

Duality of Health Promotion and Sustainable Development - Perspectives on Food Waste Reduction Strategies

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Abstract: *In this article we introduce the concept of duality of structures as our starting point for understanding the linkages between sustainability and health. We argue that the two concepts cannot be separated but must be understood as mutually dependent in the sense that health conditions sustainability and, vice versa, sustainability conditions health. Thus, to avoid unintended, negative effects the strategies directed towards sustainable development must be correlated with strategies for health promotion. The conceptual model is used to take a closer look at the complexities of food waste reduction and how these strategies affect the prospects for promoting health and sustainable food production and consumption. Danish food waste reduction strategies are used as examples with references to selected policy documents on food waste reduction strategies launched by international organisations such as FAO, WHO, and the UN. We conclude that the strategies directed towards reducing food waste ignore the health and sustainability problems related to the oversupply of food. Neither do the Danish proponents of food waste reduction strategies explicitly articulate the built-in option to reduce the supply of food as food waste is reduced. The lack of attention given to reducing the oversupply of food calls for governance initiatives directed towards reducing the overproduction of primary food produce in order to reap the environmental benefits and the health promotion benefits of reducing food waste.*

Key words: *health promotion, sustainable development, duality of structures, food loss and food waste, food security*

Introduction

Food waste has become a topical issue on the global agenda within the last few years. Food waste adds unnecessary environmental and climate impacts as well as health effects aggravating the negative impacts of food production and consumption (FAO, 2011, 2013, 2014). Food waste is an *environmental problem* in the sense that negative environmental effects are associated with the production and consumption of food, and unused food is an unnes-

sary waste of scarce natural resources. Moreover, it is a *health problem* in the sense that it is part of the challenge to securing food supply for all. Reducing food waste is mainly articulated as a question of securing the future supply of food and not using more environmental and natural resources than necessary to feed the global population. Although strategies to reduce food waste are insufficient to meet the future demand for food, a reduction increases the

prospect of securing the supply of food towards 2050 without adding to climate change impacts and environmental degradation. An estimate indicates that halving the food loss and food waste could provide one quarter of the food needed to meet demand by 2050 (Lipinski et al, 2013; FAO 2014). No matter how we understand the issues contributing to food waste, the urgency of the problem calls for an approach that takes into consideration the complexities surrounding food production and consumption and, hence, the conditions that enable or constrain the prospects for meeting the future demand for food. Achieving a sustainable production and consumption of food is closely linked to the ability to sustain a nutritious, healthy diet without unnecessary use of scarce resource. To get a better grasp of the conditions that enable and constrain sustainable food production and consumption we draw on a model of the duality of health and sustainability, including the relationships between the three sustainability pillars (Kjærgård, Land & Pedersen 2014). A duality perspective means that new strategies should integrate sustainable development from a health promotion perspective and health promotion from a sustainable development perspective.

The relationship between health and sustainability has, both within the auspices of the World Health Organization and in scientific circles concerned with health promotion, been an object for discussion for several decades (WHO Europe, 1984). It has been argued that sustainability, understood as environmental sustainability, must be seen as a structural condition for promoting health. It has also been argued that health must be seen as a precondition for sustainable development (Hancock, 1993, 1999; Kickbusch, 2010).

In the conclusions from the first international conference on health promotion in Ottawa, health and sustainability are inseparable, and it was stated:

Our societies are complex and interrelated. Health cannot be separated from other goals. The inextricable links between people and their environment constitutes the basis for a socio-ecological approach to health. The overall guiding principle for the world, nations, regions and communities alike, is the need to encourage reciprocal maintenance - to take care of each other, our communities and our natural environment. (WHO, 1986: p. 405)

Along the same lines, in the 1980s the WHO defined the concept *environmental health* as comprising those aspects of human health and disease determined by factors in the environment (WHO, 1999: p. 210). Here environmental health problems are conceived as being related to the physical interaction of environmental and health factors. Later, in the 1990s, the WHO's approach to the concept of environmental health was widened to encompass social and psychosocial conditions that have an effect on health, arguing that even if it can be difficult to prove a direct correlation between some of the social factors and health, it should not make them any less important in the consideration of environmental health priorities (WHO, 2006). Consequently, the WHO defines environmental health as comprising of:

[T]hose aspects of human health, including quality of life, that are determined by physical, chemical, biological, social and psychosocial factors in the environment. It also refers to the theory and practice of assessing, correcting and preventing those factors in the environment that can potentially affect adversely the health of present and future generations. (Drew, van Duivenboden & Bonnefoy, 2000: p. 34).

This approach implies that improvements or solutions to health problems should be found in the elimination of physical, chemical or biological risk in the environment and in the improvement of the social and psychological environment.

Under the auspices of the UN, in 1987 the Brundtland Commission introduced the concept of sustainable development, emphasising the relationship between development, nature, and the environment. In the report, 'Our Common Future', it is argued that for development to be sustainable it must include aspects of environmental, social, and economic sustainability. Health is mentioned as part of the social sustainability pillar. For development to be sustainable, it must meet essential human needs such as jobs, food, energy, water, and sanitation. The basic human needs are named as: housing, water supply, sanitation and health care (WCED, 1987: p. 55).

In our understanding, the two concepts, health and sustainability, are seen as important in the definition of each, although one, rather than the other, is given precedence in different understandings and conceptualisations. However, there is no guarantee

that health promoting strategies automatically lead to environmental sustainability and vice versa. Consequently, it becomes crucial theoretically to re-assess the interconnectedness between health and sustainability, and to discuss conditions that enable, as well as conditions that constrain, outcomes achieved by thinking about the concepts together in strategies directed towards reducing food waste.

1. Theoretical Reflections on the Mutual Linkages between Health Promotion and Sustainable Development

The concept of sustainable development is more than just sustainability. Whilst sustainability is frequently understood as the properties of, or indicators of, programme implementation, sustainable development is a process towards a new normative horizon and implies a paradigm shift from a development based on inequity and overexploitation of natural resources and environmental services, to one that requires new forms of responsibility, solidarity and accountability (Olsén, Nielsen & Nielsen, 2003; Shiva, 2005; WCED, 1987).

