packaged food (mostly unhealthy) that can be purchased easily in fast food stores (Baker & Friel, 2014; Drewnowski, et al., 2020). These current diets and the food production methods are well

[2] Cardiovascular diseases are conditions that affect the heart and blood vessels.

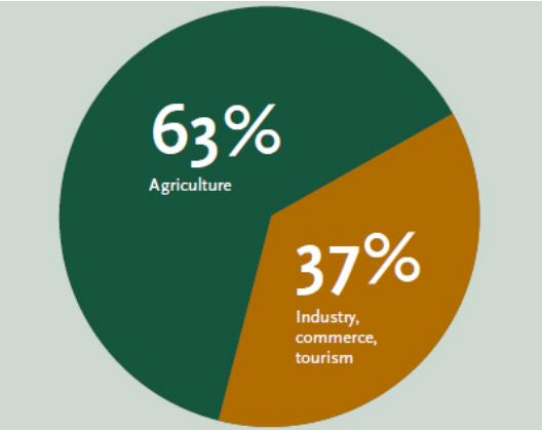
known for causing detrimental environmental effects, damaging to ecosystems and contributing to climate change (Poore & Nemecek, 2018).

Sustainable diets are beneficial in all aspects of a person's welfare, they have minimal impact on the environment, can be accessed by all people, are cost-effective, safe, and fair priced, and are accepted by society (FAO & World Health Organization [WHO], 2019). Sustainable diets strive to promote the optimal development and functioning of all individuals, ensuring the well-being of current and future generations at all stages of life, and contribute to the prevention of all forms of malnutrition (FAO & WHO, 2019). In addition, sustainable diets help reduce carbon emissions, overuse of land and water, use of phosphorus and nitrogen, and help reduce pollution from chemicals. Sustainable diets are friendly to the environment as they protect biodiversity, ensure the health of crops, animals, forest-based foods, and prevent overexploitation of aquatic resources and overfishing (FAO & WHO, 2019). Literature clearly demonstrates the significance of sustainable diets on the environment (see FAO & WHO, 2019). However, questions on whether environmental sustainability can co-exist with economic sustainability or social sustainability remain unanswered. The following section highlights how hazards that affect food systems are defined, understood, prioritised and evaluated by different actors and how this affects the transition to food systems that are sustainable.

## 2.3 Food systems hazards on livelihoods and human, environmental and ecosystems health

Food systems hazards will consequently affect food and nutrition security and livelihoods of vulnerable communities both directly and indirectly. For instance, deteriorating climate conditions negatively affect availability of and access to good sources of nutrition as a result of complex resultant pathways, including income shocks caused by floods or droughts, and job losses, while acid rain and extreme weather events directly affect food production (von Braun, 2020). In addition, human induced activities such as industrial farming practices and pollution also have negative impacts on food safety, both direct and indirect. Problems related to food safety led to numerous stakeholders advocating for a transformative food systems (Chapman & Gunter, 2018). It is therefore crucial to put sustainable preventive controls in addressing these hazards.

*Figure 1: Loss and damage from hazards in agriculture compared other sectors, 2008–2018.*




Source: FAO (2021)

Figure 1 shows the damage resulting from a combination of biological, climatological, geophysical, and hydrological hazards on various sectors of the economy globally. It indicates that the agricultural sector (this includes aquaculture, crops, fisheries, forestry, and livestock) suffers the more than the commerce, industry and tourism sectors combined. This emphasises the sector’s vulnerability to

natural hazards and disasters, which is compounded by its reliance on climate and weather conditions (FAO, 2021), and further demonstrates the importace of paying attention to food systems hazards.

## 3. Food systems hazards conceptual framework

### 3.1 Meanings of hazards and how they are prioritised and evaluated

#### *3.1.1 General definitions of hazards*

Hazards fall into two distinctive groupings, natural hazards and human-made hazards, with a third category being the intersection of these. Several definitions of hazards exist in different disciplines, informed by diverse risk contexts that include economic, political, and social factors. However, currently there is lack of a technical overview for an all-inclusive picture of hazards that is necessary for informing policy and practice of management disasters and risks (United Nations Office for Disaster Risk Reduction [UNDRR] & The International Science Council [ISC],). The United Nations Educational, Scientific and Cultural Organization (UNESCO. 2010, p. 5) defined a hazard as "*a potentially damaging physical event, phenomenon or **human activity** that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation*" [emphasis added]. The United Nations General Assembly (2016, p. 18) definition of a hazard as "*a process, phenomenon or **human activity** that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation*" [emphasis added] is close to the UNESCO 2010 definition. A related definition by the One Health Quadripartite partners is that of a threat which is "*a hazard, an agent, event, concern or issue that poses risks to human, animal, plant or ecosystem health*" (FAO, UNEP, WHO & WOAH, 2023). This description of a hazard differs slightly from the UN agencies definitions as it does not bring out the disruptive and damaging nature of hazards. The FAO and the WHO defined hazards within food safety protocols as any harmful agent, whether biological, chemical or physical, in food that may cause adverse health outcomes (FAO & WHO, 2023). In addition, the last two definitions do not include the condition of a person as a hazard, which is included in the International Federation of Red Cross and Red Crescent Societies and Save the Children (2018, p. 7) definition of a hazard as "a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage". In addition to this, hazards can either be climatological, biological, geophysical, meteorological, hydrological or and human-made.

