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## CORPUS Discussion Paper 3 on Scenario Development for Sustainable Food Consumption

CORPUS – Enhancing the Connectivity between Research and Policy-making in Sustainable  
Consumption

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# 1 Executive summary

Over the last few decades, considerable changes in food consumption – such as eating habits, dietary changes, availability and accessibility of food – have taken place. These are mainly due to an increase in productivity of the food sector, a greater diversity in product choices and a decrease in seasonal dependency due to global trade and storage and process technology. On the demand side, relatively high and stable incomes combined with low food prices have increased accessibility, availability and affordability of a highly diverse food supply. Yet, according to the FAO, total food production will have to increase by up to 70% in order to feed the growing population projected to be around 9 billion people by 2050 with the largest increase in low-income countries. It will be a huge challenge for agriculture to meet this growing demand in a sustainable way. Besides global population increase other driving forces can also be identified as having particular importance, namely: changes in diets and subsequent health problems, rising level of urbanisation, environmental impacts and (future) governance of the food system.

The food system is a complex socio-ecological system surrounded by unpredictable events and uncertainties, especially on long-term horizons such as 25-50 years ahead. In order to deal with these uncertainties, complexities and long-term challenges as well as to influence developments pro-actively, scenario planning is increasingly applied in both policy making and knowledge brokerage. Scenarios can reveal uncertainties, can help prepare for unexpected changes and highlight crucial decisions to be taken today. Scenarios can offer a clearer picture of the present and visions for the future, can help to identify key driving forces and their trends as well as assess potential outcomes of different policy paths.

The intention of this discussion paper is to provide background information to the third CORPUS “Policy meets Research” workshop on sustainable food consumption as part of the CORPUS project. The paper provides a short summary on the use of scenarios in evidence-based policy making in general as well as in the context of the CORPUS project. Moreover, it reviews recent examples of scenario building approaches in the sustainable food domain. The potential roles and applications of different types of scenarios such as backcasting or quantitative models and their benefit for policy making are discussed.

Based on prior research on key challenges and driving forces of sustainable food consumption and guided by the discussions held in the two earlier CORPUS workshops, the focus is on the following strategies and visions:

- a diet with a higher proportion of vegetables
- 80% organic food in all public procurement
- shorter distance and closer relations between producers and consumers
- community gardens and urban gardening
- food trade placed in local squares
- energy conscious and efficient food consumption.

## 2 Introduction and background

The present paper builds on Discussion Paper 1 (Reisch et al., 2010), which introduced a number of concepts, definitions and actors, as well as facts and trends in identified problem areas related to sustainable food consumption. It also builds on Discussion Paper 2 (Reisch et al., 2011) which discussed policy instruments and assessment tools to promote sustainable food consumption. All three discussion papers complement each other. As these papers are conceptualized as brief overviews, they cannot provide the extensive, in-depth coverage that these important issues deserve.<sup>1</sup>

The intention of the present discussion paper is threefold: first, to explain the use, merits and limits of scenario building as a policy tool in general; second, to give an overview of recent scenario studies on sustainable futures in the food sector; and third, to explain how scenario building is used in the CORPUS project in general and in the 3<sup>rd</sup> “Policy meets Research” workshop<sup>2</sup> specifically. The “questions for discussion” raised in the text intend to initiate discussion, raise further questions and stimulate exchange of ideas among the participants of the CORPUS workshops and beyond.

### 2.1 Scenario building as a policy tool

Scenario development evolved as a strategy tool originally applied in military planning, developed by Herman Kahn and his colleagues at the RAND Corporation (van der Heijden et al., 2002). First generation of scenarios, developed in 1950s, were mainly statistical predictions (Slaughter, 2005). In the 1970s, a second wave of scenarios began to receive attention by corporate planners at Shell and General Electric who noted the deficiencies of forecasts as these often proved to be incorrect especially in the long run. Another well-known example of scenarios in the second wave is the Limits to Growth report to the Club of Rome in 1972. In the 1980s, a new, third generation of scenarios were developed in the context of sustainability challenges. These recognized the need for societal and structural changes, a transition in order to find the way to a more sustainable future as well as new methods for explorations of the future (Sondeijker, 2009).

There are various *definitions* of scenarios and scenario development but there is a general agreement that scenarios are *not* predictions or projections (Rotmans et al., 2000; van Notten et al., 2003). Scenarios rather describe alternative images of the future with the assumption that future developments are unpredictable and stress the need to take uncertainty into account in decision making. Van Notten (2005, p. 2) proposes a definition that covers most aspects of the various approaches around the definition of scenarios:

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<sup>1</sup> All material prepared for the three CORPUS workshops (i.e., discussion papers; knowledge units; cases and examples; links to data sources, projects and websites; information on latest literature and new policy reports; the documentations of all the workshops) is available on the CORPUS website ([Hhttp://www.scp-knowledge.eu/H](http://www.scp-knowledge.eu/H)) in the “food” domain.