The concept of health is understood in a wider context than health as the absence of disease. Health is part of the dynamics of social organisation, lifestyles, and patterns of consumption and is influenced by the bio-physical environment. Hence, human health is determined by a complex context of the social and the economic system, the bio-physical environment, and the person's individual characteristics and behaviours. Health promotion implies a paradigm shift from an understanding of health as absence of disease (the bio-medical approach) to a socio-ecological understanding of health that focuses on strength, resilience and assets for health (Hancock, 1993, 1999; Kickbusch, 2010; WHO, 1986, 1997, 2010).

As mentioned in the previous section, exploring the relationship between sustainability and health is not a new venture. In 1993 Trevor Hancock developed a theoretical model entitled 'The model of human development' where he discussed the relationship between the two concepts (Hancock, 1993), and later, in 2010, Ilona Kickbusch added an important contribution to this theoretical discussion (Kickbusch, 2010). These contributions are valuable, but as we argued elsewhere (Kjærgård,

Land & Pedersen, 2014) our main inspiration has been the concept of duality.

1.1. *The Duality of Health and Sustainability*

Inspired by Giddens (1984), we have developed the concept *duality of health and sustainability* as a starting point for understanding the two concepts, their mutual relationships and the 'demands' they put on each other to foster a healthy and sustainable future (Pedersen & Land, 2010). According to Giddens' theory of structuration, agents and structures are *not* two independently given sets of phenomena - a dualism, but represent a duality where agents and structures are seen as mutually enabling and constraining phenomena (Giddens, 1984: p. 25). Likewise, we have found it fruitful to conceive of health and sustainability as mutually enabling and constraining phenomena. We do not see health and sustainability respectively as actor and structure in relation to each other. What we have taken from Giddens is his understanding of two phenomena mutually constituting each other. They produce, reproduce or constrain each other. Hence, the concept of duality has inspired us in developing a conceptual framework for the integration of strategies for health promotion with strategies for sustainable development. In addition, analyses based on duality thinking reveal that neither environmental problems nor health problems can be solved without incorporating the relationship between them. Ignoring their mutual relationship may produce unintended consequences. A critical stance towards food waste reduction strategies contributes to knowledge of the unintended effects of strategies directed at food waste reduction by singling out if and how the proponents of food waste reduction strategies takes an integrated approach or gives precedence to one or the other dimension of sustainability as the preferred solution to solve health and environmental problems (Kjærgård, Land & Petersen 2014). We will provide examples of this in the next section. This (conceptual) understanding of the relationship between health and sustainability provides a critical perspective and a lens to explore and contribute to tackling and solving the health and sustainability problems that face societies today, see Figure 1.

By understanding health and sustainability as a duality, health both creates conditions for, and is conditioned by, sustainability understood as economic, social, and environmental sustainability,

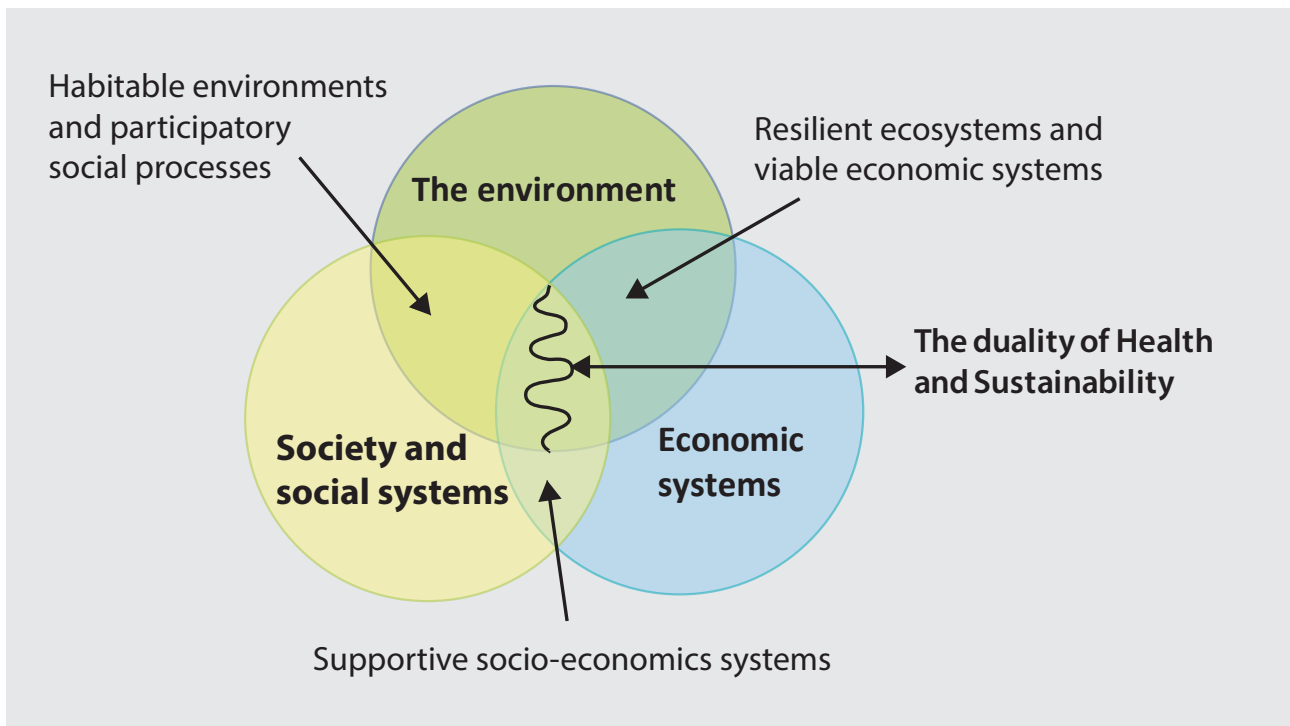


Figure 1: *The duality of health and sustainability model.*

The figure illustrates the duality between sustainability and health and the interaction between environmental, social and economic dimensions of sustainability. The core of sustainability and health is the overlap between the three dimensions of sustainable development. The 'serpent' divide illustrates the endless reconfiguration of health and sustainability. Reworked from Kjærgård, Land & Pedersen (2014).

whilst, on the other hand, sustainability creates and is conditioned by human health. This conceptualisation implies that the demands that health promotion makes on sustainable development must be extended and stated more precisely.