In academic and policy circles alike, debates and reporting on hazards has largely been limited to natural hazards. For example, The Integrated Research on Disaster Risk's (IRDR, 2014) Peril Classification and Hazard Glossary centred on natural hazards namely climatological, geophysical, hydrological, meteorological that included biological and extraterrestrial categories. Natural hazards result from geophysical processes caused by specific geophysical environmental dynamics in the atmosphere, biosphere, hydrosphere, and lithosphere as well as from extreme natural events caused by a substantial departure of one or more environmental factors from their mean value - in a positive or negative direction (Liu et al., 2016).

The IRDR (2014) acknowledged that current research on how science informs political and social decision making on hazards and disasters is inadequate. It is only in 2019 that the United Nations office for Disaster Risk Reduction (UNDRR) and the International Science Council (ICS) created a Technical Working Group to develop a list of all hazards with their scientific definitions, for the Sendai

Framework[3]. The UNDRR and ISC (2020) Hazard Definition and Classification Review technical report included biological, chemical, environmental, human-made/technological, natural, and societal hazards and expanded the categories of the IRDR Peril Classification and Hazard Glossary, particularly the biological hazards and extraterrestrial hazards. UNDRR and ISC (2020) further significantly broadened the discourse on disaster risk reduction to include both natural hazards and human-made hazards, including hazards and risks associated with biological factors, technology and the environment. The IRDR (2014) pointed out that addressing this significant shortfall on relevant research to guide policy requires an integration of policy makers and researchers from all disciplines and geographic regions. Involvement of actors in research and policy making across all disciplines helps to ensure that food systems hazards are addressed holistically.

### *3.1.2 Food systems hazards definition*

The different types of hazards that exist across food systems segments are atmospheric, biological, chemical, climatological, geophysical, hydrological, human and socioeconomic in nature. The hazards defined in section 3.1 above are potential sources of harm, disruption and damage to a food system. The One Food programme formulated a working definition of hazards specific to a food system as *"any **biological, chemical, physical, social, economic or political factor** acting on food systems that prevents resources being turned into safe and secure food, or factors associated with food systems that degrade the natural environment or negatively affect human wellbeing*" (One Food Movement, 2024a). As explained in the introduction section, people's behaviours as individuals, in groups, and at institutional governance level can cause or exacerbate hazards in food system. It is for this reason that people's behaviour and actions or inaction ought to be incorporated in the definition of food systems hazards.

## 3.2 Food systems hazards conceptual framework

The food systems hazard conceptual framework identifies, categorises, and assesses human and socioeconomic hazards across different stages of food systems: production/harvesting, processing or value addition, trade and distribution, consumption, and management of waste. It provides an understanding of how human actions, social factors, and economic conditions interact to create or exacerbate hazards that compromise food security, environmental health, and societal well-being including human health.