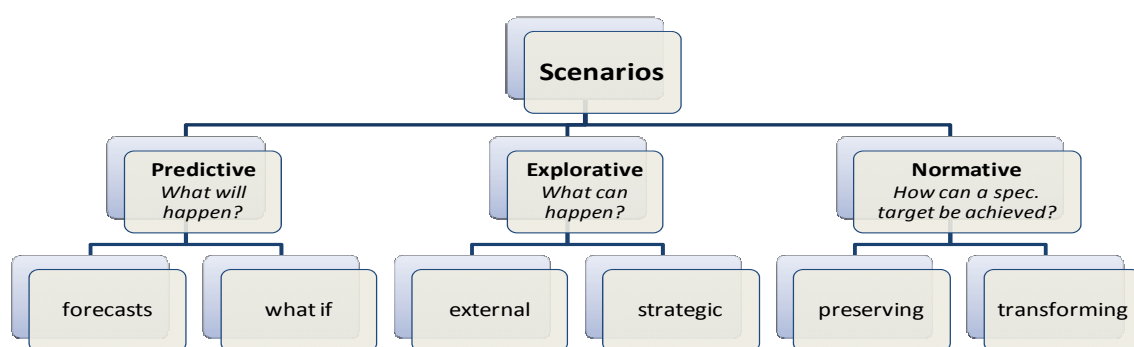
<sup>2</sup> The third and final CORPUS “Policy Meets Research” workshop with a focus on “Scenarios for sustainable food consumption” takes place in Vienna, Lebensministerium, on May 12-13, 2011.

“Scenarios are consistent and coherent descriptions of alternative hypothetical futures that reflect different perspectives on past, present, and future developments, which can serve as a basis for action”.

Several *typologies* of scenario characteristics have been proposed (e.g. Slaughter, 1988; Tapio & Hietanen, 2002; van Notten, 2003; Dreborg, 2004; Borjeson et al., 2005). Borjeson and colleagues (2005) developed a typology proposing three general types of scenario approaches: predictive, explorative and normative:

1. Projections with *predictive* scenarios answer the “What will happen?” question. These forecasts and “what-if” scenarios are predominantly quantitative and are hence particularly challenged by uncertainty in the long term.
2. *Exploratory* scenarios answer the “What can happen?” question. They are typically qualitative and aim to explore plausible futures and develop a set of scenarios on a long time horizon in order to allow structural changes. Exploratory scenarios can be divided into external and strategic scenarios: *External* scenarios focus on factors that cannot be controlled by the actors. In case of *strategic* scenarios, policies are included and tested, aiming to describe possible outcomes of strategic decisions.
3. *Normative* scenarios answer the question: “How can a specific target be reached?”. There are two types: In *preserving* scenarios the targets can be reached without transformation in an efficient way; they mainly work with optimising modelling or in qualitative way. If structural changes are needed in the system, *transforming* scenarios have to be used, such as “backcasting”; these typically result in a number of images or visions of the future illustrating how specific outcomes or a certain target can be reached.

**Figure 1: Typologies of scenarios**



Source: Borjeson et al., 2005

Contemporary scenario development and techniques are used in a wide range of contexts and in different organisational settings from corporate planning to public policy assessment. As scenario development is applied to respond to different challenges and developments, the methods and techniques used vary according to the nature of change addressed (for a detailed review see Bishop et al., 2009).

Scenarios are increasingly used to respond to and influence development (Sondeijker, 2009), to discover uncertainties, to prepare for unexpected changes and to “highlight crucial decisions that should be taken today” (Mutombo & Bauler, 2009, p. 1). Scenarios are expected to serve a wide range of functions in both policy making and knowledge brokerage. In particular, they can help to (van der Heijden, 1996; 2000; van Notten et al., 2003; Borjeson, 2006):

- get a more accurate picture of the present and identify uncertainties; through analysing different policy strategies via scenarios, decision makers are able to assess the differing outcomes and the key driving forces that influence those outcomes;
- improve policy strategies; different scenarios can describe the probable results of different actions and policies;
- discover existing problems or emerging, uncertain aspects of the future, identify opportunities and threats and explore possible ways to respond to these;
- enhance consensus building and increase the level of social learning, which is particularly the case for participatory scenario-planning processes through public and stakeholder participation in the formulation and evaluation of scenarios.

As regards methodological approaches of scenario development, the literature distinguishes between *desk research*, *model-based* and *participatory approaches* (van Notten et al., 2005). Participatory methods mainly work with stakeholder workshops, focus groups, citizens’ juries and envisioning workshops to reach specific aims: Through public, expert and stakeholder participation, scenarios can broaden the perspective, information can be collected from a wide range of disciplines and can be both challenged and integrated (Rotmans, 1998) linking scientific knowledge and political decision-making (Millenium Ecosystem Assessment, 2005). Moreover – and of increasing political importance – public and/or expert involvement in scenario formulation and evaluation can increase legitimacy and acceptance of visions and political decisions among participants and beyond (Quist, 2009).

Questions to discuss:

- *Target group and goals*: For whom should scenarios be designed (decision makers, researchers, community)? What types of scenarios are the most “user-friendly” among different groups of “scenario users”? What is the use and purpose of different future studies for different groups of users?
- *Scope*: What should be the focus and depth of scenario building: In-depth focus on the food system itself or rather focusing more in context of a sustainable food system?
- *Methods*: What should be the “ratio” between model-based and more qualitative scenario building in evidence based policy making?
- *Participation*: On what level and in what form is participation most effective in scenario building? When do we see participatory scenario building as successful?