In order to explore the duality between health promotion and sustainable development the relationships between the following factors must be incorporated:

- Habitable environments and social systems based on participatory processes that enable or constrain both health promotion and sustainable development
- Resilient ecosystems and viable economic systems that enable or constrain both sustainable growth and health promotion
- Supportive socio-economics systems that enable or constrain both health promotion and sustainable development.

With this reconceptualisation, health promotion is perceived and discussed in relation to the broad

concept of sustainable development. Within such a realm of understanding, health problems are lifted up to a common social responsibility that exceeds the responsibility of the individual. These arguments will be illustrated through the example of strategies directed towards food waste reduction.

2. Reduction of Food Waste - a Strategy for Sustainable Development and Health Promotion?

In many respects the reduction of food loss and food waste can be viewed as a positive example of a global food strategy aimed at enabling sustainable development and improving public health by securing access to adequate and healthy food. Below we will present a brief overview of some of the root causes underlying the renewed attention given to food security and resource scarcity at both global and local levels. We then highlight the positive and negative effects of local strategies aimed at reducing food waste downstream the food chain, especially food waste stemming from retail and households. Thus, we do not pay much attention to food loss further up the

food chain and, hence, to strategies to reduce loss of food from agriculture, storage, and the processing of food. The reason for selecting food waste further down the food supply chain is that food waste is a critical problem in affluent western societies. The (over)consumption of food in affluent societies has significant impacts on health and sustainable development. As regards the positive and negative effects of local food waste reduction strategies, we will draw on the model of duality of health and sustainability and take a critical look at how the strategies help to promote health and sustainable development, and, in particular, how health and sustainability aspects are articulated in the various strategies.

2.1 Food Loss and Food Waste in a Global Perspective

Food loss and food waste has recently regained a prominent position on the global political agenda (FAO, 2011, 2013, 2014a, 2014b). Reduction of food loss and food waste is articulated as one among other strategies to cope with food security, climate change, and resource scarcity (FAO et al, 2011; Porter et al, 2014).

Around one third of all food produced for consumption is lost or wasted globally (FAO, 2011). Although the estimate of food loss and food waste varies from 10 to 50%, a reduction in food loss and food waste could be a means of feeding more people without more intensive use of the natural resource base and further impairment of climate stabilisation services (FAO, 2014; Lundqvist, de Fraiture & Molden, 2008; Parfitt, Barthelm & Macnaughton, 2010). Food wastage covers food lost by deterioration throughout the food chain and food that is discarded due to expiration of shelf life or left to spoil due to oversupply of markets or individual consumer habits (FAO, 2011). Food loss and food waste incurs societal costs in the form of higher prices on food, adverse health effects and loss of livelihood, and contributes to climate change, soil erosion and degradation, water scarcity, deforestation and loss of biodiversity. As such, food loss and food waste produces negative impacts on the environment and health.

Food security has gained renewed global attention as the first decade of the new millennium witnessed a continued increase in food prices; at the end of the decade aggravated by sudden spikes in food

prices (FAO, 2009; FAO et al, 2011). The volatile food prices have turned food security and possible ways to govern food issues into a top global priority. Food security is likely to be a recurring global policy issue as the rising global population is predicted to require an increase in food production in the range of 60% towards 2050, and as yield and productivity may be affected negatively by the inevitable climate changes predicted (Porter et al, 2014). In a European perspective, a growing share of the food consumed is imported and it is foreseen that obtaining secure food supplies from other regions may be jeopardised by climate change and its possible effects on global food security (EEA, 2014: p. 70).

In the STOA (Science and Technology Options Assessment) report to the European Parliament on 'Technology options for feeding 10 billion people', a larger share of the food waste problem is attributed to European households in comparison to retail and food services, although the synthesis report does not include food loss in agriculture (Underwood et al, 2013). Underwood et al. (2013) address the oversupply of food at the retail level and link it to retailers' interests in achieving lucrative prices and, not least, consumers expectation of diversity and an abundant supply of food products. Consumers' expectations of the permanent availability of all sorts of food are articulated as one of the main causes of oversupply and food waste in the retail sector.

Reduction of food waste is often articulated as a win-win solution or an approach that opens up win-win solutions among global and local actors as it enables a number of the negative effects related to food production and consumption to be addressed (Lipinski et al, 2013). The negative effects include emissions contributing to climate change, direct and indirect effects of land use change (such as reducing the need for taking over virgin or forested land or permanent grassland), eliminating unnecessary waste of resources (including fresh water, fertilisers and pesticides), and the resulting negative effects on biodiversity and environmental efforts such as climate stabilisation.

2.2 Strategies Advanced to Reduce Food Waste in Denmark

A variety of strategies exist for reducing food waste and there are many different actors, ranging from international organisations, the EU, national min-

istries, and NGOs. For example, in Denmark the signatories of the Danish Charter against food waste include a wide range of actors with very different perspectives and interests in the functioning of the food supply chain. Among others, these include the largest food retailers, fast food service providers, the cooperative owned Arla Foods (dairy), meat manufacturers, packaging companies, the Danish Agriculture and Food Council, the Ministry of Food, Agriculture and Fisheries, and the Ministry of the Environment, consumer movements, think tanks, charities, and many others (Miljøministeriet, 2010, 2011a, 2011b). We distinguish between strategies directed at private households, and strategies directed at the retail level. In the following, we will discuss these strategies relative to a duality perspective that involves health promotion and sustainable development issues.

Strategies Directed towards Food Waste in Private Households

The agenda concerning reduction of food waste in households brings together a range of actors, who more commonly stand in opposition to each other when it comes to food production and consumption policies. Thus, in Denmark, a number of organisations representing consumers, agriculture and the industry, and food movements have initiated a study identifying the behaviour of Danish households in respect of food waste, which focuses on what should be done to reduce food waste in households (Tænk, Stop Spild af Mad, Landbrug og Fødevarer, 2012). The report shows that the average household throws away food worth 10,000 Danish kroner each year, corresponding to 1,330 Euro. The study reveals that households want to reduce their food waste on the one hand, but, on the other hand, find it difficult to acknowledge that they themselves contribute to the food waste problem. Moreover, households expect to gain an advantage by assuming the responsibility for reducing their share of the food waste problem. The motivation to act on food waste is linked to financial and time-saving gains. The proposed strategy and the initiatives launched deal with information and advice, especially for young people, and suggest easy solutions that can make a difference to the households' food waste footprint. For example, they highlight the benefits associated with meal planning, both financially and in terms of food waste. Moreover, by publishing web cookbooks on leftovers, Stop Wasting Food and organisations

that represent the food industry have tried to abolish taboos concerning the use of leftovers and to promote an understanding of these as a resources and not just waste (Stop Spild af Mad, 2015c, Arla Foods, 2015).