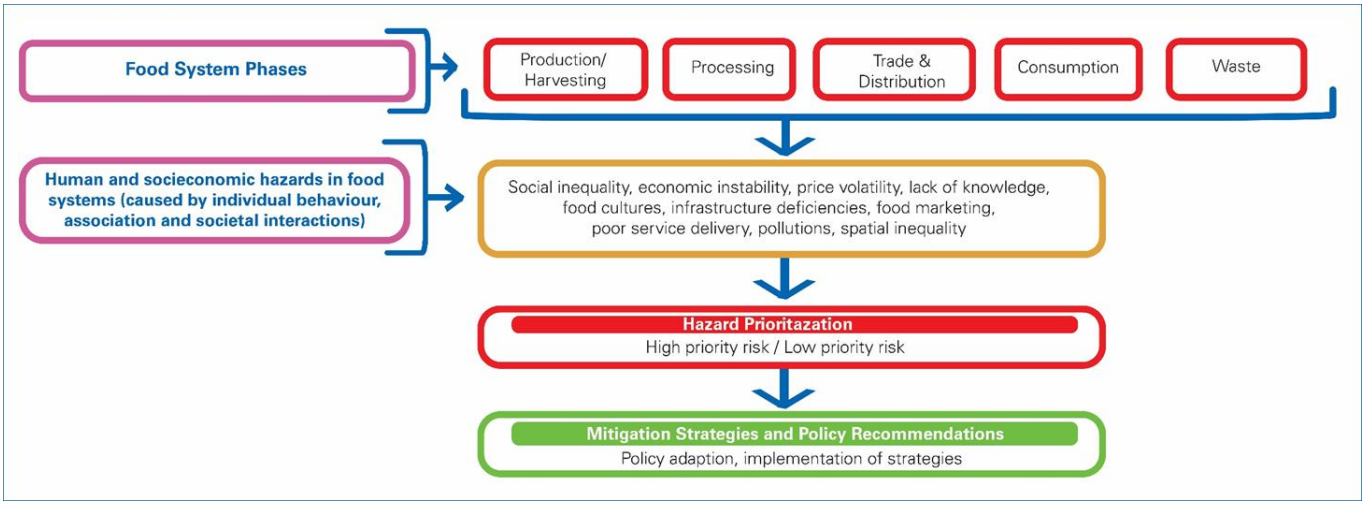
## 3.3 Identifying and categorising human and socioeconomic food systems hazards

Within the conceptual framework, the human and socioeconomic hazards in food systems need to be identified and categorised. These hazards stem from individual behaviours and association of humans at smaller group or societal levels. They are driven by broader human and socioeconomic factors like social exclusion, poverty, unemployment, income inequality, and inadequate knowledge and access to education. Human and socioeconomic hazards affect resource access, food and nutrition security, and the ability to respond to all hazards effectively. As explained in *Identifying Human and Socioeconomic Hazards in a One Food Framework* (HSRC, 2024), human and

[3] The Sendai Framework for Disaster Risk Reduction 2015-2030, supported by UN General Assembly in 2015, focused on adopting measures to tackle three facets of "disaster risk (exposure to hazards, vulnerability and capacity, and hazard's characteristics)" (UNDRR & ISC, 2019) to increase resilience, minimize existing risks and avert new risks. The aim of the framework is to considerably mitigate the occurrence of disaster and losses in human life livelihoods and health as well as economic, physical, social, cultural and environmental assets of persons, communities, businesses, and nations between 2015 and 2030.

socioeconomic hazards are the barriers, challenges and adverse conditions that threaten, impede or disrupt the sustainable food production, value addition, trade, distribution and consumption and harm the environment and ecosystems on which food systems depend on. Figure 2 illustrates the identification of human and socioeconomic hazards by their categories, as explained below. It further shows how the hazards are mapped across food value chains, as explained in Section 3.4.

*Figure 2: Mapping human and socioeconomic food systems*




Source: Authors representation

### *3.3.1 Individual psychosocial and behavioural hazards*

These refer to hazards in the food system that stem from harmful human activities that can potentially create/worsen existing hazards in the food value chains. For example, poverty is a condition that results in an individual being unable to sustain their basic needs, which can, in turn, make them more susceptible to foodborne diseases or to recover from the negative aftereffects of-which results from foodborne illnesses.

### *3.3.2 Associational socioeconomic hazards*

These hazards can come from formal/informal organisations, including households and cooperatives. They stem from activities related to a large group of individuals that have a negative effect on the food system or the food value chains. Unemployment is one of the associational hazards because it manifests as a result of systemic and structural issues that later have an impact on food systems.

### *3.3.3 Community/societal hazards*

These include hazards that stem from a macro point of view and affect societies at large. These include institutional governance or a lack thereof. For example, the unequal distribution of economic value-added threatens the economic sustainability of food systems because when economic value-added is disproportionately captured by certain actors in food value chains, such as large corporations or retailers, it often leads to income inequality, and it can be witnessed across all stages of the food chain.

## 3.4 Mapping human and socioeconomic hazards in food systems: A food value chain approach

**Primary Production/Harvesting**: At this stage, hazards may include overuse of chemicals, unsafe agricultural practices, and exposure to economic insecurities affecting farmers.

**Processing**: Hazards in this stage often arise from inadequate safety practices, contamination risks, and socioeconomic issues like poor labour conditions.

**Distribution**: Hazards here may involve supply chain disruptions, storage issues, and economic constraints like cost constraints in safety measures that affect food quality and safety.

**Consumption**: Socioeconomic factors like poverty and lack of knowledge can influence dietary choices, food access, and risk of foodborne illnesses.