## 2.2 Driving forces and expected future developments in sustainable food consumption

There have been considerable changes in food consumption – such as eating habits, dietary changes, nature and quantity of food – over the last few decades mainly due to an increase in agricultural productivity, greater diversity, and less seasonal dependency. Through falling food prices and rising incomes, food has become more affordable in many parts of the world. Yet, while there have been significant improvements in decreasing undernourishment globally (Alexandratos, 2006), there are still countries where calorie intake has declined. Due to the food price spike in 2008/2009 the share of people suffering hunger has grown. According to FAO (Alexandratos, 2006), food production has to increase by up to 70% in order to feed the growing population projected to be around 9 billion people by 2050 with the biggest increase in low-income countries (Africa is projected to double its population by 2050). It is a huge challenge for agriculture to meet this *growing demand for food* in a sustainable way. Other important future challenges are: nutrition transition, diet related health problems, food related uncertainty and distrust, rising level of urbanisation, environmental impacts and (future) governance of the food system (see Discussion Paper 1, Reisch et al., 2010).

Currently, half of the world population lives in urban areas (UNFPA, 2010) and urban populations are expected to reach 6.3 billion in 2050 (UNPD, 2009) with most significant increases in developing countries. *Rapid urbanisation* has severe effects on food consumption patterns. In a comparison of rural and urban diets, urban population shows a higher intake of calories, fat, animal protein, sugar and prepared food (Popkin, 2004) which is mainly due to an increase in convenience food and out-of-home consumption (The Government Office for Science, 2011a). This is exacerbated by excessive food advertising by the food industry (The Government Office for Science, 2011b) and by rising income levels resulting in decreased relative consumer expenditure on food (EEA, 2005). A related challenge is *nutrition transition* that reflects *changes in diet* – characterized by higher intake of meat, sugar, saturated fat, salt and low consumption of vegetables and fruits –, lower level of physical activities and related health problems. Nutrition transition describes a shift from undernourishment to nutrition-related noncommunicable diseases (NR-NCDs) such as obesity or cardiovascular diseases, diabetes and cancer (Popkin, 2004). The trend towards higher consumption of fish and meat is expected to continue; for meat estimates are a rise from 37 kg to 52 kg per person per year by 2050 (Alexandratos, 2006).

Along with obesity, *malnutrition* – referring to both under- and overnourishment – is a growing concern in the highest socioeconomic status categories in low-income countries and in socially and economically disadvantaged groups of society (SES) in industrialised countries (Popkin, 2002) especially of the urban population. Mainly affected groups are the elderly, children, poor and sick people. Malnutrition concerns the amount and type of food intake and describes a situation of imbalance between supply and demand of nutrients and energy needed to maintain different functions of the human body and to ensure normal growth (WHO, 1996). Malnutrition occurs predominantly in so-called „food deserts“: areas of relative exclusion where people experience physical and economic barriers to accessing healthy foods (Reising & Hobbiss, 2000, p. 138).

Another challenge to tackle is that consumers are increasingly uncertain and distrustful of food suppliers. This is mainly due to recent and reoccurring food scares in Europe and the *growing distance between consumers and producers*. Substantial changes are observable in future gov-

*ernance of the food system* at both national and international levels. Due to the concentration of food processing, distribution and retailing price competition has become enormous (see Discussion Paper 1, Reisch et al., 2010). A limited number of transnational corporations control food retail sales. According to the Foresight report „The Future of Food and Farming“ (The Government Office for Science, 2011a), this trend may slow down when new companies from emerging economies enter the markets. Hence, it will be of major importance how production subsidies, trade restrictions and other market interventions will develop in the future.

See KU on  
'Food system'

*Emerging environmental problems* such as climate change, land degradation, loss of biodiversity, accelerating global energy and water demand are closely linked to food production, consumption and distribution. Major contributors to environmental problems are water used for production, use of fertilizers (with impacts on groundwater, soil and air), intensification of production (and hence loss of agro-biodiversity), increasing food miles and food waste. To date, it is an actually unsolved puzzle how markets will be able to meet the growing food demand without unduly compromising environmental quality. Alternative forms of regional, local and urban food production, distribution and consumption, changes in diets towards less meat and more veggies as well as a move towards organic farming are strategies worth exploring.

Questions to discuss:

- *Drivers*: How will the above (and all the other) drivers develop in the coming decades? How will they interact with each other? How will they affect the (un)sustainability of the food system?
- *Goal conflicts*: What are the trade-offs between the different goals and aims – food security, environmental concerns, etc – in envisioning sustainable food futures?
- *Systems view*: What changes would occur in the food system if one of the variables is changed (e.g., more organic food)? How would the food system respond to drastic changes or crisis in any of the above areas (food scares, energy crisis etc.)?
- *Governance*: How do we envision future food governance? How does it affect volatility, global and local developments?
- *Glocalization*: How do global developments and local preferences interact?