In 2007 the UK non-profit organisation, WRAP (Waste and Resources Action Programme), launched the campaign *Love Food, Hate Waste* (WRAP, 2015). WRAP works together with industry, local authorities, and retailers on raising awareness of the necessity to reduce food waste and to help households to take action. WRAP wanted to demonstrate that reducing food waste is possible and can be done by everyone (WRAP, 2009). World Watch Institute Europe argues that such efforts have helped cut food waste by 21 per cent since 2007. The UK is the only country in the EU that has achieved such a reduction in food waste (World Watch Institute, 2014). A recent report by WRAP assesses that a food waste reduction of 30% by 2025, from 2007 levels, would be extremely challenging to achieve after having already helped households and post-farm gate businesses to pick the more low hanging fruits (Parry et al, 2014).

As described above, initiatives at the individual household level are primarily articulated as a matter of simple reduction of food waste, and hence better use of food resources (European-Parliament, 2011; Miljøministeriet, 2010; Ministeriet for Fødevarer, Landbrug og Fiskeri, 2011). There is less focus on whether strategies to reduce food waste have an impact on the nutritional content of food, or on how the strategies affect consumers' food intake. The social and the structural conditions for reducing food waste are almost absent in the discussion. We acknowledge that achieving food waste reduction at the household level is possible and may have positive health, as well as environmental impacts. But, we could ask, are the individual households able to fulfill this role? Environmental considerations, or global food security, do not come in as a top priority for most Danish households. Instead, saving money and time are articulated by Danish households as important drivers for reducing food waste. It should be noted that Danish Households spend around 10% of household income on food (EEA, 2014: p. 57) and thus do not have a particular large financial incentive to reduce food waste. So whether strategies at household level can contribute to improving the

global food security situation, and thus be a driver of health promotion and sustainable development, depends on the extent to which these initiatives interact with, and are supported by initiatives at the retail level and further up the food chain, not least at the political level. Reducing food waste at household level requires continued efforts to raise awareness about sustainable and healthy food habits, that is, how to change habits when buying, storing and preparing food and how to maintain routines of good food habits in the long run. As relative food prices tend to decrease, motivations other than saving money must come to the fore. Saving money and time require meal planning at household level and the structural conditions for taking up meal planning are not explicitly addressed. Failing to address the structural conditions for assuming responsibility for reducing food waste may result in temporary activities and initiatives and not the required permanent change of food choices and food behavior at the household level. Structural conditions such as declining relative food prices and renewed economic growth may discourage households from changing behaviour directed at reducing food waste.

Strategies Directed towards Food Waste at the Retail Level

In Denmark, it is estimated that retailers dispose of 303,000 tons of food each year, equivalent to 54 kg of food per capita per year, although the food discarded is suitable for human consumption (Miljøministeriet, 2011a). The amount of food waste in retail is not of the same magnitude as the food wasted by households, but it is more visible, and can easily be collected in large quantities and separated from other types of waste. Thus, there is great potential to reduce food waste at the retail level and a number of initiatives have already been taken.

Many supermarkets in Europe have taken initiatives to reduce food waste by selling food approaching the expiration date at reduced prices. The products are often placed on specific and easily recognisable counters in stores. Yet other supermarket chains have abolished discount on the purchase of large quantities and introduced a uniform price regardless of quantity. Fruits, vegetables, sweets, etc., are sold in bulk or in small portions. This allows consumers to buy the quantity they expect to use before the expiration date and, thereby, to reduce food waste in the household. Again, other supermarket chains sell 'ugly fruit', that

is, 'imperfect' fruit and vegetables, such as curved cucumbers, apples and carrots in various sizes and shapes, at a cost of 20–30% below ordinary prices, and other supermarkets use these products for soups, juice or other ready meals, and sell them at reduced prices. The Ugly Fruits campaign labels 'imperfect' fruits and vegetables with suggestive slogans in order to encourage people to buy imperfect-looking food produce (EU FUSION, 2014).

In a duality perspective these cost reducing initiatives have an environmental, economic and health promoting impact. The use of 'ugly fruit' and the sale of foods approaching the expiration date, which has the same nutritional value as the standardised products, other things being equal, means, first, less food loss and, second, that consumers will be able to buy healthy fresh food at discounted prices. The elimination of volume discounts can have positive health effects by not being an incentive to buy, and eat, larger quantities than the actual needs of the individual household. In a duality perspective, selling fresh food that would otherwise be lost, or selling an oversupply of fresh food at risk of being wasted, at reduced prices provides positive environmental and health effects.

Another approach is reducing food waste by engaging in food redistribution at the retail level. Several supermarket chains cooperate with food movements on the redistribution of oversupply of fresh food, for example, The Danish Food Bank. It is a non-profit organisation that collects food approaching its expiration date from supermarkets and distributes this surplus food — fresh or cooked — to voluntary organisations that support the homeless, crisis centres, and to other socially disadvantaged and socially vulnerable people and, thus, helps to ameliorate poverty. Thus, this strategy results in a predominantly positive synergy between the sustainability and the health perspective. However, it is important to be aware that the sale or donation of food approaching expiration date requires good logistics and rapid redistribution of fresh food to avoid spoilage and, thereof, health hazards. Moreover, it requires special attention to food inspections to avoid the negative unintended consequences of this strategy. As a result of its handling and redistribution of food from retailers, The Danish Food Bank has been awarded an elite smiley¹ by the Danish Food Inspection (fødevareBanken, 2014).

The final example from the retail level is redistribution by engaging in social food supermarkets. Together, Dansk Supermarked (the largest retail company in Denmark) and Dan Church Aid (Folkekirkens Nødhjælp), a non-profit organisation conducting humanitarian aid rooted in the Danish National Evangelical Lutheran Church, plan to open a social supermarket named Refood (Folkekirkens Nødhjælp, 2014). The oversupply of food will be sold 50–70% cheaper than in ordinary supermarkets. The surplus will be donated to Dan Church Aid's work to fight hunger in the global south. This strategy has a slightly different character to that of the Food Bank example described above. The project is directed towards all consumers who want to purchase at low prices or who wish to contribute to reducing food waste.