**Food Waste Disposal**: Ineffective waste management can lead to environmental hazards and health risks, impacting communities disproportionately in lower-income areas.

## 3.5 Prioritisation of hazards

**Criteria for Prioritisation**: Hazards are prioritised based on their severity, frequency, impact on food security, human and environmental health, political importance, social and economic benefit. Such prioritisation is often arrived at after evaluating exposure levels, vulnerability of affected populations, potential for mitigation and political power dynamics. It is important to note that hazards in one stage can influence risks in another. For example, poor waste management practices (disposal stage) can lead to soil contamination, affecting agricultural production.

There is an intricate relationship between natural resources and natural hazards. According to White et al., (2001), the interactive theory of origin of hazards claims that people encounter natural hazards as they seek to improve their well-being. Locations that are ideal for human settlement offer multiple benefits that include access to resources that provide sources of livelihood (coastal areas, floodplains, mountainside, riverbanks) but also prone to multiple hazards. Hazards occur when elements of the environment threaten or are perceived to pose risks to people and their sources of livelihood. When faced with hazards, how do people organise themselves to act whether privately or public, individually, or collectively, to counter the damages or to lessen the disruptive potential of a hazard? How does the society-nature interaction create the risks, exposure and vulnerability of society, animals, and plants to hazards? How is the environment on which they depend as well as their resilience to the hazards affected? The interactions happen based on perceptions of societies and their related value systems (Glynn et al., 2017). How people react to try and bring their circumstances back to the pre-hazard *normal* involves prioritisation.

### *3.5.1 Factors that influence hazard prioritisation*

The extent to which people, plants, animals and the environment face risk, exposure and vulnerability to hazards and disaster is significantly affected by aspects like a society's level of development, and the developmental initiatives that are implemented. The degree of social inclusion is also a major factor. This includes how participation and power are distributed and the equity in decision-making processes and implementation of decision outcomes (Tuhkanen et al., 2018). Furthermore, planning and contingency measures play a critical role. Prioritisation of hazard risks happens in the face of vulnerability to multiple hazards and a society's short-term versus long-term goals trade-offs (Tuhkanen, et al., 2018).

### *3.5.2 High priority vs low priority hazards*

High-priority hazards would be those with the potential for significant harm or those affecting vulnerable communities. Low-priority hazards would then have a lesser impact or more limited spread but may still contribute to systemic vulnerabilities.

On the prioritisation of hazards, the FAO (2023b) acknowledged that the prevention or elimination of hazards is not always possible. Rather, reducing the impact of hazards to an acceptable level would be a more efficient method of dealing with the risks associated with hazards. There are multiple ways of estimating the risk of a hazard, as given in the examples that follow. Arthur (2009) used the risk analysis approach to determine whether a hazard was acceptable or not and developed tools to evaluate how risks associated with hazards could be reduced to acceptable levels. Similarly, the FAO and Red Cross Crescent Climate Centre (FAO and Red Cross Red Crescent Climate Centre, 2019)underscored the connections between the climate crises and poverty by assessing climate risks as a combination of vulnerability, exposure and hazards. The Seafood Risk Tool estimates the risk of a hazard as a combination of the "likelihood of occurrence" and the "severity of harm" (Stentiford et al., 2022). The One Food Risk Tool that is being developed by the One Food Movement (2024b) assesses the impact of food systems hazards based on the probability of a hazard occurring, its severity and its longevity. The above illustrations show that the risk level that a hazard poses can be influenced by different factors which can vary across societies and ecosystems.

Evidently, in distinguishing between high priority and low priority hazards the exposure and vulnerability of societies and ecosystems to hazards must be considered. Notably, risks and hazards vary depending on the sectors they operate in, and any attempt of standardising hazards becomes futile (Arthur, 2009). Whether the hazards are human-made or natural, they can inflict dire consequences. Therefore, high priority hazards can be identified as agents or entities with the inherent capacity to cause the gravest or most adverse consequences (Arthur, 2009). These hazards have unacceptable risk levels that require immediate control measures. In contrast, although low priority hazards have the same capacity to cause negative consequences, the intensity of harm is at a lower level as opposed to high priority hazards (Tuhkanen, et al., 2018).

### *3.5.3 Food systems hazard mitigation strategies and policy recommendations*

After food systems hazards are identified, recommended measures should then be instituted to mitigate against or prevent those that are prioritised. Such measures include formulating new policies, adapting existing policies, introducing new programs and/or upscaling existing ones. Examples include promoting social equity and supporting practices that address the socioeconomic roots of these hazards through educational programs, policy reforms, and economic support systems in order to shield vulnerable communities from the adverse effects of human and socioeconomic food systems hazards.