### 2.3 The focus of the 3<sup>rd</sup> CORPUS Workshop

The food system is a complex socio-ecological system surrounded by unpredictable events and uncertainties, especially on long-term horizons such as 25-50 years. In order to deal with uncertainties, complexity and long-term challenges, scenario planning is increasingly applied (Raskin et al., 2002). As described above, scenarios can either be descriptive models or normative narratives about different paths that might be taken in the future. These two approaches are often applied together resulting in qualitative storylines backed up by quantitative, model-based data.

Reflecting the key challenges of sustainable food consumption, the following issues were chosen by the CORPUS project team to be given special attention in the 3<sup>rd</sup> CORPUS workshop:

- A diet with a *higher proportion of vegetables* (and less meat and animal protein) cannot only be regarded as a healthier choice but it also reduces the environmental impact of food consumption.

- *Alternative food networks* (AFNs) and *short food supply chains* (SFSCs) include schemes such as community gardens, vegetable boxes, farmers' markets and community supported food trade. These are often defined by organic, fair trade or local quality food. Special focus should be given on the following topics:
  - Shorter distance and closer relations between producers and consumers
  - Community gardens and urban gardening
  - Food trade placed in local squares
- *Public procurement* with the aim of "80% organic food" by changing food procurement strategies the public sector.
- Conscious and *energy efficient* food consumption<sup>^</sup>.

See KU on 'Community based Food Initiatives in the UK'

See KU on 'Public procurement of sustainable

This a priori focus does and should not, however, exclude alternative visions or strategies to be brought up in the workshop.

### 3 Scenarios for sustainable food futures: examples and studies

The past decade has seen quite a number of studies investigated the future of the global food system (Reilly & Willenbockel, 2010). They are using mainly long-term model based simulations or participatory backcasting. This chapter provides a brief overview of a few recent national and international scenario exercises in the sustainable food domain, starting from micro regions and national to European and global scenario studies and examples. Table 1 provides a condensed overview.

#### *Gothenburg 2050 (2002)*

The Gothenburg 2050 project (to be found at the "Goteborg 2050" website) developed a three step scenario building method through the use of backcasting: The first step is an analysis on the current state of society and of current trends. Secondly, criteria for a sustainable city in a sustainable society are developed and finally images of the future are envisioned through participatory workshops. At the last stage of the project these visions are compared to current situation and trends and are used to set up "guidelines for change". The backcasting method has five features for sustainable food scenarios:

- Sustainable and locally produced food
- A diet with a higher proportion of vegetables
- Shorter distance and closer relations between producers and consumers
- Food trade placed in local squares
- Conscious and energy efficient consumption

The Gothenburg project was quite successful in engaging stakeholders and raising awareness of the different topics listed above. However, the project has not yet managed to secure policy decisions. Not surprisingly, it seems to be a difficult tradeoff between allowing participants maximum freedom in developing future scenarios and translating the outcomes of backcasting directly into policy decisions. One learning is that in scenario building it is important to distinguish

between short-term actions and longer term objectives – the latter should inform short-term decisions but do require a longer time to implement.

*From environmental concerns towards sustainable food provisioning (2011)*

Risku-Norja (2011) has developed a scenario model for a Finnish micro region. This model focuses on ecological sustainability of primary production with the aim to explore the possibilities to reach ecological sustainability in agriculture by using the material flow approach and scenarios. One learning of the study is that food consumption scenario methods differ according to geographical areas since environmental impacts of production and consumption are strongly linked. The indicators are not universal and the information they provide is not comparable across different regions; hence, it has to be interpreted in the area-specific context. However, the model can be widely used as it has been developed to include two dimensions comprising: 'location' ranging from community to country and 'person' ranging from the individual to a whole society. The task is then to adjust computing parameters according to the circumstances.

*The past, present and future of meat eating in Finland (2010)*

Vinnari (2010) examined meat consumption in Finland and developed three scenarios using backcasting methodology towards a vegetarian future:

- *From gluttony to crash*: This scenario is based on the vision that meat consumption grows by 50% until 2025. In the first period environmental issues are not seen as relevant. In the second period there is a marked decrease in meat consumption through choice due to evident environmental effects.
- *Steady decline*: Due to continuing debate on environmental effects there is a slight decline in meat consumption. Vegetarian meals are introduced in schools, expectations raise concerning meat quality.
- *Out of our hands*: Due to animal diseases meat consumption decreases that changes the economic viability of rearing animals for meat. It can be claimed that Western countries now have a really good chance to encourage people move towards vegetarian diet, however the tool itself cannot be foreseen, it is not possible to define the most appropriate policy and legislation at present.

A major learning of the study is that vegetarianism can also spread through socio-technical development and that becoming a vegetarian does not have to be a conscious choice for each individual.

*Strategies and scenarios for managing transition to sustainable food consumption: elements from the CONSENTSUS project (2008)*

The Belgian CONSENTSUS project (Boulanger, 2008) aimed to test and assess the potential of a transition management approach to sustainable consumption. The project included three participatively constructed backcast scenarios as the first step: eco-efficiency, de-commoditization and sufficiency scenarios. Since food consumption is a mixture of the three paradigms above, the second step was to construct an integrated scenario of food consumption.