Reducing food waste by selling surplus food products from retailers in food shops run by volunteers and non-profit organisations, thus offers options for providing less expensive nutritious food to low income households in the global north as well as creating a financial surplus to humanitarian aid to the global south. However, the aid potential depends first and foremost on the level of oversupply of food in Denmark. The more surplus food being sold in Denmark, the more money can be transferred to the global south. Consequently, we see a potential inherent contradiction in the strategy. If the sale of cheap food leads consumers to eat more food or buy more food, it may result in an increase in obesity or, alternatively, an increase in food wasted by households. The latter will shift the burden of the oversupply of food from supermarkets to households. It will be neither healthy nor sustainable. In view of the major problems related to food security and poverty in the global south, this strategy will not contribute to any significant degree to enhancing access or availability of food unless surplus food products are produced and sold in amounts that will have negative consequences in the global north. We would not argue that the strategy should be 'taken off the table', but we find it relevant to point out that it does not solve the fundamental food problem either in the global north nor in the global south.

3. Food Reduction Strategies in a Duality Perspective

In the following we will explore the pros and cons of the Danish strategies directed towards reducing food waste. In particular, we will look at conditions that enable or constrain food waste reduction using the duality of health and sustainability model as a lens.

3.1 The Socio-Economic Dimension

As a starting point we explore the intersection between the social and the economic dimension and ask whether it is possible to identify supportive socio-economic structures that can enable reduction in food waste and give rise to positive sustainability and health-promoting effects. The identified strategies are directed towards reducing food waste at household level, and the behavioural approach is dominant. First of all, the strategies are directed towards providing *information* through campaigns about the appropriate behaviour of households, such as the importance of meal planning and using shopping lists, not buying and preparing more food than is needed or can be eaten, minimising plate waste, and using leftovers. However, information alone is rarely an effective approach to promoting behavioural change. The survey mentioned above showed that Danish households are only willing to make an effort to reduce food waste if it pays off in the form of financial gains or time-savings for the individual household (Tænk, Stop spild af mad, Landbrug og Fødevarer, 2012). Therefore, if households are to become the central agents of change, then this calls for a greater focus on the context of food consumption and the conditions framing choices and actions concerning food waste. By this we refer to the conditions that shape the organisation of everyday life, food and eating culture, and what motivates households to change behaviour and reduce their food waste.

3.2 Habitable Environments and Participatory Social Processes

Next, we explore the intersection between the environment and the social dimension and ask if we have identified habitable environments and participatory social processes that enable reduction in food waste and, thus, contribute positively to health promotion and sustainable development.

The emergence of new food movements dedicated to reducing food waste can be viewed as a positive

driver/impetus for raising awareness among households, for changing the underlying values shaping behaviour, and for taking actions directed towards health and sustainability. In several countries lay people have organised themselves in food movements. In Denmark the social movement, 'Stop Wasting Food', engages in providing knowledge and raising awareness about food waste through events. For example, in the middle of Copenhagen, they fed 6,000 people with excess food. The movement has developed a comprehensive archive on the web, where the extent and consequences of food waste is documented. The movement understands food waste in a broader perspective as it draws attention to the planet's carrying capacity, and to climate change. (Stop Spild af Mad, 2015a, 2015b). The role of providing information through campaigning or making knowledge on food waste accessible through the web should not be downplayed, but information and knowledge is often a weak driver if not supported by other measures. Considering the above mentioned survey of the financial and time-saving motives of Danish households for engaging in the reduction of food waste, information needs to be supplemented with other measures, as reductions in financial costs and time-saving seem to be insufficient to induce a major change in behaviour. Supplementary measures could include structural measures directed at making it easier for households to avoid food waste in the first place, such as the introduction of smaller food packages in retail, the development of intelligent food packaging for enhancing shelf life, food packaging where you can empty half of the food package without opening the entire package, or abolishing discounts on the purchase of large food quantities.

3.3 Resilient Ecosystems and Viable Economic Systems

Finally, we take a closer look at the intersection between the economic and the environmental dimensions and ask whether we can identify conditions that enable or constrain food waste reduction and, hence, contribute to health promotion and sustainable development.

The recent report from IPCC questions the future prospect of a habitable environment or, at least, states the consequences of on-going climate change as a challenge to securing the global supply of food (Porter et al, 2014). The changing climatic conditions

may have a number of negative impacts on yields and the nutritional qualities of the food produced, as well as leading to negative impacts on the natural environment and, hence, affecting living conditions.

In retail, food waste reduction revolves around using the market mechanism as the preferred approach. Market directed strategies include actions that are directed at changing consumers' awareness of quality issues to enhance willingness to buy ugly fruits or food approaching the expiration date — at reduced prices. The market directed approach is closely linked to changing consumers' knowledge about food quality or to providing incentives to change preferences for food quality, understood as a long shelf-life. Apart from market directed approaches aimed at selling 'surplus' food at reduced prices, retailers engage in donating 'surplus' food to charity. Redistribution may reduce food insecurity and add to better nutrition for the vulnerable and the poor and, thus, albeit modest, contribute positively to reducing inequalities in health. From the perspective of the retailers these strategies can generate additional benefits. Avoidance of food waste by selling 'surplus' food at reduced prices may serve as a signal to consumers and investors about a sustainable image, whilst donating the 'surplus' food to charities may provide an altruistic image. Both strategies, selling 'surplus' food at reduced prices and redistributing unsaleable food to charity, reduce the costs of handling and disposal of food waste. At the same time, both discounted prices and redistribution lead to a decrease in the amount of food purchased at full price. How far retailers are willing to go in the direction of donating food to charity rather than selling surplus food at reduced prices is an open question.

A common characteristic of the strategies we have identified is that problems of the oversupply of food are not articulated as inherent to the functioning of the food production chain. The Danish report, 'Feasibility study of food waste', states that:

Avoiding such wastes has the dual benefit of relieving the burden this waste places on the waste management system, and simultaneously means a huge reduction in greenhouse gas emissions by eliminating the initial production of the wasted food" (Miljøministeriet, 2010: p. 11).