## 4. Human and socioeconomic hazards in food systems: Selected examples and cases studies

Food systems activities are dependent on land, soil, water, climate and biodiversity and involve cultivating plants and animals, making them vulnerable to stresses and shocks arising from natural hazards (FAO, 2023a). The FAO (2023c) acknowledges that even though biological, environmental, geophysical, meteorological and hydrological hazards predominantly affect agriculture, societal hazards also pose potential threats. In addition, hazards can emanate from a complex interaction of society (i.e., human behaviour, function, organisation and development) and the physical

environment (FAO, 2023c). Human-induced hazards, the FAO (2023a) argues, can be equally as damaging as natural hazards in terms of their threat to food systems. In addition, combined natural and human-induced hazards can have widespread destructive impacts, affecting food and nutrition security as well as economic growth, trade, employment, income stability, government revenues, and efforts to reduce poverty. This section therefore looks at hazards related to all phases of food value chains.

### 4.1 Lack of knowledge leading to misuse and overuse of chemicals in framing

Agrochemicals fertilizers and pesticides are commonly used in the primary phase of food production to maximise yields and mitigate economic losses. Pesticides are used to control weeds, pests and diseases of crops, animals or aquaculture while fertilisers are used to increase production and yields (UNEP, 2022a). Furthermore, intensification of agricultural production, which is driven by rising demand for food, is to a certain extent enabled by greater fertilizer and pesticide use (UNEP, 2022b). In addition, agrochemicals are mainly used in agriculture production to minimize economic losses (UNEP, 2022c). However, improper handling, misuse and overuse, or incorrect application of agrochemicals due to disinformation/ignorance can lead to environmental contamination, water pollution and health risks for people who are involved in the manufacturing or use of the chemicals.

Pesticides and fertilizers are the key agrochemicals used in agriculture and farming, but pesticides directly cause more harmful health risks compared to chemical fertilizers (Baweja et al., 2020; Jin et al., 2015). People are exposed to pesticides mainly during formulation, manufacture, and application of pesticides; and people at high risk include formulators, production workers, mixers, loaders, sprayers, and agricultural farm workers (Aktar et al., 2009). According to Ng and Von Goetz (2017), food is among the key ways through which humans are exposed to hazardous chemicals. Research by the European Environment Agency, states that a connection exists between chronic diseases like respiratory illnesses, cancer, heart disease, and neurological diseases (European Environment Agency, 2023). The hazardous effects of chemicals and pesticides used in food systems does not affect humans only through direct exposure, but also indirectly when food is exposed to pesticide contamination (Aktar et al., 2009). In addition, pesticide, herbicide, and chemical use in the primary phase of food value chains also causes surface water and ground water contamination, soil contamination; posing substantial risks to non-target organisms that include plants, birds, fish, insects, beneficial soil microorganisms, and the environment (Aktar et al., 2009).

In addition, Aktar (2009) argues that while pesticides have a lot of economic benefits in the production of food, their disadvantages manifest through the harmful effects on people's health and on the environment. Exposure to pesticides has significant impacts on Disability Adjusted Life Years (DALYs) through the contribution to acute and chronic health problems. This is most prevalent in developing countries. Acute pesticide poisoning is linked to high mortality and morbidity, while chronic exposure to pesticides is linked to various cancers, neurological disorders, respiratory problems, reproductive health and mental health disorders. These health conditions exacerbate the DALY burden by means of causing long-term disability and premature death, particularly in agricultural communities and areas with weak regulatory oversight.

Furthermore, Aktar (2009) argued that while there is very limited data on the incidence of pesticide-related sicknesses in developing countries, the economic impact of them on non-target species including humans is estimated to be about US$8 billion annually. Chemical pesticides are commonly the preferred solution to control pests because they can be rapidly manufactured and distributed and can reduce pest populations in the short-term (UNEP, 2022c).

*Case Study: Lack of knowledge and pesticide misuse among farmers in North Indian*

Insufficient knowledge in the safe use of pesticides have posed serious hazards in agricultural communities, particularly among smallholder farmers who are vital to the nation's food system. Many farmers lack adequate training on pesticide application, storage and handling, leading to both environmental and health hazards. Studies indicate that farmers often use pesticides without fully understanding the correct dosages, potential health risks, or environmental impacts. For instance, research by Sachan et al. (2022) found that 55% of the smallholders neither read nor followed directions on the label of the pesticide. About 80%, did not know about anything about restricted or banned pesticides while 37% were unaware that some pesticides could result in lethal intoxications. In addition, over 40% of the farmers kept pesticides anywhere in their homes.