Belgian Federal Report on Sustainable Development (1999, 2003, 2005)

The first biennial Belgian Federal Report on Sustainable Development (1999) developed three scenarios using different risk assessments and the extrapolation of trends and policy topics (Sedlacko & Gjoksi, 2010):

- *Utilising scenario*: Environmental and social risks are regarded as low, while risks associated with changes of production and consumption are very high. The policy adopted uses a “wait-and-see” attitude towards environmental and social issues and aims to increase development through economic activity.
- *Managing scenario*: Environmental and social risks are considered as high as economic risks. Policy supports the technological change to cleaner production technologies and materials and achieves environmental along with social objectives.
- *Safeguarding scenario*: Environmental and social risks are regarded as very high, while economic risks are low. Policy aims to avoid environmental costs with technology being directed towards renewable resources and energies.

A follow-up report (2003) implements these scenarios with specific topics like energy production and health, while a third report (2005) uses a backcasting methodology to describe a desirable future in 2050. Long-term effects of each scenario have been assessed using long-term models. The relevance of such an investigation is the ability to identify main economic, social and environmental effects depending on the way risk is approached.

#### WWF-UK: Livewell – a balance of healthy and sustainable food choices (2011)

WWF’s Livewell study (WWF, 2011) explored how a general diet would look in the UK in 2020 if dietary recommendations were met, in addition to a 25% reduction of green house gas emission (GHGE). At the same time they also investigated the possibility of reaching a 70% GHGE reduction by 2050 while still meeting dietary recommendations. According to the study the 25% reduction of GHG emission can be achieved without eliminating all meat and dairy products, while the 70% reduction would need a radical shift in the current diet: almost eliminating meat and dairy and being left with a very limited range of consumable food. It was concluded that currently it is not realistic to set up a diet with these limitations since both, types of food and the GHG emission of production will change in the next decades. Since the population of the UK is projected to grow by 2020, any reduction should exceed 25% and 70% per person. The study concludes that a healthy and low-GHGE diet can include unhealthy and high-GHGE food if it is balanced across the diet.

#### *Thinking about the future of food / The Chatham house food supply scenarios, Chatham House Food Supply Project (2008)*

The Chatham House Food Supply Project (2008) developed four global food supply scenarios to examine their impact on the UK and the EU. Based on previous research four dimensions were taken into consideration while constructing the scenarios: (i) the changing oil price, (ii) the growth of global demand on food, (iii) the supply capacity and (iv) global and economic answers to the three topics. Story lines were developed in a participatory way with research teams and experts in the given topic. The starting points of the scenarios were the following:

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- *Just a blip*: What if current high price of food is to end up in short time and food will be cheap again? This is possible when cheap oil undercuts incentives of biofuel production and provides free territories to increase food production.
  - *Food inflation*: What if food prices remain high for several years? Demand for food grows in parallel with population and high oil price support the push of biofuels. Despite growing productivity food prices stay high due to high input prices. The scenario results in high inflation.
  - *Into a new era*: What if current the food system has reached its limits and has to change? Due to high energy prices and climate change assuring long term food supply becomes an issue. There will also be a shift towards eco-technological production in agriculture.
  - *Food in crisis*: What if a major food crisis develops due to diseases and water shortage linked with extreme energy prices due to the geopolitical situation? Production becomes expensive and badly affected by extreme weather conditions; stocks are exhausted and prices are extremely high.

#### *Getting into the Right Lane for EU 2050 (2009)*

The Netherlands Environmental Assessment Agency and the Stockholm Resilience Centre prepared a report entitled “Getting into the Right Lane for EU 2050”. Using a backcasting methodology including land resources, food and biodiversity, energy and climate change as well as transport and mobility, the report investigates the challenges for EU policy up until 2050 (Sedlacko & Gjoksi, 2010). The vision for land resources, food and biodiversity is to be able to produce food for nine billion people, while minimising impacts on ecosystems. To reach this goal productivity needs to be increased by investing in improved agricultural technology; environmental impact needs to be decreased by lowering the demand for animal products and by reducing food losses. Four scenarios of possible future global roles for the EU in relation to these challenges are developed:

- Europe as a *superpower*, with strong focus on sustainable development
- Europe is *globalised*, with strong international cooperations both in political and economic areas. The EU is reactive to environmental issues and policy coherence is needed in order to support economic interest.
- Europe as a *mercantilist*, where international cooperation is limited, trans-national cooperation is only possible with some countries. Protection of national interests plays a high role, and EU governance is not to be reformed.
- *Irrelevant Europe* is isolated and out of international cooperations due to co-existing national and regional levels.

#### *Climate benefits of changing diets in climate change (2009)*

Stehfest et al. (2009) investigated the impact of the livestock sector on greenhouse gas emission and land use in conjunction with new human dietary perspectives. In order to explore results of a dietary change they developed four different scenarios besides FAO’s reference scenario ranging from complete substitution of meat by plant proteins:

- complete substitution of meat from ruminants;
- complete substitution of all meat;
- complete substitution of all animal products;
- partial substitution of meat based on a healthy diet.