However, the oversupply of food is not explicitly addressed in the feasibility study and, in fact, in the Danish section it is only formulated as a means to reduce greenhouse gases and not explicitly as a means to reduce food production. Moreover, the report does not address food loss in primary agriculture (Miljøministeriet, 2010: p. 16). This we interpret as a reflection of the fact that the debate about food waste reduction does not address the free market forces and the financial motives of food producers and retailers. Most actors/proponents understand the agenda on reduction of food waste as a simple win-win situation and do not explicitly take into consideration to whom the benefits accrue, and/or if the benefits are of a magnitude and size constituting an incentive (financial or otherwise) to change values and habits, that is, will enable or constrain the desired action of the affected actor(s). Ignoring the complexities surrounding the drivers of food waste and the conditions enabling change of behaviour, calls for a different or for an even more radical, approach if the goal is to create enabling conditions for reducing food waste.

4. Concluding Remarks

The burden of food waste is mainly articulated as rooted in consumers' preferences for perfect food produce and, not least, inappropriate behaviour by the individual household as regards lack of meal planning, cultural preferences for serving more food than needed or eaten, and for not being aware of how much food is wasted. The responsibility of the retailers is often articulated as a matter of helping households to reduce their food waste by changing food choices from 'pretty' fresh food produce towards acceptance of non-standardised or blemished fresh food produce, changing perceptions as regards the quality of food approaching expiration date, providing options to purchase appropriate amount of food by providing new packaging or portion size, or other initiatives that will allow consumers to adopt a resource saving lifestyle.

An issue underlying the waste reduction strategies articulated by social movements, retailers or regulators is the implicit assumption that the individual household can make a real difference by taking responsibility for food waste reduction by making more sustainable and healthy food choices and changing habits related to purchasing, preparing and

eating food. Food waste reduction in households has become the answer to ethical concerns for enhancing global food security and for reducing negative environmental impacts related to food production.

In the previous section, we described the positive efforts that consumers, social movements, and retailers have made from this perspective to reduce food waste. But we have also questioned how far this approach to food waste reduction can come to grips with the environmental and health problems that our food system will face in the future. Using the duality of health and sustainability model as a lens, we have shown that the solution to the problems faced by society requires a more complex approach to the problem identification. More attention must be devoted to the conditions that condition the food choices and food habits of private households, such as eating culture, access to appropriate food, awareness of the health and environmental impacts of food choices and, not least, a better understanding of the motivation to take responsibility for less wasteful food choices and habits. If food waste reduction strategies are to make a real difference, there is a need for knowledge that goes beyond the narrow income and time gains of households.

However, we would stress that - of the strategies we have observed - the main barrier to achieving a more sustainable and health-promoting food sector lies in the relation between *resilient ecosystems* and *viable economic systems*. Neither the Danish Charter against food waste nor the food waste reducing strategies launched at the retail level explicitly articulate oversupply of food as an underlying concern and a justification for initiating strategies and actions on food waste reduction. Retailers may be aware that a reduction in food waste could potentially result in reduced sales of food. Nevertheless, reduction in the supply of food is not articulated as a goal in itself, nor is it articulated as an intended effect of food waste reduction. The overproduction of food and, thus, the subsequent overloading of the environment, may to some extent be caused by the retail sector itself. For example, to reduce procurement costs and earn extra profit, retailers may acquire more food than is actually needed and, hence, the oversupply of food may be seen as inherent to the functioning of the food retailing market. The oversupply of food, induced by retailers profit calculations, seems to be more or less ignored in comparison to wasteful food choices

and habits by households. As long as the oversupply of food is not articulated as part of the food waste reduction agenda, the potential positive effects on the environment and the climate are articulated explicitly as the *raison d'être* of food waste reduction. These positive effects are only possible if food production is reduced. Alternatively, food production could be increased with no further negative effects on the environment and the climate.

In summary, we argue that if food waste reduction is to play a vital role in securing an adequate and nutritious diet for a growing global population, then the duality model draws attention to the complexities underlying food security and healthy food consumption. Moreover, it provides insight into how the strategies directed towards reducing food waste narrow the agenda to an issue about selling surplus food at reduced prices or making households responsible for the public bad related to food production, retail and consumption. Widening the agenda and taking a more radical approach to wasted food, the proponents of waste reduction ought to consider the economic, social, as well as environmental dimensions of sustainability and health. The oversupply of food and the inherent functioning of the food chains require a more integrated approach to be taken to food waste. Despite all the good intentions, the economic dimension takes precedence over the environmental, social and health promoting dimensions in the food reduction strategies studied. This finding leads to a call for a rethinking of strategies directed at reducing food waste at both the structural level and the level of affected actors.

Notes

- 1 An elite smiley is a label companies receive for being among the best performers as regards complying with the rules related to food safety (Fødevarestyrelsen, 2012).

References

- Arla Foods. (2015) *Rester – Restemad* (Leftovers – Recipes with Leftovers). [Online] Available from: <http://www.arla.dk/opskrifter/temaer/rester/> [Accessed 18th November 2014]
- Drew, C. H., van Duivenboden, J. & Bonnefoy, X. (2000) *Environmental Health Services in Europe 5 — Guidelines for Evaluation of Environmental Health Services*. WHO Regional Publications, European Series, No. 90, WHO Europe. [Online] Available from: http://www.euro.who.int/_data/assets/pdf_file/0003/98292/E71502.pdf [Accessed 15th December 2015]
- EEA. (2014) *Environmental Indicator Report 2014 — Environmental Impacts of Production-Consumption Systems in Europe*. (Lead Authors: Reichel, A., Mortensen, L. F., Asquith, M. & Bogdanovic, J. EEA (European Environment Agency). [Online] Available from: <http://www.eea.europa.eu/publications/environmental-indicator-report-2014>, [Accessed 15th December 2015]
- EU FUSION. (2014) *News*, EU FUSIONS. [Online] Available from: www.eu-fusion.org [Accessed 18th November 2014].
- European Parliament. (2011) *Report on How to Avoid Food Waste: Strategies for a More Efficient Food Chain in the EU* (2011/2175 [INI]). Committee on Agriculture and Rural Development, 30 November 2011. (Rapporteur: Salvatore Caronna). [Online] Available from: <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+REPORT+A7-2011-0430+0+DOC+XML+V0//EN> [Accessed 15th December 2015].
- FAO. (2009) *How to Feed the World in 2050*. High-Level Expert Forum, Rome 12–13 October, Issues Briefs. [Online] Available from: http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf [Accessed 15th December 2015].
- FAO. (2011) *Global Food Losses and Food Waste — Extent, Causes and Prevention* (authored by Jenny Gustavsson et al.) FAO Rome. [Online] Available from: <http://www.fao.org/docrep/014/mb060e/mb060e00.pdf> [Accessed 15th December 2015].