*Case Study: Lack of knowledge of pesticide safety measures among farmers in Wafra and Abdally, Kuwait's two major agricultural regions*

Jallow et al. (2017) conducted a study involving 250 farmers using in-depth interviews and observations on-farm. Even though 71% and 65% of the farmers understood harmful effects of pesticides to their health and to the environment, respectively, the farmers lacked sufficient knowledge of pesticide safety. Close to 60% of the farmers reported not using personal protective equipment (PPE) during pesticide handling and pesticide label instructions were not read or followed by more than 70% of the farmers. In addition, unsafe disposal of pesticide waste or leftovers was common. A minimum of one symptom of severe pesticide poisoning was reported by 82% of the farmers.

*Case Study: Lack of understanding of pesticide overuse among cotton farmers in China*

Jin et al. (2015) conducted a survey of 160 randomly selected smallholder farmers to assess if they studied the manual prior to applying pesticides, and how much pesticides they normally use in comparison to the dose advised on the manual. Of the 143 smallholder farmers who read pesticide manuals before spraying, about 73% used up to twice the dosage instructed in the manual, 14% used more than twice of the recommended dosage while only close to 13% used roughly the quantity recommended in the manual. In addition, just 13% of the smallholder farmers understood that they were exceeding the manual's recommended pesticide dosage and recognised the need to reduce pesticide dosage.

## 4.2 Lack of education and inadequate knowledge about food safety

*Case Study: Poor knowledge about hygiene among informal street vendors in Nigeria*

In Nigeria, informal street food vendors provide affordable meals to low-income communities, but limited knowledge about food hygiene poses significant health risks. A study conducted by Chukuezi (2010) in Owerri town of Imo State, Nigeria, argues that while street food significantly contributes meeting the demand for food by urban residents, the food is linked to multiple health hazards. The study revealed that 60% street vendors had minimal or no knowledge about basic food safety practices, such as handwashing, cooking temperatures and safe storage. Many vendors lacked formal education and did not have any training on food handling hygiene leading to frequent cases of foodborne illnesses. Basic practices like using an apron; not handling food with bare hands and wearing hair covering were not applied. Some food vendors stored the food they sold in uncovered stalls while others kept the food in wheelbarrows. Over 40% of vendors stored leftovers in poor storage facilities for selling on the following day while close to 50% used dirty water to wash their utensils Another study conducted in Maseru, Lesotho by Letuka et al. (2021) found that nearly 90%

of vendors who participated in interviews did not fully understand groups of society at greatest risk of foodborne disease. Poor hygiene practices among vendors, like insufficient handwashing and incorrect food handling contribute foodborne pathogens spreading. Customers, often with limited options for affordable meals, face higher risks of contracting illnesses like salmonella, cholera, and E. coli infections.

### 4.3 Unsustainable production and consumption

*Case Study: Trade-off between livelihoods and a healthier environment in Brazil and Kenya*

The FAO and WHO (2019) note that in Brazil, the consumption of beef, soybeans, and sugar is a major contributor to the country's agricultural and export economy. However, the growing production of these commodities is leading to a decrease in habitat and biodiversity, particularly in areas such as the Atlantic Forest, the Cerrado, and the Brazilian Amazon. This raises the question of how healthier and more environmentally friendly diets can be adopted while preserving the economic security of the agricultural sector. In Kenya cattle are an essential source of sustenance and economic prosperity, particularly for rural populations, yet they are also a significant contributor to environmental degradation. How these animals, which are both culturally and economically significant, should be preserved while minimising their environmental footprint is the question that needs to be answered.

### 4.4 Poverty and food access/insecurity

*Case Study: Urban Poverty and Food Accessibility in Brazil's Favelas*

In Brazil, urban poverty has led to significant challenges in accessing affordable and nutritious food, particularly in the densely populated favelas of cities like Rio de Janeiro. World Food Programme (2022) found that over 55% of households in these areas experience food insecurity due to unemployment and low wages. As urban residents rely heavily on purchasing food rather than growing it, income fluctuations directly affect their access to affordable, nutritious options, with many resorting to low-cost, processed foods that contribute to malnutrition and chronic diseases (WFP, 2022).

The Brazilian Institute of Geography and Statistics (IBGE, 2023) further illustrates how economic hardship limits food choices, leading to high consumption of calorie-dense, low-nutrient foods. This dietary shift has led to a paradox where low-income families face both malnutrition and rising rates of obesity, an issue now recognised as hidden hunger.