Using these scenarios the authors investigated the effects of food products on land use, carbon cycle and GHG emissions. They conclude that even a less radical dietary change of the above would have significant effect on climate change and mitigation costs by approximately 25% decrease of livestock production and 40% decrease of land use compared to the reference scenario of FAO (FAO/WHO, 2003) by the year 2050.

#### *Cost effective design of economic instruments in nutrition policy (2007)*

Jensen and Smed (2007) developed several scenarios to examine the results and the effect of subsidies and taxes on different food categories. The study investigates the potential of using economic regulation as instruments to address the increasing problems of inappropriate diets. Seven different food tax and subsidy instruments or combinations of instruments have been analysed. The scenarios included:

- various taxes on nutrients like fats, saturated fats and sugar,
- various forms of subsidies to nutrients like fruits and vegetables and fibres,
- revenue-neutral combinations of taxes and subsidies.

The study shows that the average cost-effectiveness in case of targeting the intake of selected critical nutrients (i.e. fibres, saturated fat and sugar) can be increased by 10%–30% - if taxes/subsidies are targeted on these nutrients directly, compared with a more indirect regulation targeting selected food categories.

#### *Global Environment Outlook - Environment for Development (GEO-4) (2007)*

The fourth Global Environment Outlook entitled “Environment for Development” (GEO-4) developed four scenarios to investigate future alternatives for sustainable development until 2050, namely: Markets First, Policy First, Security First and Sustainability First. The scenarios examined different policy approaches and societal choices using narrative storylines and quantitative data at both global and regional levels. The study emphasized the importance of the valuation of environmental goods and services and its role for development.

#### *OECD Environmental Outlook (2008)*

The purpose of the OECD Environmental Outlook is to provide more exact analysis of policy packages and of the costs and benefits of environmental policies. It is envisaged that this would help policy-makers take better and more informed policy decisions. The OECD Environmental Outlook 2008 deals with climate change, biodiversity loss, water scarcity and health, and the key sectors with effect on the environment (agriculture, energy and transport). It includes also a simulation of the potential environmental, economic and social impacts of various policy decisions based on a single-baseline and policy-neutral reference scenario. This scenario shows how the world could be in 2030 if there were no change in policies to protect the environment.

It also analyses drivers for environmental change in the field of consumption and production, technology, demographics, economic development and urbanization. The study concludes with the main messages that tackling environmental challenges is achievable and affordable with the right policy solutions but that timing is crucial and environmental ministries need the support of other ministries and stakeholders.

*Agrimonde Scenarios and Challenges for Feeding the World in 2050, INRA-CIRAD 2009 (2009)<sup>3</sup>*

The aim of the Agrimonde project (INRA-CIRAD, 2009) was to set up scenarios that looked at feeding the world in 2050. For this purpose stakeholders developed two scenarios: The first scenario, Agrimonde GO, was a trend based scenario based on taking economic and technological development as a priority in order to forecast food consumption, land use and resource usage within current standards and policy framework. The second scenario, Agrimonde 1, was a normative scenario based on the vision of a sustainable food and agricultural system in 2050. Both scenarios were based on the same population growth forecast, which enabled a comparison of policy decisions needed for a sustainable future. A major learning of the study is that both Agrimonde GO and Agrimonde 1 scenarios would provide enough food but Agrimonde GO would have significant consequences for the environment. On the other hand, with Agrimonde 1 supply and production could expand in a sustainable way if production becomes more environmentally friendly, agricultural trade is more secure and regulated and the current food model will be changed.

*The Millennium Ecosystem Assessment (2005)*

The Millennium Ecosystem Assessment (2005) project developed four plausible scenarios to explore the future of ecosystems and human well-being for the next 50 years and beyond. The four scenarios considered increasing globalization or increasing regionalisation as two possible paths of world development and then adopted either a reactive or a proactive approach to their ecosystem management:

- *The Global Orchestration* scenario which depicts a worldwide connected society in which global markets are well developed and supranational institutions are well placed to deal with global environmental problems. However, their reactive approach to ecosystem management makes them vulnerable to surprises arising from delayed action or unexpected regional changes. Individuals are treated as most important, while people have trust in developing technologies that will solve all possible environmental problems. The scenario highlights the risks from ecological surprises.
- *The Order from Strength* scenario represents a regionalized and fragmented world concerned with security and protection, paying little attention to the common goods, and with an individualistic attitude toward ecosystem management. Nations see themselves as the most appropriate entity to defend themselves against economic insecurity and include environmental issues within this framework albeit as a secondary issue compared to other challenges. People in this scenario are also confident about technological development to solve environmental problems.

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<sup>3</sup> One of the main authors of the Agrimonde Study will present his work at the 3<sup>rd</sup> CORPUS workshop.



- *The Adapting Mosaic* scenario designs a fragmented world resulting from discredited global institutions. It explores the rise of local ecosystem management strategies and the strengthening of local institutions. Communities slowly realise that local environmental issues cannot be treated locally due to the global nature of the environment and start to develop real, working networks among communities and nations for better management.
- *The Technogarden* scenario builds on a globally connected, technology oriented world with often-engineered ecosystems to deliver human goods. Eco-efficiency improves, however it is largely based on man-made solutions. Conditions are good to solve global environmental problems with benefit of both the economy and the environment. Technological improvement in eco-efficiency co-develops with property rights requiring people to pay for polluting the environment.