- FAO, IFAD, IMF, OECD, UNCTAD, WFP, the World Bank, the WTO, IFPRI and the UN HLTF. (2011) *Price Volatility in Food and Agricultural Markets: Policy Responses*, 2 June 2011. [Online] Available from: <http://www.oecd.org/tad/agricultural-trade/48152638.pdf> [Accessed 15th December 2015].
- FAO. (2013) *Food Wastage Footprint: Impacts on Natural Resources. Summary Report*. [Online] Available from: <http://www.fao.org/docrep/018/i3347e/i3347e.pdf> [Accessed 15th December 2015].
- FAO. (2014a) *Global Initiative on Food Loss and Waste Reduction. Save Food Initiative*. [Online] Available from: <http://www.fao.org/3/a-i4068e.pdf> [Accessed 15th December 2015].
- FAO. (2014b) *Mitigation of Food Wastage — Societal Costs and Benefits*. Food Wastage Footprint (FWF) is a project led by Nadia El-Hage Scialabba, Climate, Energy and Tenure Division. [Online] Available from: <http://www.fao.org/3/a-i3989e.pdf> [Accessed 15th December 2015].
- fødevarerBanken. (2014) *Fødevarerikkerhed*. [Food Safety]. foodBank. [Online] Available from: <https://foedevarebanken.dk/om-os/foedevaresikkerhed.htm> [Accessed 5th December 2014].
- Fødevarestyrelsen. (2012) *Om Elite-Smile og Offentliggørelse* [About Elite-Smile and Making it Public]. Ministry of Food, Agriculture and Fisheries. [Online] Available from: <http://www.foedevarestyrelsen.dk/Publikationer/Alle%20publikationer/2012288.pdf> [Accessed 15th December 2015].
- Folkekirkens Nødhjælp. (2014) *Ny Butik på vej med Overskudsmad* [Dan Church Aid. New shop being set up with surplus food]. [Online] Available from: <https://www.noedhjaelp.dk/nyheder/seneste-nyt/ny-butik-paa-vej-med-overskudsmad> [Accessed 2nd September 2014].
- Giddens, A. (1984) *The Constitution of Society*. London, Polity Press.
- Hancock, T. (1993) Health, human development and the community ecosystem: Three ecological models. *Health Promotion International*, 8 (1), 41–47.
- Hancock, T. (1999) Health care reform and reform for health: Creating a health system for communities in the 21st century. *Futures*, 31, 417–436.
- Kickbusch, I. (lead author) (2010) *Triggering Debate — White Paper: The Food System — A Prism of Present and Future Challenges for Health Promotion and Sustainable Development*. Health Promotion Switzerland. [Online] Available from: <http://www.scp-knowledge.eu/sites/default/files/knowledge/attachments/WhitePaper.KickbuschIlona.HPS.pdf> [Accessed 15th December 2015].
- Kjærgård, B., Land, B. & Pedersen, K. (2014) Health and sustainability. *Health Promot. Int.* [Online] 29 (3), 558–568. (First published online: January 8, 2013). Available from: <http://heapro.oxfordjournals.org/content/29/3/558> [Accessed 15th December 2015].
- Lipinski, B., Hanson, C., Lomax, J., Kitinoja, L., Waite, R. & Searchinger, T. (2013) Reducing Food Loss and Waste, Installment 2 of ‘Creating a Sustainable Food Future’. *World Resources Institute, Working Paper*, 1, May 2013. [Online]. Available from: http://www.unep.org/pdf/WRI-UNEP_Reducing_Food_Loss_and_Waste.pdf [Accessed 15th December 2015].
- Lundqvist, J., de Fraiture, C. & Molden, D. (2008) *Saving Water: From Field to Fork – Curbing Losses and Wastage in the Food Chain*. SIWI Policy Brief. SIWI. [Online] Available from: http://dlc.dlib.indiana.edu/dlc/bitstream/handle/10535/5088/PB_From_Filed_to_Fork_2008.pdf?sequence=1 [Accessed 15th December 2015].
- Miljøministeriet. (2010) *Forundersøgelse af Madspild i Danmark* [Feasibility study of food waste in Denmark]. Miljøprojekt nr. 1325, Danish Ministry of the Environment. [Online] Available from: <http://www2.mst.dk/udgiv/publikationer/2010/978-87-92617-88-0/pdf/978-87-92617-89-7.pdf> [Accessed 15th December 2015].
- Miljøministeriet. (2011a) *Charter om Mindre Madspild* [Charter against food waste]. Danish Ministry of the Environment. [Online] Available from: http://www.mindremadspild.dk/files/media/documents/charter_om_mindre_madspild.pdf [Accessed 15th December 2015].
- Miljøministeriet. (2011b) *Katalog over idéer til initiativer til begrænsning af madspild*, Notat af 9. juni 2011 [Catalogue with ideas for initiatives directed at food waste, Memo No 9]. Danish Ministry of the Environment. [Online] Available from: http://www.mindremadspild.dk/files/media/documents/mindremadspild_idekatalog_150611.pdf [Accessed 15th December 2015].