*Case Study: Urban poverty and food insecurity in Nigeria*

The Northern Nigeria experienced food poverty because of a series of terror attacks by Boko Haram (Adebayo et al., 2016). The violence and force often used against people, destruction of assets and properties that include farmland disrupt both production and food distribution and trading activities. As a result, the security of access and availability of food for households became threatened. Furthermore, one of the findings of the study was that many farmers abandon their farms in fear of attacks. The study found that physical damage to farms, robberies by insurgents, and several forms of violence against individuals or households in Northern Nigeria statistically increased food poverty. In addition, the insurgency caused 'farmer drain' as youths from the northern region of the country migrated away, contributing to reduced yields and negatively affecting food availability and accessibility.

## 4.5 Food waste and disposal in the presence of institutional governance failure

*Case Study: Food Waste Crisis in Lagos, Nigeria*

A study by Oyelola et al. (2017) realised that food waste and packages constitute more than 68% of total household waste in Lagos. Household food waste in Nigeria is estimated to be 189 kg per capita (the highest globally), approximately 38 million tonnes (UNEP, 2021). Nigeria's food loss and waste is approximately to 40% of the food it produced every year, which is equivalent to 31% of its total land use (Bank, 2020). Only a minute percentage of what households throw away is collected for disposal. According to Kolawole, et al. (2024) most of the waste from food is often dumped in water bodies, in the bush or on the road which attracts mosquitoes, worms, flies and other microorganisms and infectious insects that could transmit diseases in people.

Food waste in Nigeria is driven by multiple factors that include buying more food than is needed for a specific period, inadequate electricity for preserving food efficiently, lack of sufficient knowledge about appropriate preservation methods, preparing more food than the quantity needed for consumption, as well poor storage and transport infrastructure which contribute to food loss and waste at a commercial level (Kolawole et al., 2024).

Ironically, Nigeria experiences food waste alongside persistent food insecurity (Aburime, 2023). Food insecurity is said to be more prevalent in rural regions while high levels of food waste are mainly in urban areas. This disparity highlights a food system that has structural distribution problem as evidenced by the lack of capacity to link surplus food in urban areas with people in need, especially in the rural areas.

*Case study: Illegal toxic waste disposal sites in South Africa*

Dumping or disposing of waste unlawfully is a problem that many communities around South Africa struggle with. It is an issue that can be found predominantly in very poor areas or what is formally called socially disorganised communities. These types of neighbourhoods present economic issues like socioeconomic deprivation, high levels of inequalities, and weak institutional governance, e. According to Niyobuhungiro and Schenck (2021), there exists a common belief in South Africa that the dumping of waste illegally is synonymous with job creation. Residents are often of the belief that dumping waste will result in the creation of employment of people to clean up the affected areas. It is approximated that every year the City of Cape Town municipality spends around R350 million (approximately US$25 million in May 2021) to clear illegal dumping sites (Niyobuhungiro & Schenck, 2021). In addition, the authors also identify that the common causes of illegal dumping include, but are not limited to, increased migration, urbanisation, and fast population growth and on a governance level, the lack of adequate facilities and lack of law enforcement are linked to inefficient and ineffective management of waste.

The result of unlawful waste dumping poses a health hazard to the residents of these respective community members, their well-being and that of the ecosystem. The results of the Niyohubungiro and Schenck (2021) study indicate that illegal dumping is a grave problem that does not seem to have a sustainable solution. Despite all the community's efforts to remove the illegal dumping sites, illegal waste would always be found in the respective sites monitored for research purposes, and on some occasions new sites were formed. The waste that was found in these sites suggests that it is

mostly dumped by spaza shop[4] owners and households. The authors also state that to identify solutions to illegal waste dumping, collaboration between community members and local authorities needs to be established.

## 5. Social and human hazards to be incorporated into One Food Wheel

Human and socioeconomic hazards in food systems discussed above are basically driven by social exclusion and inequality. All human and socioeconomic factors that contribute to disruption in food systems and impede their sustainability and harm the environment and ecosystems should be included into the One Food Wheel. Their integration in the One Food Wheel ensures that they are evaluated to inform decisions on which hazards to prioritise for effective and efficient transformation of food systems.

Assessing the human and socioeconomic hazards using the One Food Risk Tool, or other suitable tools, will help in crafting recommendations to decision makers on the hazards to prioritise. This would be important to inform policy formulation and amendments in the effort to achieve food systems transformation.

## 6. Conclusion

The One Food approach is based on the understanding that hazard control in food systems contributes significantly to human wellbeing and environmental health by minimizing exposure to harmful agents. Hazards that affect food systems include natural hazards (caused by natural phenomena and processes), human-made hazards (emanating from human action or inaction), or a combination of the two. The focus of this report is on the importance of mapping of human and social hazards in food systems. It highlighted the unsustainability of current food systems and the benefits of a One Food approach to help their transformation to attain sustainability. The report discussed the definitions, prioritisation, and mapping of human and socioeconomic hazards and why this is essential for designing resilient food systems.