#### *Foresight: Tackling Obesities: Future Choices (2007)*

In 2007, the UK Government Office for Science published the results of the Foresight project “Tackling Obesities”. It aimed to distill the factors impacting on the development of obesity and to find ways to fight obesity in the future. The authors developed four different scenarios for the year 2050 using 29 drivers for change, which were identified as having particular importance. The scenarios were based on two critical dimensions based on: uncertainty with respect to individuals’ and society’s behaviour, and uncertainty with respect to the strategic approaches taken to deal with the issue.

The four scenarios used were:

- Scenario One – an individualistic, market-driven society that adopts a more long-term and sustainable view.
- Scenario Two – a society where social responsibilities are prioritised, and communities and Government implement plans to meet long-term challenges.
- Scenario Three – a society where communities take the lead and focus on tackling difficulties as they arise.
- Scenario Four – an individualistic, market-driven society that reacts to problems when and where they occur.

From these scenarios it became evident that the prevalence of obesity will not decrease in the near future, but that the rate of increase can be influenced by the relative priority given to prevention or treatment.

#### *Foresight: The Future of Food and Farming (2011)*

The Future of Food and Farming project (2011) examined food prices and global food policy questions using two different computing models/approaches: IMPACT which is agriculture focused and GLOBE which is trade focused. Three scenarios were developed according to differing assumptions about population and income growth. All three scenarios showed significant increases in food prices for 2050 with subsequent social and political consequences and risks such as hunger that have to be managed.

**Table 1: Examples of scenarios**

Scenario Project	Issues covered	Methodology	Region covered
Gothenburg 2050 (2002)	food, transportation and energy use related to food	normative, participatory backcasting	small region (Gothenburg)
Risku-Norja (2011)	environmental impacts of primary consumption	explorative, model based	small region (Finland)
Vinnari (2010)	meat consumption	normative, backcasting	country (Finland)
Consensus (2008)	food consumption	normative, participatory backcasting	country (Belgium)
Belgian Federal Report on Sustainable Development (1999, 2003, 2005)	sustainable development in general, food	explorative, normative	country (Belgium)
Livewell (2011)	GHGE	normative, backcasting	country (UK)
Chatham House (2008)	global food supply	explorative, model based	UK and EU
Getting into the Right Lane for EU 2050 (2009)	food and biodiversity, land resources	normative, backcasting	EU
Stehfest et al (2009)	impact of livestock sector on GHGE, land use and carbon cycle	explorative, model based	global
Jensen and Smed (2007)	impact of financial tools on nutrition	explorative, model based	global
The fourth Global Environment Outlook entitled Environment for Development (GEO-4) (2007)	sustainable development in general	explorative	global
OECD Environmental Outlook (2008)	climate change, biodiversity loss, water scarcity and health	predictive, explorative	global
Agrimonde (2009)	food consumption, land use, resource usage	predictive, normative	global
Millennium Ecosystem Assessment (2005)	ecosystem and human well being	explorative, model based	global
Foresight Tackling Obesity (2007)	food, obesity	explorative, model based	global
Foresight. The Future of Food and Farming (2011)	food prices, hunger	explorative, model based	global

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## 4 The scenario approach in the 3<sup>rd</sup> CORPUS Workshop

The third CORPUS 'Policy Meets Research' Workshop has been designed in order to establish the main benefits of the approach with respect to knowledge brokering. Three key aspects will be developed:

- Building a common understanding of sustainable food futures through an imaginative projection;
- engaging heterogeneous stakeholders through an open back-casting process;
- experimenting with the joint vision of sustainable food consumption through a visual simulation process.

### *Building a common understanding of sustainable food futures through an imaginative projection*

The future has to be invented and cannot only be extrapolated from inherited past. This is in particular the case when focusing on discontinuities within sustainable transformative structural changes of the society. The scenario building process starts with a creative phase where stakeholders collaborate to imagine what a desirable vision of the future of sustainable food consumption might be. They share their views and exchange ideas until they agree on a common vision.

The scenario building process fosters a common understanding and a convergence between stakeholders. In terms of knowledge brokerage, this community building effect is an important outcome of the third CORPUS workshop – besides the identification of knowledge gaps that need to be closed through future research aiming to support of evidence-based policy-making (see joint development of a research agenda).