- Ministeriet for Fødevarer, Landbrug og Fiskeri. (2011) *Madspild, om at Udnytte Ressourcerne Bedre* [Food waste: about better use of resources]. Ministry of Food, Agriculture, and Fisheries. [Online] Available from: <http://fvm.dk/foedevarer/indsatsomraader/madspild/> [Accessed 15th December 2015].
- Olsén, P., Nielsen, B. S. & Nielsen, K. Aa. (2003) *Demokrati og Bæredygtighed - Social Fantasi og Samfundsmæssig Rigdomsproduktion* [Democracy and Sustainability - Social Creativity and Social Wealth Production]. Roskilde Universitetsforlag.
- Parfitt, J., Barthelm, M. & Macnaughton, S. (2010) Food waste within food supply chains: quantification and potential for change to 2050. *Philos Trans R Soc Lond B Biol Sci.*, 365 (1554), 3065–3081.
- Parry, A., LeRoux, S., Quedsted, T. & Parfitt, J. (2014) *UK Food Waste — Historical Changes and How Amounts Might be Influenced in the Future, Final Report — Executive Summary*. WRAP. [Online] Available from: <http://www.wrap.org.uk/node/29936> [Accessed 15th December 2015].
- Pedersen, K. B. & Land B. (2010) Health, food and sustainability. In: Nielsen, K. Aa., Elling, B., Figueroa, M. & Jelsø, E. (eds.) *A New agenda for sustainability*. UK, Ashgate, pp. 251–269.
- Porter, J. R., Xie, L., Challinor, A. J., Cochrane, K., Howden, S. M., Iqbal, M. M., Lobell, D. B. & Travasso, M. I. (2014) Food security and food production systems. In: Field, C. B., Barros, V. R., Dokken, D. J., Mach, K. J., Mastrandrea, M. D., Bilir, T. E., Chatterjee, M., Ebi, K. L., Estrada, Y. O., Genova, R. C., Girma, B., Kissel, E. S., Levy, A. N., MacCracken, S., Mastrandrea, P. R. & White, L. L. (eds.) *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. Cambridge, UK and New York, USA, Cambridge University Press, pp. 485–533.
- Shiva, V. (2005) *Earth Democracy: Justice, Sustainability, and Peace*. London, Zed Books Ltd.
- Stop spild af mad. (2015a) *Hvorfor bør man mindske madspild?* [Why one should avoid food waste]. Stop Wasting Food movement Denmark. [Online] Available from: <http://www.stopspildafmad.dk/hvorfor.html> (accessed 15th December 2015)
- Stop Spild af Mad. (2015b) *Madspil i Tal* [Food waste facts]. Stop Wasting Food movement Denmark. [Online] Available from: <http://www.stopspildafmad.dk/madspildital.html> (accessed 15th December 2015)
- Stop Spild af Mad. (2015c) *Opskrifter og råd om restemad, retter med madrester samt redskaber til mindre madspild* [Recipes and advice on leftovers, recipes with leftovers and instruments to reduce food waste]. Stop Wasting Food movement Denmark. [Online] Available from: <http://www.stopspildafmad.dk/opskrifterograad.html> (accessed 15th December 2015)
- Tænk, Stop af madspild, Landbrug og Fødevarer. (2012) *Undersøgelse af danskernes madspildsadfærd, forandringspotentialer og anbefaling til tiltag*, [Survey of the Danes food waste behavior, change potentials and recommendations for action]. The Danish Consumer Council Think, Stop Wasting Food, Danish Agriculture and Food Council [Online] Available from: <http://taenk.dk/sites/taenk.dk/files/madspildsrapport.pdf> [Accessed 15th December 2015].
- Underwood, E., Baldock, D., Aiking, H., Buckwell, A., Dooley, E., Freluh-Larsen, A., Naumann, S., O'Connor, C., Poláková, J. & Tucker, G. (2013) *Technology Options for Feeding 10 Billion People*. Synthesis Report: Options for sustainable food and agriculture in the EU, IP/A/STOA/FWC/2008-096/Lot3/C1/SC10, November 2013. [Online] Available from: http://www.ecologic.eu/sites/files/publication/2014/stoa-feeding-10-billion-people-ipol-join_et2013513539_en.pdf [Accessed 15th December 2015].
- WCED. (1987) *Our Common Future*. World Commission on Environment and Development. Oxford University Press, Oxford
- WHO Europe. (1984) A discussion document on the concept and principles of health promotion. Copenhagen, 9–13 July 1984. In: WHO. (2009) *Milestones in health promotion – Statements from global conferences*, World Health Organization. [Online] Available from: http://www.who.int/health-promotion/Milestones_Health_Promotion_05022010.pdf [Accessed 15th December 2015].
- WHO. (1986) *Ottawa Charter for Health Promotion*. WHO Regional Office for Europe, Copenhagen. Health Promot. Int., 1 (4), 405.
- WHO. (1997) *Sustainable development and health: Concepts, principles and framework for action for European cities and towns*. European Sustainable Development and Health Series, No 1. Charles Price, Editor. Published by the WHO Regional Office for Europe, Copenhagen 1997

- WHO. (1999) *Health 21: the health for all policy framework for the WHO European Region*. Copenhagen, WHO Regional Office for Europe (European Health for All Series, No. 6), http://www.euro.who.int/_data/assets/pdf_file/0010/98398/wa540ga199heeng.pdf?ua=1 [Accessed 15th December 2015].
- WHO. (2006) *Environment and health – An international concordance of selected concepts*. WHO Europe. Edited by Frank Theakston,
- WHO. (2009) *Milestones in Health Promotion - Statements from Global Conferences*. World Health Organization, http://www.who.int/healthpromotion/Milestones_Health_Promotion_05022010.pdf
- WHO and the Government of South Australia. (2010) The Adelaide statement on health in all policies — Moving towards a shared governance for health and well-being. *Health Promotion International*. [Online] 25 (2), 258–260. Available from: <http://heapro.oxfordjournals.org/content/25/2/258.extract> [Accessed 15th December 2015].
- World Watch Institute. (2014) *Highlight of the Month: British NGO Takes Lead in Fighting Food Waste*. May 2014. [Online] Available from: <http://www.worldwatch-europe.org/node/244> [Accessed 15th December 2015].
- WRAP. (2009) *Household food and drink waste in the UK*, written by T. Quested, R. Ingle, and A. Parry, [Online] http://www.wrap.org.uk/sites/files/wrap/Household_food_and_drink_waste_in_the_UK_-_report.pdf [Accessed 15th December 2015].
- WRAP. (2015) *Love Food Hate Waste*. [Online] <http://www.wrap.org.uk/sites/files/wrap/Love%20Food%20Hate%20Waste%20Retailer%20Introduction.pdf>. [Accessed 23rd February 2015].