The report provided an overview of the current food systems, highlighting why they are not sustainable, and provided the motivation for transforming the food systems – to ensure the food and nutrition security, conserve the ecosystems and environment, and safeguard overall human well-being. The meaning of hazards was defined in general and specifically to food systems. The working definition of food systems hazards by the One Food Movement partners includes human and socioeconomic factors as hazards that threated food systems and hinder their transformation to achieve sustainability holistically. The report further discussed hazards prioritisation, highlighting that hazards are prioritised differently depending largely on the power dynamics between people who are vulnerable to hazards and those that have decision making power, resources available to a society and its developmental goals. Because resources are often limited, the problem of hazards are addressed depending on whether a hazard is considered a high priority or a low priority hazard within the food systems.

This report pointed out that biological, chemical, physical, human and socioeconomic hazards hinder the transformation food systems. This derails the ambitions to make production, processing, trade

[4]A spaza shop is “an informal grocery outlet which exists and operates in disadvantaged communities of South Africa where owners depend on makeshift structures to conduct their businesses” (Mukwarami et al., 2018, p. 50)

and distribution, consumption and disposal of food waste sustainable economically, socially, and environmentally. The prevailing challenge with hazards is that they sometimes cannot be eliminated. In such scenarios, the aim would be to minimise their effects. As a result, it is crucial to distinguish between the high-priority and low-priority hazards as hazards cannot be standardised. It is important to acknowledge that hazard prioritisation differs depending on various factors including power dynamics among key actors, cost implications, values and beliefs of decision makers. Finally, the report identified several examples and case studies of human and socioeconomic hazards in food systems. These include lack of knowledge, inadequate education, inequality, and poverty.

## 7. Recommended possible areas for further research

This report explained that multiple human and socioeconomic hazards threaten and disrupt food systems across all the phases of food value chains. The scale of the effect of these hazards on their own or in combination with non-human-induced hazards can be measured using the One Food Risk Tool which asks:

- What are the variations in the effects of human and socioeconomic hazards in food systems?
    - What is the extent of differences in their occurrence, severity and timespan across food value chain phases?
- What is the compounded effect multiple food systems hazards occurring simultaneously?
    - What is the intersectionality of various human and socioeconomic hazards on food systems?
    - What is the combined effect of human and socioeconomic hazards and non-human-induced hazards on economic, social and environmental sustainability in food systems?

Addressing the problems caused by human and socioeconomic hazards requires understanding how they impact on and are impacted by food systems. In addition, inclusion and involvement of people in shaping appropriate interventions and solutions ensures ownership by all and increases uptake. Key questions to ask in this regard are:

- How do different actors in society - individuals, associations and community structures - perceive, evaluate and prioritise food systems hazards?
- How aware are different units of society about socioeconomic and environmental, impacts of human and socioeconomic food systems hazards like food loss and waste, overproduction and unsustainable consumption?
    - What cultural practices promote or hinder sustainable food systems (e.g., traditional agriculture/harvesting methods, food-preparation and consumption practices)?
    - What are the effects of dietary preferences and cultural habits influence food choices, sustainable consumption and food waste?
- What are the barriers to the of adoption sustainable farming innovations, like organic farming, agroecology, and regenerative agriculture?

Human and socioeconomic hazards in systems are mainly driven by social exclusion and inequality. They are driven by broader human and socioeconomic factors like social exclusion and its various forms like inequality, poverty, inadequate knowledge, lack of education and unemployment. This poses the questions:

- What awareness campaigns and educational initiatives can be used to raise awareness of sustainable food systems practices, and where have they been successful?
- Which members of society are most vulnerable to food insecurity and why?
    - How does poverty impact on food security among women, children, low-income earners, migrants, rural populations, urban informal settlements dwellers?
    - What is the effect of gender roles and inequality on women's participation in food systems - production/harvesting, trade and distribution, consumption and food waste?
    - What human and socioeconomic factors hinder some members of society's access to capital, land and decision-making power in food systems?
    - Are there differences between female and male farmers in the use of sustainable farming methods, and why?
- How do economic factors like price volatility, food distribution inefficiencies and infrastructure bottlenecks affect food systems sustainability?
    - What are the effects of market dynamics like monopolies, oligopolies and informal markets on profitability of sustainable food production, fair trade and consumption?
    - How does volatility in food prices affect food access and availability?
    - What barriers do smallholder farmers face in accessing domestic and markets and what are their causes barriers?

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