The first step of the workshop consists of a visioning exercise. Within the general framework of a sustainable food society, different sub-scenarios have been outlined. Each of them focuses on a particular aspect of a sustainable food society, such as: public food procurement, promotion of local agriculture, synergies with healthy diets, high tech food solutions, enjoying a sustainable gastronomy or the development of new social norms related to food (consumption). These sub-scenarios are not exclusive but complementary and may eventually overlap. Participants to the workshop are asked to further explore one of these sub-scenarios, extrapolating from a skeleton to imagine how all the subsequent aspects of society (from daily living to government or business) might look like.<sup>4</sup>

Within the Sustainable Everyday series of exhibitions, visions of different aspects of sustainable daily living have been elaborated and proposed in the form of short movie clips on food, mobility, work, energy etc. Visitors provided with a barcode entrance ticket were asked to choose between and comment on different solutions, thereby further developing and enriching the initial vision. The Sustainable Everyday exhibition became a large public visioning workshop touring

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<sup>4</sup> One good example of the exercise constitute the Blueprint project: [Hhttp://www.community-blueprint.co.uk/](http://www.community-blueprint.co.uk/)

different cities worldwide. Within the CORPUS research it has not been possible to concentrate on this method but it shows how to enrich a visioning activity in a participative way.

**Figure 2: Sustainable Everyday Exhibition**



*Engaging heterogeneous stakeholders through an open back-casting process*

The debate about the future is an open social conversation process and cannot be restricted to an experts-based interaction. A large stakeholder consultation is needed to make sure that the issue of the future of all is not overwritten by the interests of some and that enough diversity is taken into account to be sure to voice the key factors of emerging new paradigms.

The scenario building process therefore needs to be an open deliberation involving the interaction of as many different stakeholders as possible. The CORPUS scenario workshop brings together two groups (researchers and policy-makers) by letting them debate a common future of sustainable food consumption.

The second step of the workshop consists of a scenario back-casting exercise. From the vision that has been co-developed in the previous exercise, participants are required to discuss the necessary steps to move from the current situation to the future vision. These steps might be actions, measures, changes, projects, etc. in the economy, education, public administration, the social sector, business etc. Particular attention is paid to the interaction between scientists and policy-makers in this transition to sustainable food futures.

**Figure 3: Sustainable Victoira urban agriculture project**



Sustainable Victoria, the development agency of the state of Victoria in Australia explored the opportunities of urban agriculture in large cities like Melbourne. A large stakeholder workshop has been organised to bring together representatives of all sectors in Melbourne from urban development to micro-farming initiative in the urban fabric to discuss how they might collaborate and which changes in the local policy to realise the vision. For each of the new solutions of urban farming introduced at the beginning of the workshop, participants draft the process that they estimate was necessary to implement them. This condensed back-casting process was conducted through a story-telling exercise each stakeholder describing what his/her role might be in the process.

*Experimenting with the joint vision of sustainable food consumption through a visual simulation process*

The projection into possible futures of sustainable food consumption and their discussions requires more than describing characteristics of the scenarios. It requires the possibility to imagine what future everyday life may look like in order to appreciate what these alternative futures might be, and if they represent a desirable, acceptable option.

The scenario building process requires a simulation of each scenario through narratives, images or movies. Scenario visualisation techniques are a powerful tool to immerse stakeholders in the vision they should discuss and transform. At the same time the vision will impact them (or not) and transform their perception of the future by mimicking the co-evolution process between stakeholders and their environment. In the CORPUS scenario workshop, this mutual influence between the vision and those who generate it, is directly serving the brokering process.

The workshop will take place as a poster exhibition proposing snapshots of a sustainable food society. Participants will be nudged into a context that is prompting innovative solutions, ideas, and aspects around sustainable food consumption. The poster exhibition may represent a street in a sustainable food society with changes in shops, restaurants, advertisement, etc. This immersion situation should both help them to 'feel' what everyday living in such a society might be and help them to consider a context where sustainable food is mainstream.

**Figure 4: EMUDE project**



In the EU funded EMUDE (Emerging Users Demand for sustainable solutions) project, the scenario of Collaborative Services has been elaborated inspired by a selection of social innovations to show how daily living might look if it became the norm for citizens to participate in the services they benefit from. A series of personas and snapshots about the different collaborative services they are involved in were presented in a highly visual form to help project the vision.

## 5 Conclusion and implications

The food system is surrounded by unpredictable events and uncertainties and faces a wide range of challenges. The transition of the food system in a more sustainable direction requires a systematic approach. As drivers of change have an effect at global, national, regional and local level, new governance is needed for these differing scales. Governance has to respond to challenges such as ending hunger, meeting the growing demand for food, addressing price volatility, dealing with climate change and other environmental problems, changing governance of the food system, and encouraging dietary changes to prevent malnutrition.

As stated earlier in Discussion Paper 2, effective policies need to be established with support from practices discussed that enable a viable and effective route to transition. Scenario planning helps to indentify alternative future pathways and can help policy makers discover the key driving forces and uncertainties. When this information is linked with scientific knowledge and stakeholder participation, to legitimize and encourage acceptance, the decision-making process is more robust.

Based on the review of scenario examples, we can conclude that scenarios, by definition, are limited to including a few selected parameters rather than the whole food domain, for example: GHG emissions, land use or hunger reduction. Territorial scales range from local to global including micro regions and countries as well. Modell based scenarios provide quantified data and can be used anywhere if given appropriate data, while backcasting scenarios focus more on supporting policy making. With respect to participatory backcasting scenarios, it is important to emphasize that limiting the area of discussions also limits the scope of vision, while too much liberalization of the discussion makes policy making more difficult.

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